86th Annual Research Report

RICE RESEARCH STATION

Crowley, Louisiana

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Louisiana State University Agricultural Center
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INTRODUCTION

Research work at the Rice Research Station, Crowley, Louisiana, is conducted cooperatively by the Louisiana Agricultural Experiment Station (L.A.E.S.) and the United States Department of Agriculture, Agricultural Research Service. The 1994 rice research program included breeding, biotechnology, variety testing, production and distribution of foundation seed, fertilization, soil and water management, cultural practices, weed control, insect control, disease investigations, rice drying, bird control in rice, and physiology studies. Forages and crops grown in rotation with rice were evaluated relative to increasing the efficiency of land use. The aquaculture research program places emphasis upon production practices, crawfish forages, and multi-cropping of crawfish with agronomic crops. Although most of the research work was performed by members of the Rice Station staff, several staff members from other L.A.E.S. units conducted research at this station.

The research activities of this station include both fundamental and applied research, although the latter predominates due to the mission of the Rice Research Station. Research accomplishments and general progress of the Rice Station during 1994 are presented in this report representing the 86th Annual Research Report of the Rice Research Station, L.A.E.S., Louisiana State University Agricultural Center.

Varieties developed by the Rice Research Station and released by the L.A.E.S. were planted on 35% of the 1994 rice acreage in the south. Cypress was the leading long-grain variety and Bengal was the leading medium-grain variety in 1994 in the south. The station continued research utilizing three approaches to red rice control: genetic transfer (Gulfmont, Koshihikari, Cypress, and Bengal); somaclonal mutants; and plant growth regulators. The conservation rice tillage research program remains the only one of this nature in the U.S., and approximately 18% of the 1994 acreage in Louisiana was planted using this technology. The biocontrol of rice insects remains the only one of its type in the U.S. and progress was made in this area of research.

Disease tolerance and disease control remain major problems facing Louisiana rice producers. Improved disease tolerant long- and medium-grain experimental lines were advanced through seed increases in 1994. Two very promising fungicides were tested, and research involving fungicide safeners for selected herbicides was initiated.

This annual report of research progress is dedicated to Earl Sonnier (Assistant Professor). Mr. Sonnier was instrumental in establishing and improving the Rice Foundation Seed program. He was heavily involved in research for red rice control and was part of the team that developed and improved water management as a tool for red rice control. Mr. Sonnier was actively involved in the International Program of the Rice Research Station. He established excellent working relationships with research organizations and rice producers in Rio Grande do Sul and Santa Catarina states in Brazil. He was fondly and respectfully referred to as "Dr. Sonnier" by his many Brazilian friends. The Rice Research Station dedicates this report in his memory.

MONTHLY RAINFALL DATA
RICE RESEARCH STATION - CROWLEY, LA
1994

DATE	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC	YEAR TOTAL
1			.17		.50	.21			.12	*			
2	.20		1.25		.10	.01	.10		.02	*			
3					1.42	.61		.19		*		.70	
4					.02							2.80	
5		.10											
6				2.25			.88						
7	.01			.41		.03			.92				
8	.40	.08					.50			*			
9			1.23				.70	2.10		*			
10		.32	.38			.10	.90	.23			.15	.20	
11		.93					.30				.01	.30	
12	.33			1.25		1.60	.85						
13	.25			.62		1.70	.83						
14					1.0		.42						
15							.02						
16			.05	.80					.30	.20			
17	.60				.65				.10	.10		1.60	
18	.20				.66					.10			
19							.11			1.06			
20										.84			
21				.22				.10					
22		.29		.02			.50			.40			
23		.13		.10		.23						*	
24		.34		1.20		.19	1.60	.02					
25				.10				.68					
26											.40		
27	2.62												
28	.52		.20				.40				.40	.90	
29	.20							.30					
30	.30				.50						.02		
31					.65			1.28					
MONTH TOTAL	5.63	2.19	3.28	6.97	5.50	4.68	8.11	4.90	1.46	2.70	.98	13.00	
1993	12.91	3.76	5.31	9.86	4.77	14.27	4.05	1.43	2.87	6.61	8.58	4.33	78.75

* Missing data.

RICE BREEDING

GENETIC IMPROVEMENT OF RICE FOR LOUISIANA PRODUCTION[1]

S.D. Linscombe, F. Jodari, K.F. Carriere, A.P. Fabacher, K.C. Leonards, R.J. Guidry, C.G. Gravot, H.L. Hoffpauir, and R. Pollingue

INTRODUCTION

The Rice Breeding project has as a primary objective the development of superior genotypes for the Louisiana rice industry. The major types of rice grown in Louisiana are conventional cooking long- and medium-grain types. In 1994, approximately 70% of the Louisiana rice acreage was seeded to long-grain varieties while the remaining acreage was seeded primarily to medium-grain types (with a small acreage seeded to special purpose types). The Breeding project is developing improved genotypes of both long- and medium-grain types. Also, under the direction of Dr. Farman Jodari, a major emphasis is placed on the development of various special purpose types.

The development of premium quality short and medium grains has been given increased emphasis within the Breeding project. The interest here is the development of agronomically adapted lines that possess quality characteristics that may be more acceptable to the Japanese and Korean markets. This is of increased importance because of the opening of Japanese markets to imported rice. Currently, the Gulf South rice growing area is at a disadvantage because of the lack of agronomically acceptable genotypes that possess the cooking quality type preferred in these markets. A number of lines in preliminary and advanced testing have displayed excellent agronomic characteristics. However, extensive cooking and quality evaluations will be necessary to determine if any of these lines meet required quality parameters. An additional complication in this area is the effect of growing environment on the cooking quality of these genotypes.

A secondary objective of the Breeding project is to conduct other research studies that may have direct and/or indirect effects on varietal development efforts. Included here are studies on herbicide tolerance of rice genotypes, milling quality, mutation breeding, physiological characteristics associated with genetic gain, and evaluation of genetically engineered herbicide-resistant rice lines.

The 1994 rice breeding nursery included 52,355 panicle rows (F_3-F_8 generations), 387 F_1 transplant populations, and 159 F_2 bulk populations. On- and off-station yield testing included 3,881 plots.

[1] This research is supported in part by funding provided by rice producers through the Louisiana Rice Research Board.

The artificial hybridization program included 350 initial crosses and backcrosses for varietal improvement and/or genetic studies. Germplasm increase populations of 44 lines were grown for seed increase and purification.

The field evaluation of genetically engineered herbicide (glufosinate)-resistant lines was expanded and included work with transformed Cypress and Bengal in 1994. This work was conducted in cooperation with Drs. Michael Braverman, Jim Oard, and Patrick Bollich. The greatest potential of this research is the development of rice genotypes that are resistant to herbicides that are efficacious on red rice.

Anther culture is being used to rapidly develop homozygous lines in promising populations. Currently, a number of lines in preliminary testing have been developed through these efforts in cooperation with Dr. Timothy Croughan.

Pest evaluation of promising selections were conducted by cooperating projects. Dr. Don Groth rated advanced tests for the major rice diseases (blast and sheath blight). Dr. Bill Rice and Mr. George Trahan (USDA-ARS) evaluated all advanced breeding lines for susceptibility to damage by rice water weevil larvae.

Progress is being made in attempts to incorporate higher levels of disease resistance into advanced breeding lines. LSBR-5 (a somaclone selection from the Biotechnology program of Dr. M.C. Rush) has been used as a germplasm source for sheath blight tolerance in a number of populations. Several lines with good levels of sheath blight tolerance and acceptable agronomic and quality characteristics are being extensively evaluated.

Three lines are currently in advanced seed increase. These are LA 9302008, LA 9302106, and LA 9302065. 2008 and 2106 are semidwarf medium grains with good levels of blast resistance. 2065 is a semidwarf long grain with excellent blast resistance and moderate levels of sheath blight resistance.

COOPERATIVE UNIFORM REGIONAL RICE NURSERY (URN)

Public rice breeders in the United States conduct cooperative yield nurseries in which experimental lines and commercial varieties are grown and evaluated at research locations in Arkansas, Louisiana, Mississippi, Texas, Florida, and California. The nurseries are used to test the adaptation of entries in the diverse rice growing environments of the United States. The entries in the 1994 nursery included material from Arkansas, California, Louisiana, Mississippi, and Texas, and some entries from foreign countries. Main and ratoon crop data were generated from the URN at the Rice Research Station and are presented in Tables 1-14. In tables where main and ratoon crop numbers are presented, total yield numbers may vary by 1 digit because of rounding. Information on performance characteristics from all states is compiled and stored in the Rice Data Bank by the Department of Experimental Statistics, LSU Agricultural Center.

Experiment: Uniform Regional Nursery - Group I

Location: Rice Research Station

Seeding Rate/Date: 150 lb/A, March 25, 1994

Planting Method: Water-seeded (pre-germinated seed)

Fertilization: 103-54-54 lb/A (N-P_2O_5-K_2O) preplant incorporated, Mar 23;
21 lb N/A, May 19; 21 lb N/A, June 1; 60 lb N/A, Aug 4 (ratoon crop)

Plot Size: 4.66 x 18 ft (84 ft^2)

Water Management: Flood, Mar 24; drain, Apr 1; reflood, Apr 4;
harvest drainage, July 18; reflood, Aug 4; harvest drainage,
Oct. 3

Herbicides: Londax (bensulfuron) 1 oz ai/A, Apr 20
Ordram (molinate) 3 lb ai/A, Apr 26

Insecticides: Furadan (carbofuran) .5 lb ai/A, Apr 28

Harvest: Aug 3; ratoon crop, Oct. 17

Experimental Design: Randomized complete block with four replications

Results: Tables 1 and 2

Table 1. Agronomic and milling performance of 1994 uniform rice nursery, Group I. Crowley, LA.

1994 entry	Pedigree	Grain Type*	Seedling vigor**	Days to 50% heading	Plant height (in)	Lodging (%)	Yield*** (lb/A @ 12%)	Milling % (Whl-Tot)	SB[1]	RN[1]	SV[1]
1	ALAN/TBNT	L	4	88	46	0	7318 a	59 - 69	3	5	2
7	ALAN/TBNT	L	4	93	45	0	6948 ab	63 - 70	4	2	2
6	VSTA/LBNT//RSMT	L	8	91	41	0	6802 abc	60 - 69	4	2	1
5	MBLE//82CAY21/LMNT	L	6	82	35	0	6778 abc	61 - 68	4	6	3
2	LBLE/L201//MBLE	L	6	83	44	10	6759 abc	63 - 69	5	4	2
20	JKSN	L	5	88	45	38	6730 abcd	60 - 69	4	4	3
11	82CAY21/LMNT//L202	L	6	95	39	0	6719 abcd	52 - 65	2	1	2
18	JODN	L	5	89	40	0	6529 abcde	58 - 67	3	2	1
4	BN73*2/NV76//NWRX	L	6	91	45	0	6175 bcdef	57 - 67	4	3	2
8	MERC/AKIHIKARI	M	5	82	37	83	6148 bcdef	72 - 75	4	3	1
17	MBLE	L	5	81	40	63	6035 bcdef	65 - 71	4	6	3
15	ALAN	L	3	88	44	63	5966 bcdef	59 - 67	4	4	3
19	MILL	L	4	86	44	53	5877 cdef	63 - 71	3	4	2
16	ADAR	L	4	88	47	68	5790 cdef	60 - 70	3	4	2
12	GFMT*2/1409	L	6	94	40	0	5697 def	56 - 69	4	3	3
10	LBNT/STBN//NWBT	L	5	89	44	0	5652 ef	60 - 68	3	5	3
14	LMNT/3/TBNT/LA110//LMNT...	L	5	86	41	83	5628 ef	69 - 73	4	2	1
3	GFMT*2/I409	L	6	85	40	0	5459 f	64 - 70	5	5	3
9	VSTA/LBNT//RSMT	L	8	89	39	0	5419 f	63 - 69	2	2	2
13	LBNT/9902/3/DAWN/9695/...	L	6	85	41	88	5268 f	67 - 71	3	4	2
C.V.			9.6	1.6	3.2	--	10.1	3.9-2.0	26	39	28

* L = Long grain, M = Medium grain.
** Subjective rating 1 to 9, where 1 = excellent, 9 = poor.
*** Numbers followed by the same letter are not significantly different (Duncan's MRT, P = 0.05).
[1] SB=sheath blight, 0-9 scale; RN=rotten neck blast, % infection (x10); and SV=rotten neck blast severity, 0-9 scale.

Table 2. Performance of main and ratoon crops of 1994 uniform regional nursery, Group I, Crowley, LA.

1994 entry	Pedigree	Ratoon height (in)	Main crop yield	Ratoon crop yield	Total yield
			------lb/A @ 12%------		
4	BN73*2/NV76//NWRX	35	6175	3723	9898 a
1	ALAN/TBNT	37	7318	2472	9790 ab
10	LBNT/STBN//NWBT	32	5652	3473	9125 abc
11	82CAY21/LMNT//L202	28	6719	2358	9077 abc
6	VSTA/LBNT//RSMT	28	6802	2124	8925 abcd
5	MBLE//82CAY21/LMNT	24	6778	2101	8879 abcd
2	LBLE/L201//MBLE	31	6759	2032	8791 abcd
18	JODN	29	6529	2188	8717 abcd
20	JKSN	33	6730	1964	8694 abcd
7	ALAN/TBNT	35	6948	1672	8620 abcd
15	ALAN	33	5966	2538	8503 abcd
19	MILL	32	5877	2474	8352 bcd
14	LMNT/3/TBNT/LA110//...	30	5628	2422	8050 cd
9	VSTA/LBNT//RSMT	28	5419	2626	8045 cd
8	MERC/AKIHIKARI	28	6148	1896	8044 cd
12	GFMT*2/1409	28	5697	2314	8011 cd
16	ADAR	33	5790	2047	7837 cd
3	GFMT*2/I409	30	5459	2345	7804 cd
17	MBLE	29	6035	1634	7669 cd
13	LBNT/9902/3/DAWN/9695...	31	5268	2182	7450 d
C.V.		4.9	10.1	17.6	10.5

* Numbers followed by the same letter are not significantly different (Duncan's MRT, P = 0.05).

Experiment: Uniform Regional Nursery - Group II

Location: Rice Research Station

Seeding Rate/Date: 150 lb/A, March 25, 1994

Planting Method: Water-seeded (pre-germinated seed)

Fertilization: 103-54-54 lb/A (N-P_2O_5-K_2O) preplant incorporated, Mar 23;
21 lb N/A, May 19; 21 lb N/A, June 1; 60 lb N/A, Aug 4 (ratoon crop)

Plot Size: 4.66 x 18 ft (84 ft^2)

Water Management: Flood, Mar 24; drain, Apr 1; reflood, Apr 4; harvest drainage,
July 18; reflood, Aug 4; harvest drainage, Oct. 3

Herbicides: Londax (bensulfuron) 1 oz ai/A, Apr 20
Ordram (molinate) 3 lb ai/A Apr 26

Insecticides: Furadan (carbofuran) .5 lb ai/A, Apr 28

Harvest: Aug 3; ratoon crop, Oct 17

Experimental Design: Randomized complete block with four replications

Results: Tables 3 and 4

Table 3. Agronomic and milling performance of 1994 uniform rice nursery, Group II. Crowley, LA.

1994 entry	Pedigree	Grain Type*	Seedling vigor**	Days to 50% heading	Plant height (in)	Lodging (%)	Yield*** (lb/A @ 12%)	Milling % (Whl-Tot)	SB[1]	RN[1]	SV[1]
36	L202//TBNT/BLMT	L	5	88	39	0	7711 a	54 - 69	3	2	1
28	RICO/V4716	M	5	93	47	15	7655 a	61 - 71	4	1	1
24	ALAN/TBNT	L	5	89	46	20	7447 a	62 - 69	5	5	2
40	LGRU	L	5	91	46	20	6632 b	51 - 66	3	5	4
38	BNGL	M	5	92	38	0	6438 bc	57 - 69	4	3	3
21	LMNT/RA73	L	5	89	44	15	6361 bc	55 - 66	4	5	2
26	KATY//GFMT/PCOS	L	5	92	48	63	6307 bc	66 - 70	3	2	2
25	MERC//MERC/KOSH	M	5	87	39	80	6257 bc	65 - 70	3	1	1
37	ORIN	M	5	91	40	85	6074 bcd	56 - 70	3	1	1
22	MERC//MERC/KOSH	M	5	85	39	68	6066 bcd	70 - 72	4	2	1
35	GFMT*2/TQNG	L	6	90	40	0	6059 bcd	65 - 72	4	2	1
34	DLRS	L(A)	6	92	41	0	6041 bcd	68 - 72	4	3	2
32	GCHW/SMAR*3	L	6	86	41	28	5873 bcde	63 - 71	3	4	2
33	VSTA/LBNT//BLMT/3/...	L	5	86	39	0	5842 bcde	64 - 70	4	4	3
30	87309	L	4	92	46	65	5639 cde	64 - 68	3	3	2
27	B737/265116//V6STL/3/...	L	5	92	45	53	5636 cde	64 - 68	3	2	2
23	RU8303116/LMNT	L	7	88	35	0	5588 cde	64 - 71	5	3	2
39	MARS	M	3	91	45	83	5375 def	63 - 69	3	4	3
29	GCHW/SMAR*3	M	6	87	40	80	5120 ef	55 - 68	3	4	3
31	DMSI/DLLAX2//LMNT	L(A,E)	5	90	46	63	4763 f	62 - 70	4	3	2
C.V.			11.5	1.6	3.1	--	8.3	6.9-1.7	29	40	33

* L = Long grain, M = Medium grain (A = aromatic, E = elongating).
** Subjective rating 1 to 9, where 1 = excellent, 9 = poor.
*** Numbers followed by the same letter are not significantly different (Duncan's MRT, P = 0.05).
[1] SB=sheath blight, 0-9 scale; RN=rotten neck blast, % infection (x10); and SV=rotten neck blast severity, 0-9 scale.

Table 4. Performance of main and ratoon crops of 1994 uniform regional nursery, Group II, Crowley, LA.

1994 entry	Pedigree	Ratoon height (in)	Main crop yield	Ratoon crop yield	Total yield
			------lb/A @ 12%------		
36	L202//TBNT/BLMT	30	7711	2830	10541 a
21	LMNT/RA73	34	6361	3136	9497 ab
40	LGRU	34	6632	2683	9315 b
34	DLRS	29	6041	3010	9051 bc
24	ALAN/TBNT	32	7447	1467	8913 bcd
38	BNGL	29	6438	2446	8884 bcd
33	VSTA/LBNT//BLMT/3/...	30	5842	2868	8710 bcd
28	RICO/V4716	32	7655	992	8647 bcd
35	GFMT*2/TQNG	32	6059	2261	8320 bcde
32	GCHW/SMAR*3	30	5873	2093	7966 cdef
30	87309	33	5639	2300	7939 cdef
23	RU8303116/LMNT	28	5588	2314	7902 cdef
39	MARS	35	5375	2420	7795 def
22	MERC//MERC/KOSH	27	6066	1345	7411 efg
37	ORIN	30	6074	1313	7387 efg
25	MERC//MERC/KOSH	28	6257	933	7190 efgh
26	KATY//GFMT/PCOS	33	6307	791	7098 efgh
27	B737/265116//V6STL/3/...	32	5636	1161	6797 fgh
29	GCHW/SMAR*3	29	5120	1412	6532 gh
31	DMSI/DLLAX2//LMNT	36	4763	1323	6086 h
C.V.		5.9	8.3	18.9	9.1

* Numbers followed by the same letter are not significantly different (Duncan's MRT, P = 0.05).

Experiment: Uniform Regional Nursery - Group III

Location: Rice Research Station

Seeding Rate/Date: 150 lb/A, March 25, 1994

Planting Method: Water-seeded (pre-germinated seed)

Fertilization: 103-54-54 lb/A (N-P_2O_5-K_2O) preplant incorporated, Mar 23;
21 lb N/A, May 19; 21 lb N/A, June 1; 60 lb N/A, Aug 15 (ratoon crop)

Plot Size: 4.66 x 18 ft (84 ft^2)

Water Management: Flood, Mar 24; drain, Apr 1; reflood, Apr 4; harvest drainage July 20; reflood, Aug 15; harvest drainage, Oct. 14

Herbicides: Londax (bensulfuron) 1 oz ai/A, Apr 20
Ordram (molinate) 3 lb ai/A, Apr 26

Insecticides: Furadan (carbofuran) .5 lb ai/A, Apr 28

Harvest: Aug 12; ratoon crop, Oct. 24

Experimental Design: Randomized complete block with four replications

Results: Tables 5 and 6

Table 5. Agronomic and milling performance of 1994 uniform rice nursery, Group III. Crowley, LA.

1994 entry	Pedigree	Grain Type*	Seedling vigor**	Days to 50% heading	Plant height (in)	Lodging (%)	Yield*** (lb/A @ 12%)	Milling % (Whl-Tot)	SB[1]	RN[1]	SV[1]
53	NWBT/KATY	L	5	96	49	8	8708 a	65 - 70	3	1	1
41	KATY/STBN	L	5	95	49	20	8525 ab	63 - 68	3	1	1
50	NWBT/KATY	L	5	99	48	0	8143 ab	65 - 70	2	1	1
51	902207X2(25KR)	L	4	95	42	33	7969 abc	65 - 71	3	2	2
48	902207X2(25KR)	L	5	96	42	25	7892 abc	64 - 69	4	2	2
44	NWBT/KATY	L	5	97	48	0	7891 abc	66 - 71	2	0	0
54	NWBT/KATY	L	4	95	51	5	7841 abc	68 - 72	2	1	1
47	M201/KATY	L	5	97	48	0	7643 bcd	64 - 69	2	1	1
42	CPRS//LMNT*2//CR1113	L	5	96	41	15	7119 cde	64 - 70	3	3	3
57	KBNT	L	4	93	46	65	6809 def	64 - 69	4	1	1
59	CPRS	L	4	95	41	50	6723 defg	66 - 71	4	2	2
55	LMNT	L	6	97	40	0	6562 efgh	60 - 69	5	4	3
49	LMNT/KATY	L	6	98	39	0	6544 efgh	64 - 70	3	0	0
58	KATY	L	4	97	51	63	6044 fgh	64 - 69	3	1	0
46	RU8303181/CB801	L	8	99	37	0	6042 fgh	60 - 67	4	3	2
45	CPRS//L201/7402003	L	5	96	48	58	5987 fgh	58 - 67	4	5	3
56	GFMT	L	6	95	42	3	5806 gh	60 - 69	5	5	2
60	NWBT	L	4	95	47	3	5735 gh	58 - 67	3	6	3
52	LBLE-X2/2/BJ-1*F1//...	L	7	95	41	38	5672 h	59 - 67	5	5	3
43	GFMT*2/I409	L	7	104	41	0	5670 h	63 - 70	3	1	1
C.V.			9.3	1.0	3.0	--	8.7	3.2-2.1	22	42	45

* L = Long grain.
** Subjective rating 1 to 9, where 1 = excellent, 9 = poor.
*** Numbers followed by the same letter are not significantly different (Duncan's MRT, P = 0.05).
[1] SB=sheath blight, 0-9 scale; RN=rotten neck blast, % infection (x10); and SV=rotten neck blast severity, 0-9 scale.

Table 6. Performance of main and ratoon crops of 1994 uniform regional nursery, Group III, Crowley, LA.

1994 entry	Pedigree	Ratoon height (in)	Main crop yield	Ratoon crop yield	Total yield
			------lb/A @ 12%------		
41	KATY/STBN	33	8525	2431	10956 a
54	NWBT/KATY	36	7841	2610	10451 ab
50	NWBT/KATY	33	8143	1662	9805 abc
44	NWBT/KATY	33	7891	1698	9589 bcd
53	NWBT/KATY	33	8708	782	9490 bcd
48	902207X2(25KR)	30	7892	1335	9228 bcde
51	902207X2(25KR)	28	7969	1099	9068 cdef
52	LBLE-X2/2/BJ-1*F1//...	30	5672	3297	8969 cdefg
46	RU8303181/CB801	27	6042	2926	8968 cdefg
47	M201/KATY	32	7643	1229	8872 cdefg
42	CPRS//LMNT*2//CR1113	29	7119	1728	8847 cdefg
57	KBNT	31	6809	1587	8397 defgh
59	CPRS	28	6723	1595	8318 defgh
49	LMNT/KATY	26	6544	1574	8118 efgh
55	LMNT	28	6562	1456	8019 efgh
56	GFMT	30	5806	2040	7846 fgh
45	CPRS//L201/7402003	33	5987	1744	7731 gh
60	NWBT	32	5735	1987	7723 gh
58	KATY	35	6044	1373	7417 h
43	GFMT*2/I409	27	5670	1467	7137 h
C.V.		5.2	8.7	24.9	9.0

* Numbers followed by the same letter are not significantly different (Duncan's MRT, P = 0.05).

Experiment: Uniform Regional Nursery - Group IV

Location: Rice Research Station

Seeding Rate/Date: 150 lb/A, March 25, 1994

Planting Method: Water-seeded (pre-germinated seed)

Fertilization: 103-54-54 lb/A (N-P_2O_5-K_2O) preplant incorporated, Mar 23;
21 lb N/A, May 19; 21 lb N/A, June 1; 60 lb N/A, Aug 15 (ratoon crop)

Plot Size: 4.66 x 18 ft (84 ft^2)

Water Management: Flood, Mar 24; drain, Apr 1; reflood, Apr 4; harvest drainage,
July 20; reflood, Aug 15; harvest drainage, Oct. 14

Herbicides: Londax (bensulfuron) 1 oz ai/A, Apr 20
Ordram (molinate) 3 lb ai/A, Apr 26

Insecticides: Furadan (carbofuran) .5 lb ai/A, Apr 28

Harvest: Aug 12; ratoon crop, Oct. 24

Experimental Design: Randomized complete block with four replications

Results: Tables 7 and 8

Table 7. Agronomic and milling performance of 1994 uniform rice nursery, Group IV. Crowley, LA.

1994 entry	Pedigree	Grain Type*	Seedling vigor**	Days to 50% heading	Plant height (in)	Lodging (%)	Yield*** (lb/A @ 12%)	Milling % (Whl-Tot)	SB[1]	RN[1]	SV[1]
79	RICO	M	7	95	46	80	7833 a	61 - 70	1	0	0
65	KATY/CPRS	L	5	96	39	0	7819 ab	67 - 72	3	3	2
71	LMNT/LBLE SC-5	L	6	96	44	0	7609 abc	60 - 72	3	0	0
62	LCSN/CPRS	L	5	91	38	0	7529 abcd	63 - 71	3	4	2
61	88362	L	5	97	41	0	7201 abcde	64 - 72	4	1	1
66	PCOS/LMNT//GFMT	L	5	97	39	0	7069 abcdef	61 - 69	5	3	3
75	PCOS/RU8703196//GFMT	L	7	98	39	0	7049 abcdef	65 - 71	4	2	1
68	CPRS/LMNT*2//CR1113	L	5	93	40	5	6999 bcdef	62 - 70	3	4	3
74	TXMT/3/...	L	6	96	43	0	6812 cdefg	59 - 69	2	1	2
72	KATY//GFMT/PCOS	L	6	90	37	0	6762 defg	60 - 69	3	4	2
63	RU8003050/CA82Y24//LMNT...	L	6	95	37	0	6701 defg	62 - 70	3	3	2
80	TORO-2	L	5	92	46	45	6594 efgh	59 - 71	3	4	2
77	VSTA/LBNT//L201/3/SKBT	L	5	86	45	48	6586 efgh	63 - 72	5	3	2
64	BN73*2/NV76//TBNT	L	5	93	44	0	6461 efghi	59 - 69	3	3	2
67	NWBT///LBNT/STBN	L	5	95	44	0	6302 fghi	53 - 66	3	6	3
78	GFMT/RU8703196	L	6	99	40	0	6136 ghi	59 - 71	4	3	2
70	LMNT/RA73	L	5	99	43	0	6108 ghi	58 - 70	4	5	4
73	GCHW/LMNT	L	5	96	45	0	5849 hi	55 - 67	4	7	3
69	LBNT WX/RU8703190	L(W)	6	94	39	0	5744 i	66 - 69	5	4	3
76	LMNT//BN73*/NV76	L	4	96	46	33	5648 i	62 - 69	2	6	3
C.V.			7.6	1.0	3.6	--	7.5	3.9-2.2	33	33	34

* L = Long grain, M = Medium grain (W = waxy).
** Subjective rating 1 to 9, where 1 = excellent, 9 = poor.
*** Numbers followed by the same letter are not significantly different (Duncan's MRT, P = 0.05).
[1] SB=sheath blight, 0-9 scale; RN=rotten neck blast, % infection (x10); and SV=rotten neck blast severity, 0-9 scale.

Table 8. Performance of main and ratoon crops of 1994 uniform regional nursery, Group IV, Crowley, LA.

1994 entry	Pedigree	Ratoon height (in)	Main crop yield	Ratoon crop yield	Total yield
			------lb/A @ 12%------		
71	LMNT/LBLE SC-5	31	7609	3729	11337 a
62	LCSN/CPRS	26	7529	3245	10774 ab
66	PCOS/LMNT//GFMT	28	7069	3229	10298 bc
65	KATY/CPRS	26	7819	2008	9827 cd
77	VSTA/LBNT//L201/3/...	30	6586	3208	9794 cd
72	KATY//GFMT/PCOS	27	6762	2925	9687 cde
67	NWBT///LBNT/STBN	31	6302	3180	9481 cdef
68	CPRS/LMNT*2//CR1113	29	6999	2273	9272 defg
63	RU8003050/CA82Y24//...	26	6701	2510	9210 defgh
75	PCOS/RU8703196//GFMT	28	7049	1933	8982 defghi
64	BN73*2/NV76//TBNT	34	6461	2521	8981 defghi
78	GFMT/RU8703196	28	6136	2698	8834 efghi
69	LBNT WX/RU8703190	29	5744	2965	8709 fghi
74	TXMT/3/...	28	6812	1669	8480 ghi
76	LMNT//BN73*/NV76	33	5648	2805	8452 ghi
61	88362	29	7201	1163	8364 hi
70	LMNT/RA73	31	6108	2166	8274 i
73	GCHW/LMNT	32	5849	2416	8265 i
80	TORO-2	30	6594	1635	8229 i
79	RICO	30	7833	385	8218 i
C.V.		5.6	7.5	8.3	6.0

* Numbers followed by the same letter are not significantly different (Duncan's MRT, P = 0.05).

Experiment: Uniform Regional Nursery - Group V

Location: Rice Research Station

Seeding Rate/Date: 150 lb/A, March 25, 1994

Planting Method: Water-seeded (pre-germinated seed)

Fertilization: 103-54-54 lb/A (N-P_2O_5-K_2O) preplant incorporated, Mar 23; 21 lb N/A, May 19; 21 lb N/A, June 1; 60 lb N/A, Aug 15 (ratoon crop)

Plot Size: 4.66 x 18 ft (84 ft^2)

Water Management: Flood, Mar 24; drain, Apr 1; reflood, Apr 4; harvest drainage, July 20; reflood, Aug 15; harvest drainage, Oct. 3

Herbicides: Londax (bensulfuron) 1 oz ai/A Apr 20
Ordram (molinate) 3 lb ai/A, Apr 26

Insecticides: Furadan (carbofuran) .5 lb ai/A, Apr 28

Harvest: Aug 12; ratoon crop, Oct. 17

Experimental Design: Randomized complete block with two replications

Results: Tables 9 and 10

Table 9. Agronomic and milling performance of 1994 uniform rice nursery, Group V. Crowley, LA.

1994 entry	Pedigree	Grain Type*	Seedling vigor**	Days to 50% heading	Plant height (in)	Lodging (%)	Yield*** (lb/A @ 12%)	Milling % (Whl-Tot)	SB[1]	RN[1]	SV[1]
82	RICO/V4716	M	5	88	43	0	7498 a	64 - 69	5	1	2
97	82CAY21/TBNT/3/...	L	5	94	41	0	7335 ab	59 - 67	3	1	1
87	LBLE/L201//TBNT	L	5	89	44	0	7291 ab	58 - 68	3	4	2
108	ALAN/KATY	L	4	91	43	0	7157 abc	63 - 70	4	1	2
111	TBNT/KATY	L	4	88	48	30	7128 abc	66 - 72	4	1	1
85	MERC//MERC/KOSH	M	6	89	44	20	7034 abc	71 - 73	3	0	0
83	VSTA/LBNT//L201/3/SKBT	L	4	84	41	10	6919 abcd	66 - 73	6	3	3
109	V4716/MARS	M	7	95	42	0	6860 a-e	62 - 68	4	3	2
115	MERC//M401/NTAI	M	4	82	40	45	6850 a-f	68 - 72	3	1	1
106	82CAY21/LMNT//L202	L	5	95	40	0	6849 a-f	50 - 63	4	2	2
120	TBNT	L	6	92	53	0	6831 a-f	57 - 69	4	4	2
112	RICO/MERC	M	6	87	43	35	6777 a-f	55 - 67	4	1	1
103	CFRS//GCHW/...	L	5	92	39	0	6675 a-g	59 - 66	5	2	2
110	GFMT*2/TQNG	L	6	91	40	0	6588 a-h	62 - 70	4	3	2
91	82CAY21/LMNT//KATY	L	5	94	39	0	6573 a-h	57 - 69	4	1	2
98	RU8703196/PCOS//GFMT	L	6	93	43	0	6521 a-h	48 - 71	3	2	2
88	KATY/CFRS	L	5	98	48	0	6488 a-h	59 - 66	3	3	2
86	VSTA/LBNT//RSMT	L	7	90	39	0	6468 a-i	60 - 69	4	4	3
114	8403113/3/KCAI/LEAH//...	L	4	84	40	0	6453 a-i	57 - 68	6	5	3
100	8403113/3/KCAI/LEAH//...	L	4	85	43	0	6441 a-i	59 - 69	5	5	3
90	KATY//TBNT/NWRX	L	5	83	43	45	6375 a-i	62 - 69	4	3	2
113	GCHW/LMNT//CB801/3/LMNT	L	7	84	36	0	6125 a-j	62 - 70	5	6	4
81	87324	L	4	88	40	0	6108 a-j	62 - 70	5	4	3
89	LMNT/JSMN//TRO2	L	5	92	44	0	6093 a-j	56 - 69	4	4	3
94	NWBT/LMNT//82CAY21/LMNT	L	6	93	38	0	6070 a-j	62 - 69	5	2	2
102	VSNTLM//L201/9NRZ/3/...	L	6	84	37	0	5984 b-j	59 - 68	5	5	3
119	L202	L	4	83	38	30	5967 b-j	54 - 66	6	4	3
105	LMNT/RA73//KATY	L	4	90	45	45	5942 b-j	56 - 68	5	3	2
116	GFMT*2/TQNG	L	6	95	39	0	5838 c-j	55 - 70	3	1	2
92	LMNT/JSMN//TRO2	L	6	92	44	0	5721 c-j	55 - 69	5	4	3
99	VSNTLM//L201/9NRZ/3/...	L	7	84	36	0	5524 d-j	59 - 67	5	6	4
93	87302	L	4	84	39	40	5467 e-j	59 - 68	5	5	3
96	MARS/TBNT//KATY	L	5	94	51	70	5415 f-j	61 - 68	3	2	1
104	RU8703196/PCOS//GFMT	L	7	95	41	0	5293 ghij	60 - 66	6	3	4
95	GFMT*2/1409	L	7	88	42	0	5263 ghij	62 - 73	5	4	3
107	GFMT*2/I409	L	6	95	37	0	5244 ghij	61 - 70	5	2	2
101	GFMT*2/I409	L	6	85	42	0	5208 hij	62 - 71	4	4	3
84	88433	L	4	78	36	0	5193 hij	67 - 72	6	8	6
118	LBLE	L	4	84	50	75	5055 ij	63 - 70	3	4	2
117	RSMT	L	6	89	38	0	4784 j	49 - 63	4	6	4
C.V.			9.0	1.4	3.1	--	9.3	5.2-1.8	23	45	35

* L = Long grain, M = Medium grain.

** Subjective rating 1 to 9, where 1 = excellent, 9 = poor.

*** Numbers followed by the same letter are not significantly different (Duncan's MRT, P = 0.05).

[1] SB=sheath blight, 0-9 scale; RN=rotten neck blast, % infection (x10); and SV=rotten neck blast severity, 0-9 scale.

Table 10. Performance of main and ratoon crops of 1994 uniform regional nursery, Group V, Crowley, LA.

1994 entry	Pedigree	Ratoon height (in)	Main crop yield	Ratoon crop yield	Total yield	
			------lb/A @ 12%------			
82	RICO/V4716	27	7498	2407	9905	a
97	82CAY21/TBNT/3/...	28	7335	2507	9842	a
83	VSTA/LBNT//L201/3/...	29	6919	2670	9589	ab
108	ALAN/KATY	30	7157	2209	9365	abc
85	MERC//MERC/KOSH	32	7034	2267	9300	abc
106	82CAY21/LMNT//L202	28	6849	2283	9132	abcd
111	TBNT/KATY	35	7128	1973	9100	abcde
102	VSNTLM//L201/9NRZ/3/...	27	5984	3108	9092	abcde
87	LBLE/L201//TBNT	34	7291	1733	9023	abcde
110	GFMT*2/TQNG	33	6588	2394	8982	abcde
109	V4716/MARS	28	6860	2070	8930	abcde
98	RU8703196/PCOS//GFMT	31	6521	2360	8880	abcde
114	8403113/3/KCAI/LEAH/...	29	6453	2360	8813	abcde
120	TBNT	39	6834	1959	8793	abcde
100	8403113/3/KCAI/LEAH/...	31	6441	2349	8790	abcde
81	87324	28	6108	2632	8740	abcde
103	CPRS//GCHW/...	28	6675	1991	8666	abcde
86	VSTA/LBNT//RSMT	26	6468	2188	8655	abcde
90	KATY//TBNT/NWRX	31	6375	2232	8606	abcde
119	L202	25	5967	2467	8434	abcdef
112	RICO/MERC	30	6777	1654	8431	abcdef
115	MERC//M401/NTAI	29	6850	1544	8393	abcdef
93	87302	31	5467	2882	8349	abcdef
94	NWBT/LMNT//82CAY21/...	28	6070	2160	8230	abcdef
99	VSNTLM//L201/9NRZ/3/...	26	5524	2629	8153	abcdef
116	GFMT*2/TQNG	28	5838	2300	8138	abcdef
101	GFMT*2/I409	31	5208	2811	8019	bcdef
113	GCHW/LMNT//CB801/3/...	24	6125	1756	7881	bcdefg
89	LMNT/JSMN//TRO2	31	6093	1737	7830	bcdefg
84	88433	28	5193	2603	7796	cdefg
105	LMNT/RA73//KATY	33	5942	1819	7761	cdefg
91	82CAY21/LMNT//KATY	29	6573	1181	7754	cdefg
107	GFMT*2/I409	30	5244	2368	7612	cdefg
104	RU8703196/PCOS//GFMT	30	5293	2164	7456	defg
118	LBLE	35	5055	2386	7441	defg
92	LMNT/JSMN//TRO2	31	5721	1693	7414	defg
88	KATY/CPRS	33	6488	863	7351	defg
117	RSMT	26	4784	2549	7333	efg
95	GFMT*2/1409	29	5263	1445	6708	fg
96	MARS/TBNT//KATY	36	5415	804	6219	g
C.V.		5.2	9.3	16.9	8.6	

* Numbers followed by the same letter are not significantly different (Duncan's MRT, P = 0.05).

Experiment: Uniform Regional Nursery - Group VI

Location: Rice Research Station

Seeding Rate/Date: 150 lb/A, March 25, 1994

Planting Method: Water-seeded (pre-germinated seed)

Fertilization: 103-54-54 lb/A (N-P_2O_5-K_2O) preplant incorporated, Mar 23;
21 lb N/A, May 19; 21 lb N/A, June 1; 60 lb N/A, Aug 15 (ratoon crop)

Plot Size: 4.66 x 18 ft (84 ft^2)

Water Management: Flood, Mar 24; drain, Apr 1; reflood, Apr 4; harvest drainage,
July 20; reflood, Aug 15; harvest drainage, Oct. 14

Herbicides: Londax (bensulfuron) 1 oz ai/A, Apr 20
Ordram (molinate) 3 lb ai/A, Apr 26

Insecticides: Furadan (carbofuran) .5 lb ai/A, Apr 28

Harvest: Aug 12; ratoon crop, Oct. 24

Experimental Design: Randomized complete block with two replications

Results: Tables 11 and 12

Table 11. Agronomic and milling performance of 1994 uniform rice nursery, Group VI. Crowley, LA.

1994 entry	Pedigree	Grain Type*	Seedling vigor**	Days to 50% heading	Plant height (in)	Lodging (%)	Yield*** (lb/A @ 12%)	Milling % (Whl-Tot)	SB[1]	RN[1]	SV[1]
155	TXMT/3/LBNT//9881/...	L	6	93	44	0	8273 a	56 - 67	3	2	0
139	ACT4	L	5	98	39	0	8254 a	66 - 72	4	0	0
151	ZNTH/3/164986-4/NV66//...	M	4	94	43	80	8144 ab	68 - 71	3	3	2
128	MARSX2/V4716	M	5	92	39	0	7986 abc	66 - 71	5	6	3
136	66198	L	5	92	38	0	7629 abcd	63 - 71	3	3	2
130	LMNT/RA73//KATY	L	5	91	37	0	7373 a-e	61 - 70	5	4	2
121	BP87/9902//LBNT/9957	L	5	89	43	0	7346 a-f	64 - 72	4	3	1
137	MARS/CM101	S(W)	6	94	36	40	7303 a-g	64 - 71	3	1	1
154	L201//TBNT/BLMT/3/8403	L	5	91	37	0	7297 a-g	58 - 69	4	3	3
152	LMNT/86-20001-S	L	6	98	38	0	7190 b-h	54 - 67	2	0	0
134	SMARS/MARS//MARS/3/RICO	M	6	92	33	15	7178 b-h	65 - 69	2	1	1
125	MERC/V4716	M	6	86	37	0	7094 c-i	66 - 70	4	4	4
142	NWBT/KATY//RA73/LMNT	L	6	88	41	15	6893 d-j	60 - 70	3	4	3
133	88427	L	5	85	40	0	6890 d-j	64 - 70	4	2	1
149	LBLE SC-5/LMNT	L	6	102	44	0	6831 d-k	52 - 64	1	1	1
129	TRO2/LMNT	L	6	96	34	0	6702 d-l	62 - 70	4	4	2
135	RU8703196/PCOS//GFMT	L	6	94	43	0	6560 e-l	59 - 68	3	5	3
144	GFMT*2/TQNG	L	7	96	41	0	6502 e-m	57 - 70	2	1	1
127	LMNT/BOND	L	6	94	40	0	6459 e-n	56 - 67	6	5	3
153	GFMT*2/TQNG	L	5	88	39	0	6438 e-n	59 - 70	4	5	3
160	LCSN	L	6	95	40	0	6431 e-n	57 - 69	4	4	3
147	LMNT/KATY	L	6	97	35	0	6361 e-n	65 - 71	3	2	2
157	DLMT	L(A)	6	97	39	0	6350 e-n	61 - 70	4	4	2
145	ACT33	L	5	101	42	0	6295 f-o	58 - 67	2	2	1
132	LBNTWX/BLMT	L(W)	6	96	37	0	6262 g-o	65 - 69	4	4	2
138	PCOS/LMNT//GFMT	L	6	97	41	0	6213 h-o	62 - 69	5	4	3
122	864142/8403113	L	4	95	47	0	6081 i-o	51 - 65	3	6	4
150	PCOS/LMNT//GFMT	L	7	99	40	0	6032 i-o	62 - 70	3	3	2
148	ZNTH/3/164986-4/NV66//...	M	4	87	44	90	6014 j-o	66 - 70	4	4	2
124	88427	L	5	84	41	0	5978 j-o	60 - 69	4	7	3
131	MERC/V4716	M	6	88	40	45	5887 j-o	62 - 71	5	6	3
156	KCAI/LEAH//LEAH/3/8403	L	5	97	43	0	5814 k-p	57 - 66	3	5	3
158	RXMT	L	7	91	36	0	5672 l-p	55 - 66	6	7	6
123	DLMT/B8462T3-710	L(E)	6	94	37	0	5488 mnop	42 - 72	5	6	4
126	DLMT/B8462T3-710	L(A,E)	6	95	41	0	5444 mnop	58 - 71	6	5	3
141	GFMT/RU8703196	L	6	99	40	0	5402 nop	58 - 68	4	3	2
146	DMSI/L203//TTEP/...	L(E)	7	88	43	90	5267 op	46 - 70	4	4	2
143	A301/JSMN	L(A)	6	97	47	90	4844 pq	49 - 68	2	1	1
140	DMSI//LMNT/NWBT/3/...	L(A,E)	4	83	46	90	4121 qr	54 - 71	4	1	1
159	DLLA	L(A)	5	95	54	90	3903 r	57 - 68	3	2	1
C.V.			8.3	1.4	3.5	--	6.8	7.7-1.6	40	35	36

* L = Long grain, M = Medium grain, S = Short grain (A = aromatic, E = elongating, W = waxy).
** Subjective rating 1 to 9, where 1 = excellent, 9 = poor.
*** Numbers followed by the same letter are not significantly different (Duncan's MRT, P = 0.05).
[1] SB=sheath blight, 0-9 scale; RN=rotten neck blast, % infection (x10); and SV=rotten neck blast severity, 0-9 scale.

Table 12. Performance of main and ratoon crops of 1994 uniform regional nursery, Group VI, Crowley, LA.

1994 entry	Pedigree	Ratoon height (in)	Main crop yield	Ratoon crop yield	Total yield	
			------lb/A @ 12%------			
155	TXMT/3/LBNT//9881/...	30	8273	2620	10892	a
149	LBLE SC-5/LMNT	31	6831	3676	10506	ab
154	L201//TBNT/BLMT/3/...	26	7297	3192	10489	ab
151	ZNTH/3/164986-4/NV66	29	8144	2333	10477	ab
142	NWBT/KATY//RA73/LMNT	29	6893	3115	10008	abc
152	LMNT/86-20001-S	27	7190	2806	9996	abc
128	MARSX2/V4716	28	7986	1995	9980	abcd
129	TRO2/LMNT	25	6702	3122	9823	abcd
121	BP87/9902//LBNT/9957	32	7346	2466	9811	abcd
130	LMNT/RA73//KATY	26	7373	2203	9575	abcd
160	LCSN	29	6431	3025	9455	abcde
144	GFMT*2/TQNG	32	6502	2914	9416	bcde
153	GFMT*2/TQNG	30	6438	2933	9371	bcdef
125	MERC/V4716	24	7094	2232	9326	b-g
127	LMNT/BOND	29	6459	2808	9267	b-h
139	ACT4	27	8254	969	9222	b-h
136	86198	28	7629	1574	9203	b-h
138	PCOS/LMNT//GFMT	29	6213	2926	9139	b-h
156	KCAI/LEAH//LEAH/3/...	30	5814	3256	9069	b-h
132	LBNTWX/BLMT	25	6262	2780	9041	b-h
135	RU8703196/PCOS//GFMT	28	6560	2478	9038	b-h
133	88427	27	6890	2126	9016	b-h
157	DLMT	27	6352	2481	8833	c-i
137	MARS/CM101(GL)	24	7303	1527	8830	c-i
148	ZNTH/3/164986-4/NV66	29	6014	2776	8790	c-i
122	864142/8403113	31	6081	2633	8713	c-j
147	LMNT/KATY	23	6361	2269	8630	c-k
131	MERC/V4716	29	5887	2683	8570	c-k
124	88427	29	5978	2500	8478	d-k
123	DLMT/B8462T3-710	26	5488	2580	8068	e-l
150	PCOS/LMNT//GFMT	28	6032	1964	7995	e-l
134	SMARS/MARS//MARS/3/...	20	7178	728	7906	f-l
126	DLMT/B8462T3-710	27	5444	2398	7841	g-l
158	RXMT	22	5672	2169	7841	hijkl
146	DMSI/L203//TTEP/...	30	5267	2512	7779	hijkl
141	GFMT/RU8703196	29	5402	2008	7410	ijkl
143	A301/JSMN	30	4844	2428	7272	jkl
140	DMSI//LMNT/NWBT/3/...	32	4121	3075	7195	kl
145	ACT33	26	6295	463	6758	l
159	DLLA	33	3903	639	4542	m
C.V.		3.8	6.8	12.9	6.9	

* Numbers followed by the same letter are not significantly different (Duncan's MRT, P = 0.05).

Experiment: Uniform Regional Nursery - Group VII

Location: Rice Research Station

Seeding Rate/Date: 150 lb/A, March 25, 1994

Planting Method: Water-seeded (pre-germinated seed)

Fertilization: 103-54-54 lb/A (N-P_2O_5-K_2O) preplant incorporated, Mar 23;
21 lb N/A, May 19; 21 lb N/A, June 1; 60 lb N/A, Aug 15 (ratoon crop)

Plot Size: 4.66 x 18 ft (84 ft^2)

Water Management: Flood, Mar 24; drain, Apr 1; reflood, Apr 4; harvest drainage,
July 25; reflood, Aug 15; harvest drainage, Oct. 20

Herbicides: Londax (bensulfuron) 1 oz ai/A, Apr 20
Ordram (molinate) 3 lb ai/A, Apr 26

Insecticides: Furadan (carbofuran) .5 lb ai/A, Apr 28

Harvest: Aug 15; ratoon crop, Oct. 28

Experimental Design: Randomized complete block with two replications

Results: Tables 13 and 14

Table 13. Agronomic end milling performance of 1994 uniform rice nursery, Group VII. Crowley, LA.

1994 entry	Pedigree	Grain Type*	Seedling vigor**	Days to 50% heading	Plant height (in)	Lodging (%)	Yield*** (lb/A @ 12%)	Milling % (Whl-Tot)	SB[1]	RN[1]	SV[1]
199	CGUI	M	5	98	42	35	9177 a	61 - 73	2	0	0
192	RXCL	M	6	97	39	40	8244 ab	65 - 71	4	0	0
188	88427	L	5	84	42	0	7709 abc	64 - 71	8	6	2
179	KATY/STBN	L	4	93	44	0	7596 abcd	62 - 69	6	6	3
191	ACT3	L	5	100	37	0	7559 a-e	64 - 74	5	3	2
180	2201/LMNTX2	L	6	95	40	0	7522 a-e	61 - 69	7	8	2
169	RU8703196/RSMT//TQNG	L	7	96	42	0	7366 b-f	48 - 70	4	7	3
185	LBNT/STBN//NWBT/3/MILL	L	5	85	43	20	7257 b-g	63 - 71	4	8	2
197	JSMN85	L(A)	7	89	43	40	7215 b-g	49 - 63	3	0	0
193	8203035/8401164	L	5	103	45	0	6989 b-h	44 - 66	4	7	3
200	TQNG	M	6	99	44	90	6946 b-h	47 - 71	2	0	0
161	KATY/STBN	L	5	96	47	15	6908 b-h	64 - 70	3	4	1
195	2207//L201/7402003	L	5	91	44	20	6902 b-h	63 - 70	4	6	3
165	KATY/CPRS	L	6	100	43	0	6839 b-h	59 - 68	3	5	2
182	KATY/NWBT/3/LBNT/STBN/	L	6	92	44	25	6813 b-h	61 - 69	5	8	3
166	LMNT/KATY	L	7	99	38	0	6813 b-h	65 - 71	5	3	1
176	LMNT/KATY	L	5	95	46	0	6808 b-h	67 - 72	5	6	2
168	KATY/CPRS	L	5	98	37	0	6789 b-h	58 - 68	6	5	3
174	TXMT/3/LBNT...	L	5	95	39	35	6714 b-h	56 - 68	6	5	3
162	2201/3/82CAY21//TTEP/I	L	6	103	44	0	6678 b-h	57 - 67	5	3	3
164	TBNT/KATY	L	5	98	37	0	6644 b-h	64 - 72	4	3	2
172	GFMT*2/1409	L	7	98	37	0	6357 c-i	60 - 74	6	2	1
183	RICO/MERC	M	5	91	46	90	6262 c-i	63 - 69	3	3	3
167	LMNT/BOND	L	6	95	39	15	6253 c-i	62 - 70	7	7	3
178	GFMT*2/TQNG	L	6	96	44	35	6223 c-i	66 - 73	3	2	2
181	LMNT/KATY	L	6	97	36	0	6019 c-i	63 - 71	6	8	3
198	A301	L(A)	6	90	39	0	6009 c-i	52 - 70	6	7	4
171	CPRS/ESD	L(A,E)	6	99	35	0	5991 c-i	58 - 74	5	5	3
186	L201//TBNT/BLMT	L	6	100	44	10	5928 c-i	59 - 70	5	8	4
170	LMNT/BOND	L	7	95	43	50	5871 d-i	58 - 69	5	8	3
194	NWBT/KATY	L	5	93	46	25	5806 d-i	61 - 68	4	6	2
189	ELPASO144	L	3	85	44	90	5799 d-i	61 - 70	4	2	1
175	GFMT*2/1409	L	7	98	42	0	5740 e-i	63 - 72	5	4	2
177	8702025/DLLA	L(A)	6	88	38	0	5726 e-i	59 - 69	7	7	3
190	DLMT/B8462T3-710	L(E)	7	98	37	0	5627 fghi	60 - 70	5	6	4
184	LMNT*3/JSMN	L(A)	7	103	43	0	5625 fghi	52 - 68	3	0	0
173	88365	L	4	93	44	35	5516 ghi	65 - 69	5	8	2
187	DLMN/B8462T3-710	L(E)	6	92	34	0	5486 ghi	61 - 72	6	8	3
163	LMNT*3/JSMN	L(A)	9	109	39	0	5374 hi	29 - 65	3	2	2
196	LMNT*3/JSMN	L(A)	9	105	35	0	4624 i	52 - 66	4	1	1
C.V.			8.2	5.0	4.1	--	11.3	9.7-2.3	27	32	43

* L = Long grain, M = Medium grain (A = aromatic, E = elongating).

** Subjective rating 1 to 9, where 1 = excellent, 9 = poor.

*** Numbers followed by the same letter are not significantly different (Duncan's MRT, P = 0.05).

[1] SB=sheath blight, 0-9 scale; RN=rotten neck blast, % infection (x10); and SV=rotten neck blast severity, 0-9 scale.

Table 14. Performance of main and ratoon crops of 1994 uniform regional nursery, Group VII, Crowley, LA.

1994 entry	Pedigree	Ratoon height (in)	Main crop yield	Ratoon crop yield	Total yield	
			--------lb/A @ 12%--------			
199	CGUI	27	9177	2269	11446	a
197	JSMN85	29	7215	3336	10550	ab
192	RXCL	26	8244	2284	10528	ab
185	LBNT/STBN//NWBT/3/...	28	7257	3215	10472	abc
188	88427	29	7709	2482	10191	abcd
195	2207//L201/7402003	29	6902	3153	10054	abcde
182	KATY/NWBT/3/LBNT/...	31	6813	3038	9851	a-f
179	KATY/STBN	30	7596	2182	9777	a-g
184	LMNT*3/JSMN	31	5625	3978	9603	b-h
180	2201/LMNTX2	25	7522	1749	9271	b-i
169	RU8703196/RSMT//TQNG	31	7366	1863	9229	b-j
167	LMNT/BOND	28	6253	2864	9117	b-k
183	RICO/MERC	32	6262	2601	8863	b-k
170	LMNT/BOND	31	5871	2906	8777	c-k
191	ACT3	25	7559	1164	8723	d-k
171	CPRS/ESD	26	5991	2680	8671	d-k
190	DLMT/B8462T3-710	24	5627	3007	8634	d-k
164	TBNT/KATY	30	6644	1980	8624	d-k
176	LMNT/KATY	30	6808	1813	8621	d-k
174	TXMT/3/LBNT...	26	6714	1871	8585	d-k
165	KATY/CPRS	28	6839	1619	8458	d-k
178	GFMT*2/TQNG	31	6223	2190	8413	e-k
200	TQNG	29	6946	1425	8371	e-k
161	KATY/STBN	31	6908	1433	8341	e-k
166	LMNT/KATY	25	6813	1472	8285	e-k
163	LMNT*3/JSMN	24	5374	2852	8226	f-k
186	L201//TBNT/BLMT	27	5928	2226	8153	f-k
168	KATY/CPRS	28	6789	1351	8140	f-k
187	DLMN/B8462T3-710	24	5486	2573	8059	ghijk
162	2201/3/82CAY21//TTEP	28	6678	1355	8033	ghijk
172	GFMT*2/1409	26	6357	1671	8028	ghijk
194	NWBT/KATY	34	5806	2178	7984	hijk
196	LMNT*3/JSMN	24	4624	3360	7984	hijk
193	8203035/8401164	27	6989	859	7848	hijk
181	LMNT/KATY	25	6019	1669	7688	ijk
175	GFMT*2/1409	29	5740	1901	7641	ijk
177	8702025/DLLA	24	5726	1759	7485	jk
198	A301	25	6009	1429	7438	k
189	ELPASO144	30	5799	1590	7389	k
173	88365	30	5516	1847	7363	k
C.V.		6.1	11.3	12.0	8.3	

* Numbers followed by the same letter are not significantly different (Duncan's MRT, P = 0.05).

COMMERCIAL VARIETY TESTS

The Rice Breeding project annually conducts yield trials on commercial rice varieties. Included in these tests are the major commercial varieties and advanced experimental lines in final stages of testing before release from cooperating public and private breeding programs.

These tests were conducted at five locations in Louisiana in 1994. These included the Rice Research Station, the Northeast Research Station at St. Joseph, and on-farm locations in East Carroll, Rapides, and Vermilion parishes. The East Carroll and Rapides locations were conducted in cooperation with Dr. Patrick Bollich. The Northeast Research Station location was conducted in cooperation with Dr. David Jordan, weed scientist at that location.

These tests included the following entries:

Entry	Grain type*	Source**
Very Early Group		
AB 869	M	Busch Ag.
Adair	L	AAES
Akitakomachi	S	Japan
Alan	L	AAES
CM 101	S	CCRRF
Labelle	L	TAES, USDA
LaGrue	L	AAES
L202	L	CCRRF
L203	L	CCRRF
Jackson	L	TAES, USDA; MAFES
Jodon	L	LAES
Maybelle	L	TAES, USDA
Millie	L	AAES
Rosemont	L	TAES, USDA
RT 7015	L	Rice Tec
Tebonnet	L	AAES
TX 3006	L	TAES, USDA
TX 3009	L	TAES, USDA
Early Group		
AB 647	M	Busch Ag.
AR 1176	L	AAES
AR 1179	L	AAES

Continued.

Continued.

Entry	Grain type*	Source**
Early Group (continued)		
AR 1191	L	AAES
Bengal	M	LAES
Cypress	L	LAES
Della	L (aromatic)	LAES
Dellmont	L (aromatic)	TAES, USDA
Dellrose	L (aromatic)	LAES
Gulfmont	L	TAES, USDA
Jasmine 85	L (low amylose aromatic)	TAES, USDA
Katy	L	AAES
Kaybonnet	L	AAES
Koshihikari	S	Japan
LA 2192	M	LAES
LA 2071	L	LAES
LA 2177	L (aromatic)	LAES
Lacassine	L	LAES
Lemont	L	TAES, USDA
Mars	M	AAES
Mercury	M	LAES
Newbonnet	L	AAES
Orion	M	AAES
Rico 1	M	TAES, USDA
Saturn	M	LAES
Toro 2	L (low amylose)	LAES
TX 3166	L	TAES, USDA
V 4716	M	Rice Tec

* L = long grain, M = medium grain, and S = short grain.
** Busch Ag., Jonesboro, AR; AAES, Rice Research and Extension Center, Arkansas Agricultural Experiment Station, Stuttgart, AR; MAFES, Delta Research and Extension Center, Mississippi Agricultural and Forestry Experiment Station, Stoneville, MS; LAES, Rice Research Station, Louisiana Agricultural Experiment Station, LSU Agricultural Center, Crowley, LA; CCRRF, Rice Experiment Station, California Cooperative Rice Research Foundation, Biggs, CA; TAES, USDA, Texas A & M Research and Education Center, Texas Agricultural Experiment Station, U.S. Department of Agriculture, Beaumont, TX; RiceTec Inc., Alvin, TX.

Individual location data are presented in Tables 15 to 25. Summary data are presented in Tables 26 and 27.

Experiment: Commercial Variety Test - Very Early Group

Location: Rice Research Station

Seeding Rate/Date: 100 lb/A, March 23, 1994

Planting Method: Drill-seeded

Fertilization: 14-42-42 lb/A (N-P_2O_5-K_2O) preplant incorporated, Mar 23; 92 lb N/A, Apr 26; 21 lb N/A, May 19; 21 lb N/A, June 1; 60 lb N/A, Aug 2

Plot Size: 4.66 x 16 ft (74.5 ft^2)

Water Management: Flush, Mar 30; flush, Apr 11; flood, Apr 27; harvest drainage, July 20; reflood, Aug 2; harvest drainage, Sept 20

Herbicides: Arrosolo (propanil 3 lb ai/A + molinate 3 lb ai/A), Apr 26

Insecticides: Furadan (carbofuran) .5 lb ai/A, May 19

Harvest: Aug 1; ratoon crop, Sept 30

Experimental Design: Randomized complete block with four replications

Results: Tables 15 and 16

Table 15. Agronomic and milling performance of 1994 commercial varieties, very early group, Crowley, LA.

1994 entry	Seedling vigor*	Days to 50% heading	Plant height (in)	Lodging (%)	Yield** (lb/A @ 12%)	Milling % (Whl-Tot)
TX 3009	5	95	47	0	7403 a	64 - 71
MAYBELLE	4	85	40	0	6923 ab	60 - 89
JODON	5	92	35	0	6786 bc	59 - 68
TEBONNET	6	94	50	0	6607 bcd	58 - 69
AB869	6	97	39	0	6464 bcde	62 - 70
ADAIR	5	90	43	0	6369 cde	55 - 68
LAGRUE	5	94	42	0	6243 def	47 - 65
JACKSON	5	93	40	0	6179 def	59 - 68
CM 101	6	86	38	0	6006 efg	67 - 71
L202	5	89	36	0	5971 efgh	54 - 68
RT7015	5	91	35	0	5954 efgh	59 - 69
ALAN	5	93	40	0	5731 fghi	61 - 69
AKITAKOMACHI	6	86	39	50	5520 ghi	59 - 75
MILLIE	5	92	40	0	5440 hi	65 - 71
TX 3006	8	95	35	0	5274 ij	55 - 67
L203	4	84	36	0	4927 jk	42 - 65
ROSEMONT	6	92	34	0	4528 kl	48 - 65
LABELLE	8	98	48	0	4353 l	49 - 63
C.V.	10.4	0.8	3.1	--	5.7	8.9-2.0

* Subjective rating 1 to 9, where 1 = excellent, 9 = poor.
** Numbers followed by the same letter are not significantly different (Duncan's MRT, P = 0.05).

Table 16. Performance of main and ratoon crops of 1994 commercial varieties, very early group, Crowley, LA.

1994 entry	Ratoon height (in)	Main crop yield	Ratoon crop yield	Total yield*
		----------lb/A @ 12%----------		
LAGRUE	35	6243	3712	9955 a
ADAIR	33	6369	3488	9857 ab
JODON	28	6786	2825	9611 abc
TX 3009	36	7403	2156	9559 abc
MAYBELLE	31	6923	2349	9272 abcd
JACKSON	33	6179	2991	9170 bcd
CM 101	30	6006	3098	9104 cd
ALAN	32	5731	3367	9098 cd
TEBONNET	39	6607	2292	8899 cd
L202	25	5971	2913	8884 cd
AB869	29	6464	2406	8869 cd
RT7015	26	5954	2768	8723 de
MILLIE	31	5440	3236	8676 de
AKITAKOMACHI	27	5520	2522	8042 ef
TX 3006	28	5274	2280	7554 fg
ROSEMONT	26	4528	2711	7239 gh
LABELLE	39	4353	2260	6613 hi
L203	26	4927	1580	6507 i
C.V.	6.2	5.7	8.5	5.3

* Numbers followed by the same letter are not significantly different (Duncan's MRT, P = 0.05).

Experiment: Commercial Variety Test - Early Group

Location: Rice Research Station

Seeding Rate/Date: 100 lb/A, March 23, 1994

Planting Method: Drill-seeded

Fertilization: 14-42-42 lb/A (N-P_2O_5-K_2O) preplant incorporated, Mar 23; 92 lb N/A, Apr 26; 21 lb N/A, May 19; 21 lb N/A, June 1; 60 lb N/A, Aug 12

Plot Size: 4.66 x 16 ft (74.5 ft^2)

Water Management: Flush, Mar 30; flush, Apr 11; flood, Apr 27; harvest drainage, July 20; reflood, Aug 12; harvest drainage, Oct 7

Herbicides: Arrosolo (propanil 3 lb ai/A + molinate 3 lb ai/A), Apr 26

Insecticides: Furadan (carbofuran) .5 lb ai/A, May 19

Harvest: Aug 10; ratoon crop, Oct 20

Experimental Design: Randomized complete block with four replications

Results: Tables 17 and 18

Table 17. Agronomic and milling performance of 1994 commercial varieties, early group, Crowley, LA.

1994 entry	Seedling vigor*	Days to 50% heading	Plant height (in)	Lodging (%)	Yield** (lb/A @ 12%)	Milling % (Whl-Tot)
LA 2192	7	103	39	0	9175 a	63 - 69
AB 647	7	106	44	0	9049 a	62 - 74
RICO 1	7	98	44	0	9019 a	64 - 71
AR-1179	5	98	42	0	8599 ab	64 - 70
AR-1191	5	97	43	0	8309 bc	68 - 72
AR-1176	5	96	42	0	8250 bcd	66 - 71
KAYBONNET	4	96	43	0	8052 bcde	63 - 70
CYPRESS	5	97	38	0	7899 cde	64 - 69
KATY	5	98	44	0	7689 cdef	65 - 70
V-4716	6	96	36	0	7677 cdef	67 - 71
JASMINE 85	7	111	46	0	7580 def	52 - 69
ORION	6	97	42	0	7528 efg	65 - 70
TX 3166	6	98	35	0	7015 fgh	58 - 68
MARS	5	98	46	0	7005 fgh	62 - 69
LA 2071	7	89	35	0	7001 fgh	62 - 71
DELLROSE	6	96	39	0	6899 ghi	52 - 69
SATURN	5	99	51	90	6751 hij	63 - 68
LACASSINE	6	98	37	0	6740 hij	55 - 69
BENGAL	5	98	37	0	6686 hij	68 - 70
TORO 2	6	97	42	0	6626 hijk	61 - 70
LEMONT	6	99	36	0	6315 hijkl	52 - 71
LA 2177	6	96	37	0	6228 ijkl	60 - 69
GULFMONT	6	98	37	0	6216 ijkl	55 - 67
DELLMONT	7	101	37	0	6180 jkl	60 - 70
MERCURY	6	96	37	0	5990 kl	60 - 68
DELLA	5	98	54	25	5726 lm	60 - 69
KOSHIHIKARI	7	88	41	68	5667 lm	71 - 74
NEWBONNET	5	99	43	0	5214 m	47 - 63
C.V.	10.4	0.8	3.4	--	5.9	10.9-2.2

* Subjective rating 1 to 9, where 1 = excellent, 9 = poor.

** Numbers followed by the same letter are not significantly different (Duncan's MRT, P = 0.05).

Table 18. Performance of main and ratoon crops of 1994 commercial varieties, early group, Crowley, LA.

1994 entry	Ratoon height (in)	Main crop yield	Ratoon crop yield	Total yield*
		----------lb/A @ 12%----------		
AB 647	28	9049	4453	13502 a
JASMINE 85	29	7580	4034	11614 b
LA 2192	23	9175	2426	11601 b
DELLROSE	30	6899	3866	10766 c
CYPRESS	28	7899	2834	10733 c
V 4716	28	7677	2867	10543 cd
KAYBONNET	31	8052	2264	10417 cde
AR 1191	34	8309	2108	10416 cde
RICO 1	29	9019	1395	10414 cde
LACASSINE	31	6740	3411	10151 cdef
AR 1179	31	8599	1515	10114 cdef
AR 1176	33	8250	1782	10031 cdef
TX 3166	26	7015	2976	9990 cdefg
ORION	30	7528	2306	9834 defg
BENGAL	27	6686	3090	9776 defgh
LA 2071	28	7001	2669	9669 defghi
KATY	33	7689	1926	9614 efghi
MARS	33	7005	2581	9586 efghi
GULFMONT	29	6216	3064	9280 fghij
DELLMONT	28	6180	2970	9150 ghij
TORO 2	31	6626	2293	8919 hij
LEMONT	29	6315	2521	8836 ij
LA 2177	27	6228	2463	8691 j
MERCURY	28	5990	2683	8673 j
KOSHIHIKARI	31	5667	2839	8506 jk
SATURN	35	6751	1122	7873 kl
NEWBONNET	30	5214	2472	7686 l
DELLA	36	5726	851	6577 m
C.V.	11.3	5.9	14.1	5.4

* Numbers followed by the same letter are not significantly different (Duncan's MRT, P = 0.05).

Experiment: Commercial Variety Test - Early Group

Location: Pine Island, Trahan Farm, Vermilion Parish

Seeding Rate/Date: 100 lb/A, March 30, 1994

Planting Method: Drill-seeded

Fertilization: 40 lb P_2O_5/A, 40 lb K_2O/A, Aug 1; surface applied, 46 lb N/A, May 3

Plot Size: 4.66 x 16 ft (74.5 ft^2)

Water Management: Flush, Aug 8; flood, May 5; harvest drainage, July 20

Herbicides: Arrosolo (propanil 3 lb ai/A + molinate 3 lb ai/A), May 3

Insecticides: Furadan (carbofuran) .5 lb ai/A, May 15

Harvest: Aug 11

Experimental Design: Randomized complete block with three replications

Results: Table 19

Table 19. Agronomic and milling performance of 1994 commercial varieties, early group, Pine island, LA.

1994 entry	Days to 50% heading	Plant height (in)	Lodging (%)	Yield* (lb/A @ 12%)	SB[1]	RN[1]	SV[1]
LA 2192	101	36	0	5639 a	5	1	1
AB 647	104	40	0	5561 ab	3	0	0
SATURN	95	46	60	5547 abc	4	3	1
RICO 1	98	38	0	5500 abc	4	1	2
CYPRESS	95	35	0	5296 abcd	8	4	2
KAYBONNET	92	38	0	5247 abcde	7	6	3
KATY	96	41	0	5164 abcde	6	5	3
AR 1176	95	40	0	5121 abcde	7	6	2
BENGAL	95	35	0	5038 a-f	5	4	2
AR 1179	96	39	0	4966 a-g	7	6	2
JASMINE 85	106	42	0	4902 a-g	4	0	0
TORO 2	95	38	0	4778 b-g	6	6	3
V 4716	96	35	0	4761 b-h	6	4	2
MARS	96	40	0	4710 c-h	5	5	2
ORION	98	37	0	4703 c-h	4	2	1
LACASSINE	100	36	0	4575 d-i	7	5	3
DELLROSE	99	38	0	4490 d-j	6	5	3
LEMONT	102	37	0	4414 e-j	7	3	2
NEWBONNET	95	44	0	4223 fghij	6	8	4
AR 1191	98	39	0	4178 ghij	6	4	2
GULFMONT	100	36	0	4152 ghij	6	5	2
TX 3166	101	34	0	4140 ghij	6	3	2
LA 2071	88	33	0	3930 hij	8	7	3
MERCURY	95	35	0	3838 ij	6	5	3
LA 2177	96	35	0	3808 ij	7	6	3
DELLA	98	46	0	3806 ij	6	3	2
DELLMONT	104	36	0	3705 j	7	5	2
C.V.	2.2	4.2	--	9.3	17	29	26

* Numbers followed by the same letter are not significantly different (Duncan's MRT, P = 0.05).

[1] SB = sheath blight, 0-9 scale; RN = rotten neck blast, % infection (x10); and SV = rotten neck blast severity, 0-9 scale.

Experiment: Commercial Variety Test - Very Early Group

Location: Northeast Research Station, St Joseph

Seeding Rate/Date: 100 lb/A, Apr 6, 1994

Planting Method: Drill-seeded

Fertilization: 17-50-50 lb/A (N-P_2O_5-K_2O) preplant incorporated, Apr 6; 92 lb N/A, May 23

Plot Size: 4.66 x 16 ft (74.5 ft^2)

Water Management: Flush, Apr 8; flood, May 24; harvest drainage, Aug 2

Herbicides: Facet (quinclorac) .375 lb ai/A, Apr 9; Arrosolo (propanil 3 lb ai/A + molinate 3 lb ai/A), May 22

Harvest: Aug 16

Experimental Design: Randomized complete block with four replications

Results: Table 20

Table 20. Agronomic and milling performance of 1994 commercial varieties, very early group, Saint Joe, LA.

1994 entry	Days to 50% heeding	Plant height (in)	Lodging (%)	Yield* (lb/A @ 12%)
LAGRUE	95	41	0	6517 a
TX 3009	98	45	0	6177 ab
ADAIR	91	40	0	5955 abc
MILLIE	93	37	0	5385 abcd
JODON	93	35	0	5308 abcd
JACKSON	93	37	0	5270 abcd
AKITAKOMACHI	91	39	0	5178 bcd
ALAN	92	37	0	5135 bcde
ROSEMONT	93	32	0	5101 bcde
TEBONNET	95	48	0	4756 cdef
AB869	94	34	0	4686 cdef
RT7015	89	34	0	4458 defg
L202	90	35	0	3839 efg
TX 3006	94	34	0	3788 fg
LABELLE	94	46	0	3301 gh
L203	87	36	0	3234 gh
MAYBELLE	88	36	0	2286 h
C.V.	1.3	3.9	-	17.1

* Numbers followed by the same letter are not significantly different (Duncan's MRT, P = 0.05).

Experiment: Commercial Variety Test - Early Group

Location: Northeast Research Station, St Joseph

Seeding Rate/Date: 100 lb/A, Apr 6, 1994

Planting Method: Drill-seeded

Fertilization: 17-50-50 lb/A (N-P_2O_5-K_2O) preplant incorporated, Apr 6; 92 lb N/A, May 23

Plot Size: 4.66 x 16 ft (74.5 ft^2)

Water Management: Flush, Apr 8; flood, May 24; harvest drainage, Aug 2

Herbicides: Facet (quinclorac) .375 lb ai/A, Apr 9; Arrosolo (propanil 3 lb ai/A + molinate 3 lb ai/A), May 22

Harvest: Aug 23

Experimental Design: Randomized complete block with four replications

Results: Table 21

Table 21. Agronomic and milling performance of 1994 commercial varieties, early group, Saint Joe, LA.

1994 entry	Days to 50% heading	Plant height (in)	Lodging (%)	Yield* (lb/A @ 12%)
AB 647	112	38	0	9072 a
LA 2192	107	35	0	8590 ab
RICO 1	102	39	0	7889 bc
NEWBONNET	101	41	0	7612 bcd
JASMINE 85	113	38	0	7491 cde
AR 1179	100	40	0	7480 cde
AR 1176	100	41	0	6797 def
V 4716	100	34	0	6599 defg
CYPRESS	100	35	0	6584 defg
KAYBONNET	100	38	0	6529 defg
AR 1191	101	40	0	6516 defg
KATY	101	40	0	6458 efg
LACASSINE	102	33	0	6229 fgh
TX 3166	104	32	0	6179 fgh
ORION	98	38	0	6060 fgh
LEMONT	102	33	0	6032 fgh
BENGAL	98	33	0	6005 fgh
GULFMONT	102	34	0	5939 fgh
KOSHIHIKARI	95	39	48	5800 fgh
DELLMONT	107	34	0	5598 gh
DELLA	101	46	0	5182 hi
LA 2177	96	32	0	4460 ij
TORO 2	97	37	0	4361 ij
DELLROSE	95	35	0	4173 ij
SATURN	100	49	0	4129 ij
MARS	97	39	0	4073 j
MERCURY	96	32	0	3937 j
LA 2071	91	31	0	3668 j
C.V.	2.1	4.8	--	11.3

* Numbers followed by the same letter are not significantly different (Duncan's MRT, P = 0.05).

Experiment: Commercial Variety Test - Very Early and Early Groups

Location: Epps, Buford Perry Farm, East Carroll Parish

Seeding Rate/Date: 100 lb/A, May 9, 1994

Planting Method: Drill-seeded

Fertilization: 120 lb N/A, June 19

Plot Size: 7 x 25 ft (175 ft^2)

Water Management: Flush, May 15, 20 and 25; flood, June 20; harvest drainage, Sept 6

Herbicides: Stam (propanil) 3 lb ai/A + Facet (quinclorac) .375 lb ai/A, June 1; Ordram (molinate) 3.5 lb ai/A, June 28; Londax (bensulfuron) 1 oz ai/A, July 1

Insecticides: Furadan (carbofuran) .5 lb ai/A, July 9

Fungicides: Benlate (benomyl) .5 lb ai/A, July 28 and Aug 12

Harvest: Sept 26

Experimental Design: Randomized complete block with four replications

Results: Tables 22 and 23

Table 22. Agronomic and milling performance of 1994 commercial varieties, very early group, East Carroll Parish, LA.

1994 entry	Days to 50% heading	Plant height (in)	Lodging (%)	Yield* (lb/A @ 12%)	Milling % (Whl-Tot)
ROSEMONT	94	39	0	10676 a	63 - 73
LAGRUE	98	49	0	10286 ab	61 - 70
JODON	95	40	0	9086 abc	63 - 72
L203	86	41	5	9008 abc	52 - 72
TEBONNET	97	56	68	8978 abc	64 - 71
ADAIR	92	50	60	8890 bc	56 - 71
AB869	93	44	0	8619 bc	66 - 71
ALAN	94	45	5	8554 bc	64 - 72
JACKSON	95	44	0	8537 bc	63 - 72
TX 3009	98	53	0	8426 cd	66 - 70
RT7015	93	38	0	8324 cd	67 - 72
L202	91	37	0	7916 cd	59 - 72
MILLIE	95	47	0	7628 cd	63 - 73
TX 3006	93	37	0	7598 cd	66 - 72
MAYBELLE	85	40	0	7290 cde	61 - 73
LABELLE	95	54	0	6715 de	66 - 72
AKITAKOMACHI	84	45	90	5829 e	71 - 76
CM 101	93	40	0	3450 f	67 - 73
C.V.	1.4	4.4	--	13.4	4.1-1.5

* Numbers followed by the same letter are not significantly different (Duncan's MRT, P = 0.05).

Table 23. Agronomic and milling performance of 1994 commercial varieties, early group, East Carroll Parish, LA.

1994 entry	Days to 50% heading	Plant height (in)	Lodging (%)	Yield* (lb/A @ 12%)	Milling % (Whl-Tot)
LA 2192	94	39	0	11859 a	64 - 71
AB 647	98	46	85	11824 a	54 - 72
RICO 1	97	47	70	11718 a	66 - 72
JASMINE 85	106	45	0	10737 b	48 - 67
BENGAL	94	41	0	10576 b	63 - 72
ORION	94	47	0	10482 b	65 - 70
AR 1179	101	47	0	10394 bc	65 - 72
AR 1191	127	48	0	9688 cd	64 - 72
MARS	96	48	58	9619 cde	66 - 71
AR 1176	100	48	0	9576 de	67 - 72
MERCURY	93	43	0	9543 de	67 - 73
NEWBONNET	96	47	0	9330 def	66 - 71
CYPRESS	100	41	0	9179 defg	67 - 73
KAYBONNET	97	46	0	8852 defgh	67 - 72
LA 2071	99	45	0	8780 efgh	56 - 70
TORO 2	97	48	38	8564 fgh	65 - 72
KATY	101	49	0	8424 gh	64 - 70
LACASSINE	100	38	0	8419 gh	66 - 72
LEMONT	101	38	0	8361 gh	65 - 73
DELLMONT	102	42	0	8265 h	63 - 72
GULFMONT	98	39	15	8124 h	66 - 72
V 4716	94	38	0	7257 i	70 - 72
KOSHIHIKARI	92	44	90	7213 i	72 - 76
SATURN	92	54	68	7174 i	70 - 72
DELLROSE	95	42	0	7149 i	67 - 73
DELLA	94	54	68	6889 i	56 - 70
LA 2177	93	35	0	6628 i	62 - 71
C.V.	9.8	3.4	--	5.8	3.8-1.6

* Numbers followed by the same letter are not significantly different (Duncan's MRT, P = 0.05).

Experiment: Commercial Variety Test - Very Early and Early Groups

Location: Rapides Parish, Will Bollich Farm

Seeding Rate/Date: 100 lb/A, June 10, 1994

Planting Method: Drill-seeded

Fertilization: 120 lb N/A, July 5

Plot Size: 7 x 25 ft (175 ft^2)

Water Management: Flush, June 13, 21 and 28; Flood, July 6; harvest drainage, Sept 21

Herbicides: Arrosolo (3 lb ai/A molinate + 3 lb ai/A propanil), July 2; Londax (bensulfuron) 1 oz ai/A, July 16; Ordram (molinate) 3 lb ai/A, July 16

Insecticides: Furadan (carbofuran) .5 lb ai/A, July 20; Methyl Parathion, .25 lb ai/A, Aug 30, Sept 10

Fungicides: Rovral (iprodione), .5 lb ai/A, Aug 30

Harvest: Oct 27

Experimental Design: Randomized complete block with four replications

Results: Tables 24 and 25

Table 24. Agronomic and milling performance of 1994 commercial varieties, very early group, Rapides Parish, LA.

1994 entry	Days to 50% heading	Plant height (in)	Lodging (%)	Yield* (lb/A @ 12%)	Milling % (Whl-Tot)
ADAIR	78	44	0	5755 a	56 - 69
JODON	78	39	0	5731 a	61 - 70
JACKSON	78	39	0	5586 ab	60 - 70
LAGRUE	84	43	0	5525 abc	54 - 67
ALAN	78	42	0	5426 abcd	59 - 69
L202	75	40	0	5047 bcde	56 - 69
TX 3009	84	45	0	4957 cdef	65 - 71
TEBONNET	80	53	0	4951 cdef	58 - 69
AB869	77	40	0	4901 def	57 - 70
MILLIE	81	43	0	4833 def	61 - 71
RT7015	77	38	0	4808 ef	60 - 69
MAYBELLE	72	38	0	4517 efg	61 - 71
ROSEMONT	78	36	0	4359 fg	51 - 65
TX 3006	81	36	0	4139 g	59 - 72
AKITAKOMACHI	72	36	48	3453 h	72 - 74
L203	68	37	0	2894 i	49 - 67
LABELLE	80	50	0	1951 j	60 - 68
C.V.	1.3	3.9	--	8.6	9.9-2.2

* Numbers followed by the same letter are not significantly different (Duncan's MRT, P = 0.05).

Table 25. Agronomic and milling performance of 1994 commercial varieties, early group, Rapides Parish, LA.

1994 entry	Days to 50% heading	Plant height (in)	Lodging (%)	Yield* (lb/A @ 12%)	Milling % (Whl-Tot)
AB 647	87	42	0	7595 a	60 - 75
LA 2192	83	39	0	7562 a	57 - 71
JASMINE 85	89	43	0	6675 b	38 - 68
AR 1179	86	44	0	6589 bc	61 - 71
AR 1176	85	45	0	6404 bcd	62 - 71
AR 1191	86	45	0	6286 bcd	63 - 72
RICO 1	83	42	0	6235 bcd	67 - 73
KAYBONNET	83	43	0	6199 bcd	61 - 69
ORION	81	38	0	5905 cde	66 - 71
BENGAL	82	36	0	5869 de	50 - 69
KATY	85	44	0	5831 de	59 - 70
CYPRESS	84	40	0	5765 de	60 - 71
LEMONT	86	36	0	5447 ef	60 - 72
LACASSINE	86	39	0	5281 efg	59 - 70
MARS	81	43	0	5209 efgh	62 - 71
TORO 2	82	39	0	4900 fghi	65 - 73
LA 2071	87	42	0	4886 fghi	48 - 70
SATURN	82	49	0	4871 fghi	70 - 72
MERCURY	78	39	0	4777 fghi	68 - 72
GULFMONT	84	38	0	4734 ghi	59 - 69
DELLA	81	50	0	4646 ghi	57 - 70
DELLROSE	81	39	0	4558 hi	61 - 70
V 4716	82	36	0	4483 i	67 - 73
DELLMONT	85	38	0	4472 i	55 - 70
LA 2177	80	36	0	4391 i	59 - 70
NEWBONNET	84	44	0	4357 i	52 - 65
KOSHIHIKARI	72	37	83	3062 j	72 - 76
C.V.	1.0	3.3	--	8.0	13.0-2.1

* Numbers followed by the same letter are not significantly different (Duncan's MRT, P = 0.05).

Table 26. Agronomic and milling performance of 1994 commercial varieties, very early group, Four location means.

1994[1] entry	Seedling vigor*	Days to 50% heading	Plant height (in)	Lodging (%)	Yield** (lb/A @ 12%)	Milling %*** (Whl-Tot)
LAGRUE	5	93	44	0	7143 a	54 - 68
ADAIR	5	88	44	15	6742 ab	56 - 69
TX 3009	5	94	48	0	6741 ab	65 - 71
JODON	5	89	37	0	6727 ab	61 - 70
JACKSON	5	90	40	0	6393 abc	61 - 70
TEBONNET	6	91	52	17	6323 abc	60 - 70
ALAN	5	89	41	1	6211 abc	61 - 70
AB869	6	90	39	0	6167 abc	61 - 70
ROSEMONT	6	89	35	0	6166 abc	54 - 68
RT7015	5	88	36	0	5886 abc	62 - 70
MILLIE	5	90	42	0	5821 abc	63 - 72
L202	5	86	37	0	5693 abc	56 - 69
MAYBELLE	4	82	38	0	5249 bcd	61 - 71
TX 3006	8	91	35	0	5199 bcd	60 - 70
L203	4	81	38	1	5016 cd	47 - 68
AKITAKOMACHI	6	83	40	47	4995 cd	67 - 75
LABELLE	8	92	50	0	4080 de	58 - 68
C.V.	-	2.0	4.0	--	16.2	

* Subjective rating 1 to 9, where 1 = excellent, 9 = poor (two-location mean).

** Numbers followed by the same letter are not significantly different (Duncan's MRT, P = 0.05).

*** Three-location mean.

[1] CM 101 not at all locations, therefore, not in thia table.

Table 27. Agronomic and milling performance of 1994 commercial varieties, early group, Five location means.

1994[1] entry	Seedling vigor*	Days to 50% heading	Plant height (in)	Lodging (%)	Yield** (lb/A @ 12%)	Milling %*** (Whl-Tot)
AB 647	3	101	42	17	8620 a	59 - 74
LA 2192	3	97	38	0	8585 a	61 - 70
RICO 1	3	96	42	14	8072 ab	66 - 72
AR 1179	3	96	43	0	7605 abc	63 - 71
JASMINE 85	3	105	43	0	7477 bc	46 - 68
AR 1176	2	95	43	0	7230 bcd	65 - 72
AR 1191	2	102	43	0	6985 cd	65 - 72
KAYBONNET	2	94	42	0	6976 cd	64 - 70
CYPRESS	2	95	38	0	6945 cde	64 - 71
ORION	3	93	41	0	6936 cde	65 - 70
BENGAL	3	93	36	0	6835 cdef	60 - 71
KATY	3	96	44	0	6713 cdefg	63 - 70
LACASSINE	3	97	37	0	6249 defgh	60 - 70
V 4716	3	94	36	0	6155 defghi	68 - 72
NEWBONNET	2	95	44	0	6147 defghi	55 - 66
MARS	3	94	43	12	6123 defghi	63 - 70
LEMONT	3	98	36	0	6114 defghi	59 - 72
TORO 2	3	93	41	8	5846 efghi	64 - 72
GULFMONT	3	96	37	3	5833 efghi	60 - 70
SATURN	3	93	50	44	5694 ghi	68 - 71
LA 2071	4	91	37	0	5653 ghi	55 - 70
DELLMONT	3	100	37	0	5644 ghi	59 - 71
MERCURY	3	92	37	0	5617 ghi	65 - 71
DELLROSE	3	93	38	0	5454 hi	60 - 71
DELLA	3	94	50	19	5250 hi	58 - 70
KOSHIHIKARI *	7	87	40	72	5197 hi	72 - 75
LA 2177	3	92	35	0	5103 i	61 - 70
C.V.	19.3	3.7	4.2	--	11.4	5.9-4.3

* Subjective rating 1 to 9, where 1 = excellent, 9 = poor (two-location mean).

** Numbers followed by the same letter are not significantly different (Duncan's MRT, P = 0.05).

*** Three-location mean.

[1] Koshihikari and TX 3166 not at all locations, therefore, not in this table.

ADVANCED YIELD TESTS

The Rice Breeding project annually conducts on-farm testing of advanced experimental lines to complement tests conducted on station. The goals of this program are to sample additional environments in yield testing of new promising selections from the varietal development program. These additional yield evaluations are needed to identify the performance characteristics, strengths and weaknesses of the test entries. Multi-location and multi-year testing are essential to provide the information needed to make decisions relative to the release of new varieties.

These tests were conducted at the Rice Research Station and four on-farm locations in 1994. The on-farm locations were as follows:

East Carroll Parish (Epps, LA) - Buford Perry Farm
Morehouse Parish (Jones, LA) - Edmund and Kirk Zaunbrecher Farm
Rapides Parish (Cheneyville, LA)- Will Bollich Farm
Vermilion Parish (Gueydan, LA) - Errol Lounsberry Farm

Twenty-four experimentals and six checks were included in the 1994 testing program. Ratoon crop information was generated at the Rice Research Station and at the Vermilion Parish location. These tests were conducted in cooperation with Dr. Pat Bollich and the Rice Fertilization and Cultural Management Project. The East Carroll and Morehouse locations were managed by Mr. Doug Walker.

The advanced yield test at the RRS was conducted in such a way to quantify the level of sheath blight resistance of the various lines. The test was planted in the normal manner, then an entire second set of the test was planted in an adjacent cut. The second set was inocualted with Rhizoctonia solani just after the panicle initiation stage of development. Thus, these plots were subjected to high levels of sheath blight pressure. This work was conducted in cooperation with Dr. Don Groth. Tables 28-32 present data from these studies. Data from the off-station locations are presented in Tables 33-37. Summary data are presented in Table 38 (Summary data includes only uninoculated plots from the RRS).

Experiment: Advanced Yield Test

Location: Rice Research Station

Seeding Rate/Date: 100 lb/A, March 24, 1994

Planting Method: Drill-seeded

Fertilization: 14-42-42 lb/A (N-P_2O_5-K_2O) preplant incorporated, Mar 23; 92 lb N/A, Apr 26; 21 lb N/A, May 19; 21 lb N/A, June 6; 60 lb N/A, Aug 12

Plot Size: 4.66 x 25 ft (116.5 ft^2)

Water Management: Flush, Mar 30, Apr 11; flood, Apr 27; harvest drainage, July 20; reflood, Aug 12; harvest drainage, Oct 7

Herbicides: Arrosolo (propanil 3 lb ai/A + molinate 3 lb ai/A), Apr 26

Insecticides: Furadan (carbofuran) .5 lb ai/A, May 19

Harvest: Aug 9-10; ratoon crop, Oct 21

Experimental Design: Randomized complete block with four replications

Results: Tables 28-32

Table 28. Agronomic and milling performance of 1994 advanced yield test (uninoculated with Rhizoctonia solani), Crowley, LA.

1994 entry	Pedigree	Grain Type*	Seedling vigor**	Days to 50% heading	Plant height (in)	Lodging (%)	Yield*** (lb/A @ 12%)	Milling % (Whl-Tot)	SB[1]
230	RICO	M	6	97	41	0	8774 a	60 - 65	3
218	RXCL	M	9	105	37	0	8375 ab	60 - 64	2
206	RICO1/V4716	M	6	97	42	0	8218 abc	66 - 69	3
211	90 2207X2 (25KR)	L	6	97	36	0	8171 abc	65 - 71	5
221	MARSX2/V4716	M	6	97	39	0	8151 abc	68 - 72	4
203	MERC//MERC/KOSH	M	7	94	38	0	7925 bcd	68 - 74	3
229	CPRS	L	5	96	36	0	7867 bcd	66 - 72	4
227	KBNT	L	4	94	39	0	7768 bcde	61 - 69	4
208	CPRS//2201/7402003	L	5	95	42	0	7718 bcde	57 - 69	4
205	MERC//MERC/KOSH	M	6	94	37	0	7642 cdef	63 - 71	3
207	CPRS//LMNT*2/CR1113	L	6	95	37	0	7639 cdef	64 - 71	5
214	CPRS/LMNT*2//CR1113	L	6	95	37	0	7633 cdef	63 - 70	5
219	TXMT/3/...	L	6	96	37	0	7627 cdef	57 - 68	3
225	LGRU	L	5	93	41	0	7620 cdef	50 - 67	4
209	90 2207X2 (25KR)	L	6	97	36	0	7589 cdef	66 - 71	5
220	MARS/CM101	S(W)	7	96	35	0	7327 defg	65 - 72	3
223	SMARS/MARS//MARS/3/RICO	M	6	95	39	0	7311 defg	61 - 70	4
216	LMNT/LBLESC-5	L	7	98	40	0	7127 efgh	56 - 69	2
213	KATY/CPRS	L	6	97	35	0	6999 fghi	67 - 74	5
228	BNGL	M	5	97	36	0	6801 ghij	63 - 69	3
217	LMNT/86-20001-5	L	7	100	36	0	6688 ghij	58 - 69	3
202	MBLE//82CAY21/LMNT	L	5	85	33	0	6550 hijk	61 - 70	5
210	DMSI/DLLAX2//LMNT...	L(A,E)	5	94	45	0	6473 hijk	56 - 72	3
201	LBLE/L201//MBLE	L	5	87	39	0	6437 ijk	61 - 72	4
212	LCSN/CPRS	L	7	94	35	0	6266 jk	63 - 70	5
204	MERC/AKIHIKARI	M	8	88	36	0	6196 jk	69 - 73	3
224	A301/JSMN	L(A)	6	100	46	0	5969 kl	47 - 68	3
215	LBLESC-5/LMNT	L	7	98	38	0	5521 l	45 - 68	2
226	DLMT	L(A)	8	101	36	0	5494 l	57 - 70	4
222	DMSI//LMNT/NWBT...	L(A,E)	7	88	45	0	4786 m	52 - 71	2
C.V.			10.0	1.0	3.1	-	5.8	4.9-1.9	2.0

* L = Long grain, M = Medium grain, S = Short grain (A = aromatic, E = elongating, W = waxy).
** Subjective rating 1 to 9, where 1 = excellent, 9 = poor.
*** Numbers followed by the same letter are not significantly different (Duncan's MRT, P = 0.05).
[1] SB = Sheath blight, 0-9 scale.

Table 29. Performance of main and ratoon crops of 1994 advanced yield test (uninoculated with Rhizoctonia solani), Crowley, LA.

1994 entry	Pedigree	Ratoon height (in)	Main crop yield	Ratoon crop yield	Total yield*	
			----------lb/A @ 12%----------			
216	LMNT/LBLESC-5	33	7127	3546	10673	a
225	LGRU	33	7620	2869	10489	ab
230	RICO	30	8774	1637	10411	abc
227	KBNT	32	7768	2615	10382	abc
223	SMARS/MARS//MARS/3/...	30	7311	2984	10294	abcd
203	MERC//MERC/KOSH	28	7925	2262	10187	abcde
211	90 2207X2 (25KR)	29	8171	1925	10096	a-f
208	CPRS//2201/7402003	33	7718	2321	10039	a-f
218	RXCL	26	8375	1609	9984	a-f
221	MARSX2/V4716	28	8151	1822	9973	a-f
229	CPRS	29	7867	2076	9943	a-f
220	MARS/CM101	26	7327	2372	9699	a-g
206	RICO1/V4716	31	8218	1451	9669	a-h
219	TXMT/3/...	26	7627	2031	9657	a-h
214	CPRS/LMNT*2//CR1113	29	7633	1907	9539	b-i
205	MERC//MERC/KOSH	29	7642	1858	9499	b-i
213	KATY/CPRS	27	6999	2495	9494	b-i
207	CPRS//LMNT*2/CR1113	29	7639	1797	9436	c-i
217	LMNT/86-20001-5	30	6688	2587	9275	d-j
210	DMSI/DLLAX2//LMNT...	34	6473	2775	9248	e-j
228	BNGL	28	6801	2303	9105	f-k
212	LCSN/CPRS	28	6266	2610	8876	g-l
204	MERC/AKIHIKARI	29	6196	2616	8812	g-l
209	90 2207X2 (25KR)	28	7589	1075	8663	hijkl
224	A301/JSMN	33	5969	2639	8609	ijkl
201	LBLE/L201//MBLE	30	6437	2100	8537	ijkl
202	MBLE//82CAY21/LMNT	25	6550	1754	8304	jklm
215	LBLESC-5/LMNT	30	5521	2715	8236	klm
226	DLMT	29	5494	2437	7931	lm
222	DMSI//LMNT/NWBT...	35	4786	2773	7559	m
C.V.		4.8	5.8	14.9	6.4	

* Numbers followed by the same letter are not significantly different (Duncan's MRT, P = 0.05).

Table 30. Agronomic and milling performance of 1994 advanced yield test (inoculated with Rhizoctonia solani), Crowley, LA.

1994 entry	Pedigree	Grain Type*	Seedling vigor**	Days to 50% heading	Plant height (in)	Lodging (%)	Yield*** (lb/A @ 12%)	Milling % (Whl-Tot)	SB[1]	SSB[1]
221	MARSX2/V4716	M	6	97	37	0	8022 a	67 - 73	5	6
206	RICO1/V4716	M	6	97	42	0	7734 ab	69 - 73	6	6
218	RXCL	M	8	105	38	0	7647 ab	59 - 66	4	4
230	RICO	M	7	97	41	0	7509 ab	60 - 68	5	5
203	MERC//MERC/KOSH	M	6	93	37	0	7470 b	59 - 74	6	6
228	BNGL	M	5	97	34	0	6974 c	68 - 73	6	5
227	KBNT	L	4	94	39	0	6737 cd	58 - 67	6	7
223	SMARS/MARS//MARS/3/RICO	M	6	94	37	0	6659 cde	59 - 70	6	7
205	MERC//MERC/KOSH	M	6	94	37	0	6649 cde	57 - 70	6	7
210	DMSI/DLLAX2//LMNT...	L(A,E)	6	93	44	0	6532 cde	57 - 71	6	6
213	KATY/CFRS	L	6	97	34	0	6522 cde	65 - 72	7	8
216	LMNT/LBLESC-5	L	6	98	39	0	6505 cde	57 - 69	6	6
225	LGRU	L	5	93	41	0	6488 cde	49 - 66	7	8
217	LMNT/86-20001-5	L	7	99	35	0	6276 def	55 - 68	6	6
201	LBLE/L201//MBLE	L	5	85	38	0	6272 def	65 - 71	7	8
208	CFRS//2201/7402003	L	5	96	40	0	6180 defg	56 - 67	7	7
220	MARS/CM101	S(W)	7	96	33	0	6145 efg	54 - 73	5	6
204	MERC/AKIHIKARI	M	7	87	36	0	5840 fgh	68 - 72	6	6
219	TXMT/3/...	L	6	97	35	0	5703 ghi	56 - 69	7	8
212	LCSN/CFRS	L	7	95	34	0	5690 ghi	58 - 67	7	8
215	LBLESC-5/LMNT	L	6	99	37	0	5398 hij	50 - 67	6	5
224	A301/JSMN	L(A)	6	101	42	0	5349 hij	46 - 70	5	5
226	DLMT	L(A)	8	100	34	0	5255 ijk	60 - 71	7	7
229	CFRS	L	4	96	34	5	5196 ijk	63 - 69	8	8
211	90 2207X2 (25KR)	L	6	97	36	3	5000 jk	62 - 71	8	8
209	90 2207X2 (25KR)	L	6	97	36	15	4946 jk	64 - 70	8	8
222	DMSI//LMNT/NWBT...	L(A,E)	6	88	43	35	4778 k	50 - 71	6	6
202	MBLE//82CAY21/LMNT	L	5	84	31	55	4257 l	61 - 69	8	9
214	CFRS/LMNT*2//CR1113	L	6	95	36	25	4057 l	49 - 71	8	9
207	CFRS//LMNT*2/CR1113	L	5	96	35	43	3835 l	60 - 69	8	9
C.V.			8.0	0.9	2.9	--	5.6	8.3-2.3	7.7	8.8

* L = Long grain, M = Medium grain, S = Short grain (A = aromatic, E = elongating, W = Waxy).
** Subjective rating 1 to 9, where 1 = excellent, 9 = poor.
*** Numbers followed by the same letter are not significantly different (Duncan's MRT, P = 0.05).
[1] SB = Sheath blight, 0-9 scale (early boot); SSB = sheath blight, 0-9 scale (harvest).

Table 31. Performance of main and ratoon crops of 1994 advanced yield test (inoculated with Rhizoctonia solani), Crowley, LA.

1994 entry	Pedigree	Ratoon height (in)	Main crop yield	Ratoon crop yield	Total yield*
			----------lb/A @ 12%----------		
210	DMSI/DLLAX2//LMNT...	34	6532	3116	9648 a
221	MARSX2/V4716	27	8022	1559	9581 ab
223	SMARS/MARS//MARS/3/...	30	6659	2871	9531 ab
218	RXCL	27	7647	1772	9419 ab
203	MERC//MERC/KOSH	29	7470	1705	9175 abc
206	RICO1/V4716	31	7734	1327	9062 abcd
225	LGRU	33	6488	2523	9011 abcd
228	BNGL	27	6974	1813	8787 bcde
217	LMNT/86-20001-5	30	6276	2306	8582 cdef
216	LMNT/LBLESC-5	33	6505	2019	8524 cdefg
201	LBLE/L201//MBLE	29	6272	2100	8372 cdefg
204	MERC/AKIHIKARI	29	5840	2474	8315 defg
230	RICO	29	7509	711	8220 defg
220	MARS/CM101	25	6145	1955	8100 efgh
227	KBNT	31	6737	1350	8087 efgh
215	LBLESC-5/LMNT	29	5398	2568	7966 efgh
205	MERC//MERC/KOSH	27	6649	1204	7853 fghi
208	CPRS//2201/7402003	33	6180	1612	7792 fghi
213	KATY/CPRS	26	6522	1204	7726 fghi
224	A301/JSMN	32	5349	2319	7669 ghi
222	DMSI//LMNT/NWBT...	34	4778	2543	7321 hij
212	LCSN/CPRS	26	5690	1387	7077 ij
219	TXMT/3/...	27	5703	1123	6826 jk
226	DLMT	28	5255	1454	6710 jk
229	CPRS	28	5196	1040	6235 kl
211	90 2207X2 (25KR)	29	5000	850	5850 l
209	90 2207X2 (25KR)	28	4946	769	5715 l
202	MBLE//82CAY21/LMNT	25	4257	1280	5537 l
214	CPRS/LMNT*2//CR1113	24	4057	737	4794 m
207	CPRS//LMNT*2/CR1113	28	3835	782	4617 m
C.V.		--	5.6	20.5	6.7

* Numbers followed by the same letter are not significantly different (Duncan's MRT, P = 0.05).

Table 32. Comparison of performance of 1994 advanced yield entries under uninoculated versus inoculated (*Rhizoctonia solani*) conditions, Crowley, LA.

1994 entry	Pedigree	Yield		Difference	%
		Uninoculated	Inoculated		
230	RICO1	8774	7509	1265	14.4
218	RXCL	8375	7647	728	8.7
206	RICO1/V4716	8218	7734	484	5.8
211	90 2207X2 (25KR)	8171	5000	3171	38.8
221	MARSX2/V4716	8151	8022	129	1.6
203	MERC//MERC/KOSH	7925	7470	455	5.7
229	CFRS	7867	5196	2671	33.9
227	KBNT	7768	6737	1031	13.3
208	CFRS//2201/7402003	7718	6180	1538	19.9
205	MERC//MERC/KOSH	7642	6649	993	13.0
207	CFRS//LMNT*2/CR1113	7639	3835	3805	49.8
214	CFRS//LMNT*2/CR1113	7633	4057	3576	46.8
219	TXMT/3/...	7627	5703	1924	25.2
225	LGRU	7620	6488	1132	14.9
209	90 2207X2 (25KR)	7589	4946	2643	34.8
220	MARS/CM101	7327	6145	1182	16.1
223	SMARS/MARS//MARS/3/RICO1	7311	6659	652	8.9
216	LMNT/LBLESC-5	7127	6505	622	8.7
213	KATY/CPRS	6999	6522	477	6.8
228	BNGL	6801	6974	-173	+2.5
217	LMNT (86-20001-5)	6688	6276	412	6.2
202	MBLE//82CAY21/LMNT	6550	4257	2293	35.0
210	DMSI/DLLAX2//LMNT...	6473	6532	-59	+0.9
201	LBLE/L201//MBLE	6437	6272	165	2.6
212	LCSN/CPRS	6266	5690	576	9.2
204	MERC/AKIHIKARI	6196	5840	356	5.7
224	A301/JSMN	5969	5349	620	10.4
215	LBLESC-5/LMNT	5521	5398	123	2.3
226	DLMT	5494	5255	239	4.4
222	DMSI//LMNT/NWBT...	4786	4778	8	0.2

Experiment: Advanced Yield Test

Location: Epps, Buford Perry Farm, East Carroll Parish

Seeding Rate/Date: 100 lb/A, May 9, 1994

Planting Method: Drill-seeded

Fertilization: 120 lb N/A, June 19

Plot Size: 7 x 25 ft (175 ft^2)

Water Management: Flush, May 15, 20 and 25; flood, June 20; harvest drainage, Sept 6

Herbicides: Stam (propanil) 3 lb ai/A + Facet (quinclorac) .375 lb ai/A, June 1; Ordram (molinate) 3.5 lb ai/A, June 28; Londax (bensulfuron) 1 oz ai/A, July 1

Insecticides: Furadan (carbofuran) .5 lb ai/A, July 9

Fungicides: Benlate (benomyl) .5 lb ai/A, July 28 and Aug 12

Harvest: Sept 26

Experimental Design: Randomized complete block with four replications

Results: Table 33

Table 33. Agronomic and milling performance of 1994 advanced yield test, East Carroll Parish, LA.

1994 entry	Pedigree	Grain Type*	Days to 50% heading	Plant height (in)	Lodging (%)	Yield** (lb/A @ 12%)	Milling % (Whl-Tot)
218	RXCL	M	94	39	0	11959 a	64 - 71
230	RICO	M	97	47	70	11718 a	66 - 72
228	BNGL	M	94	41	0	10576 b	63 - 72
225	LGRU	L	98	49	0	10286 bc	61 - 70
206	RICO1/V4716	M	94	45	0	9828 bcd	69 - 75
205	MERC//MERC/KOSH	M	91	42	0	9612 cde	69 - 72
209	90 2207X2 (25KR)	L	100	40	0	9500 cdef	67 - 71
215	LBLESC-5/LMNT	L	101	46	0	9470 cdef	60 - 69
214	CPRS/LMNT*2//CR1113	L	99	39	0	9289 defg	66 - 72
220	MARS/CM101	S(W)	97	38	0	9185 defgh	62 - 74
229	CPRS	L	100	41	0	9179 defgh	67 - 73
203	MERC//MERC/KOSH	M	91	42	0	9173 defgh	71 - 73
224	A301/JSMN	L(A)	100	48	33	9113 defgh	57 - 71
221	MARSX2/V4716	M	96	42	0	9074 defgh	68 - 73
219	TXMT/3/...	L	99	38	0	8870 efghi	61 - 72
227	KBNT	L	97	46	0	8852 efghi	67 - 72
211	90 2207X2 (25KR)	L	100	39	0	8793 efghi	67 - 72
216	LMNT/LBLESC-5	L	99	45	0	8780 efghi	56 - 70
201	LBLE/L201//MBLE	L	86	44	23	8698 efghi	65 - 72
217	LMNT/86-20001-5	L	100	40	0	8570 fghi	48 - 68
208	CPRS//2201/7402003	L	96	47	60	8515 ghi	64 - 72
207	CPRS//LMNT*2/CR1113	L	98	41	0	8442 ghi	66 - 71
226	DLMT	L(A)	102	42	0	8265 hij	63 - 72
213	KATY/CPRS	L	100	37	0	8088 ij	68 - 73
223	SMARS/MARS//MARS/3/RICO	M	91	42	0	8046 ij	68 - 72
204	MERC/AKIHIKARI	M	89	40	0	8031 ij	70 - 74
202	MBLE//82CAY21/LMNT	L	84	34	0	7562 j	64 - 73
212	LCSN/CPRS	L	96	38	0	7495 j	68 - 73
210	DMSI/DLLAX2//LMNT...	L(A,E)	91	47	3	7388 j	60 - 72
222	DMSI//LMNT/NWBT...	L(A,E)	92	54	0	6054 k	51 - 70
C.V.			0.8	3.2	--	6.1	4.3-1.3

* L = Long grain, M = Medium grain, S = Short grain (A = aromatic, E = elongating, W = waxy).
** Numbers followed by the same letter are not significantly different (Duncan's MRT, P = 0.05).

Experiment: Advanced Yield Test

Location: Jones, Zaunbrecher Farm, Morehouse Parish

Seeding Rate/Date: 150 lb/A, May 11, 1994

Planting Method: Water-seeded (pre-germinated seed), delayed flood

Fertilization: 120 lb N/A, June 9

Plot Size: 7 x 25 ft (175 ft^2)

Water Management: Flood, May 11; drain, May 15; flush, May 19, 26 and June 3; flood, June 10; harvest drainage, Aug 30

Herbicides: Stam (propanil) 4 lb ai/A + Basagran (bentazon) .75 lb ai/A, June 7; Londax (bensulfuron) 1 oz ai/A, June 21

Insecticides: Furadan (carbofuran) .5 lb ai/A, June 23

Fungicides: Benlate (benomyl) .5 lb ai/A, June 23 and Aug 8

Harvest: Sept 13

Experimental Design: Randomized complete block with four replications

Results: Table 34

Table 34. Agronomic and milling performance of 1994 advanced yield test, Morehouse Parish, LA.

1994 entry	Pedigree	Grain Type*	Days to 50% heeding	Plant height (in)	Lodging (%)	Yield** (lb/A @ 12%)	Milling % (Whl-Tot)
218	RXCL	M	87	37	0	13298 a	65 - 71
230	RICO	M	87	43	23	11780 b	69 - 74
228	BNGL	M	83	37	0	11537 bc	63 - 71
206	RICO1/V4716	M	84	43	0	11175 bcd	67 - 74
208	CFRS//2201/7402003	L	82	44	8	10916 cde	61 - 70
225	LGRU	L	86	44	0	10874 cdef	56 - 68
221	MARSX2/V4716	M	85	38	0	10807 cdef	66 - 70
211	90 2207X2 (25KR)	L	87	37	0	10637 defg	68 - 73
209	90 2207X2 (25KR)	L	86	37	0	10612 defg	66 - 72
227	KBNT	L	85	44	0	10476 defgh	64 - 72
215	LBLESC-5/LMNT	L	88	40	0	10440 defgh	63 - 72
224	A301/JSMN	L(A)	88	44	20	10431 defgh	58 - 73
207	CFRS//LMNT*2/CR1113	L	85	39	0	10184 efghi	65 - 72
229	CFRS	L	88	37	0	10139 efghi	64 - 71
219	TXMT/3/...	L	89	36	0	10120 efghi	63 - 73
214	CFRS/LMNT*2//CR1113	L	85	37	5	10066 efghi	64 - 71
216	LMNT/LBLESC-5	L	86	40	0	10052 efghi	52 - 71
205	MERC//MERC/KOSH	M	78	39	13	9997 fghi	68 - 72
212	LCSN/CFRS	L	84	36	0	9824 ghij	67 - 73
220	MARS/CM101	S(W)	87	36	0	9614 hijk	66 - 75
217	LMNT/86-20001-5	L	89	37	0	9510 ijk	60 - 71
213	KATY/CFRS	L	89	35	0	9505 ijk	67 - 73
223	SMARS/MARS//MARS/3/RICO	M	78	40	0	9113 jkl	65 - 72
203	MERC//MERC/KOSH	M	80	39	0	9106 jkl	71 - 73
202	MBLE//82CAY21/LMNT	L	75	32	0	8849 kl	60 - 71
226	DLMT	L(A)	90	35	0	8805 kl	67 - 74
201	LBLE/L201//MBLE	L	75	40	0	8769 kl	63 - 71
210	DMSI/DLLAX2//LMNT...	L(A,E)	82	45	43	8473 l	49 - 69
204	MERC/AKIHIKARI	M	77	36	0	8338 l	66 - 72
222	DMSI//LMNT/NWBT...	L(A,E)	78	48	70	6772 m	51 - 71
C.V.			1.0	3.3	--	5.3	4.5-2.4

* L = Long grain, M = Medium grain, S = Short grain (A = aromatic, E = elongating, W = waxy).
** Numbers followed by the same letter are not significantly different (Duncan's MRT, P = 0.05).

Experiment: Advanced Yield Test

Location: Cheneyville, Will Bollich Farm, Rapides Parish

Seeding Rate/Date: 100 lb/A, June 10, 1994

Planting Method: Drill-seeded

Fertilization: 120 lb N/A, July 5

Plot Size: 7 x 25 ft (175 ft^2)

Water Management: Flush, June 13, 21 and 28; flood, July 6; harvest drainage, Sept 21

Herbicides: Arrosolo (molinate 3 lb ai/A + propanil 3 lb ai/A), July 2; Londax (bensulfuron) 1 oz ai/A, July 16; Ordram (molinate), 3 lb ai/A, July 16

Insecticides: Furadan (carbofuran) .5 lb ai/A, July 20; Methyl Parathion .25 lb ai/A, Aug 30, Sept 10

Fungicides: Rovral (iprodione) .5 lb ai/A, Aug 30

Harvest: Oct 27

Experimental Design: Randomized complete block with four replications

Results: Table 35

Table 35. Agronomic and milling performance of 1994 advanced yield test, Rapides Parish, LA.

1994 entry	Pedigree	Grain Type*	Seedling vigor**	Days to 50% heading	Plant height (in)	Lodging (%)	Yield*** (lb/A @ 12%)	Milling % (Whl-Tot)
218	RXCL	M	3	83	39	0	7562 a	57 - 71
206	RICO1/V4716	M	5	81	44	0	7163 a	66 - 75
211	90 2207X2 (25KR)	L	5	85	40	0	6253 b	64 - 71
230	RICO	M	7	83	42	0	6235 b	67 - 73
208	CPRS//2201/7402003	L	4	83	45	0	6202 bc	59 - 70
227	KBNT	L	4	83	43	0	6199 bc	61 - 69
219	TXMT/3/...	L	5	84	36	0	6162 bc	57 - 70
215	LBLESC-5/LMNT	L	5	87	41	0	6052 bcd	60 - 70
214	CPRS/LMNT*2//CR1113	L	5	84	39	0	5891 bcde	60 - 68
220	MARS/CM101	S(W)	6	83	34	0	5873 bcde	62 - 74
228	BNGL	M	5	82	36	0	5869 bcde	50 - 69
207	CPRS//LMNT*2/CR1113	L	5	84	41	0	5800 bcde	50 - 71
229	CPRS	L	4	84	40	0	5765 bcde	60 - 71
205	MERC//MERC/KOSH	M	6	77	39	8	5700 bcde	68 - 71
225	LGRU	L	6	84	43	0	5525 bcdef	54 - 67
213	KATY/CPRS	L	5	85	36	0	5469 cdef	66 - 73
209	90 2207X2 (25KR)	L	5	85	40	0	5393 defg	61 - 69
217	LMNT/86-20001-5	L	6	87	38	0	5367 defg	52 - 69
212	LCSN/CPRS	L	5	83	38	0	5209 efgh	64 - 72
203	MERC//MERC/KOSH	M	6	76	37	0	5165 efghi	67 - 73
216	LMNT/LBLESC-5	L	7	87	42	0	4886 fghij	48 - 70
224	A301/JSMN	L(A)	7	85	45	0	4845 fghij	39 - 71
221	MARSX2/V4716	M	5	81	37	0	4685 ghijk	62 - 71
202	MBLE//82CAY21/LMNT	L	5	73	34	0	4495 hijk	51 - 70
223	SMARS/MARS//MARS/3/RICO	M	5	77	38	0	4484 hijk	65 - 72
226	DLMT	L(A)	8	85	38	0	4472 ijk	55 - 70
201	LBLE/L201//MBLE	L	5	73	39	0	4365 jk	64 - 71
210	DMSI/DLLAX2//LMNT...	L(A,E)	6	80	44	0	4201 jk	56 - 70
204	MERC/AKIHIKARI	M	7	73	34	0	4045 k	72 - 76
222	DMSI//LMNT/NWBT...	L(A,E)	7	77	48	0	2878 l	40 - 68
C.V.			12.7	1.0	3.2	-	8.3	14.8-2.1

* L = Long grain, M = Medium grain, S = Short grain (A = aromatic, E = elongating, W = waxy).
** Subjective rating 1 to 9, where 1 = excellent, 9 = poor.
*** Numbers followed by the same letter are not significantly different (Duncan's MRT, P = 0.05).

Experiment: Advanced Yield Test

Location: Gueydan, Errol Lounsberry Farm, Vermilion Parish

Seeding Rate/Date: 150 lb/A, March 28, 1994

Planting Method: Water-seeded (pre-germinated seed)

Fertilization: 45 lb/A P_2O_5 and K_2O preplant incorporated, Fall 1993; 90 lb N/A, preplant incorporated, Mar 25; 21 lb N/A, June 6; 75 lb N/A, ratoon crop, July 28

Plot Size: 7 x 25 ft (175 ft^2)

Water Management: Flood, Mar 26; drain, Apr 3; reflood, Apr 8; harvest drainage, July 11; ratoon crop flood, July 29; harvest drainage, Oct 5

Herbicides: Londax (bensulfuron) 1 oz ai/A, Apr 28

Insecticides: Furadan (carbofuran) .5 lb ai/A, May 11

Fungicides: Benlate (benomyl) .75 lb ai/A, June 19

Harvest: July 28; ratoon crop, Oct 31

Experimental Design: Randomized complete block with four replications

Results: Tables 36-37

Table 36. Agronomic and milling performance of 1994 advanced yield test, Vermilion Parish, LA.

1994 entry	Pedigree	Grain Type*	Seedling vigor**	Days to 50% heading	Plant height (in)	Lodging (%)	Yield*** (lb/A @ 12%)	Milling % (Whl-Tot)	SB[1]	RN[1]
218	RXCL	M	8	90	37	0	8868 a	57 - 64	0	0
230	RICO	M	7	89	41	0	8782 a	62 - 68	1	0
203	MERC//MERC/KOSH	M	5	81	37	0	7871 b	67 - 71	1	1
205	MERC//MERC/KOSH	M	5	82	37	0	7572 bc	64 - 69	5	2
214	CFRS/LMNT*2//CR1113	L	4	82	35	0	7436 bcd	59 - 68	6	2
227	KBNT	L	4	82	40	0	7338 bcd	62 - 69	4	0
209	90 2207X2 (25KR)	L	4	85	36	0	7279 bcd	60 - 67	4	2
207	CFRS//LMNT*2/CR1113	L	4	82	36	0	7230 bcde	61 - 69	6	3
208	CFRS//2201/7402003	L	4	82	41	0	7157 cdef	60 - 68	3	1
206	RICO1/V4716	M	5	88	42	0	7150 cdef	66 - 70	1	1
211	90 2207X2 (25KR)	L	4	84	35	0	7122 cdef	62 - 68	5	2
216	LMNT/LBLESC-5	L	6	87	38	0	7089 cdef	54 - 67	3	1
212	LCSN/CPRS	L	6	82	36	0	6893 cdefg	60 - 69	5	2
228	BNGL	M	5	88	33	0	6889 cdefg	61 - 67	2	3
221	MARSX2/V4716	M	6	87	36	0	6845 defgh	62 - 67	3	5
229	CFRS	L	4	84	35	0	6829 defghi	62 - 68	3	3
219	TXMT/3/...	L	6	85	35	0	6792 defghi	54 - 66	4	1
220	MARS/CM101	S(W)	6	88	43	0	6773 defghi	67 - 72	1	1
213	KATY/CPRS	L	5	86	33	0	6545 efghij	62 - 69	4	3
225	LGRU	L	7	83	43	0	6490 fghijk	54 - 66	2	2
202	MBLE//82CAY21/LMNT	L	4	73	32	0	6341 ghijkl	61 - 68	6	5
215	LBLESC-5/LMNT	L	7	90	36	0	6181 hijkl	56 - 66	0	0
210	DMSI/DLLAX2//LMNT...	L(A,E)	6	86	44	0	6153 ijkl	57 - 69	3	2
217	LMNT/86-20001-5	L	7	88	35	0	6148 ijkl	49 - 65	2	0
204	MERC/AKIHIKARI	M	7	77	35	0	6144 ijkl	64 - 71	3	3
201	LBLE/L201//MBLE	L	5	76	38	0	5988 jkl	62 - 69	6	5
223	SMARS/MARS//MARS/3/RICO	M	4	84	37	0	5854 kl	65 - 70	2	2
226	DLMT	L(A)	7	88	35	0	5707 lm	54 - 67	3	3
222	DMSI//LMNT/NWBT...	L(A,E)	5	75	44	78	5171 mn	57 - 70	3	1
224	A301/JSMN	L(A)	7	90	42	0	4730 n	47 - 65	1	0
C.V.			16.2	1.3	9.7	--	6.1	4.3-2.4	51	43

* L = Long grain, M = Medium grain, S = Short grain (A = aromatic, E = elongating, W = waxy).
** Subjective rating 1 to 9, where 1 = excellent, 9 = poor.
*** Numbers followed by the same letter are not significantly different (Duncan's MRT, P = 0.05).
[1] SB = sheath blight, 0-9 scale; RN = rotten neck blast, 0-9 scale.

Table 37. Performance of main and ratoon crops of 1994 advanced yield test, Vermilion Parish, LA.

1994 entry	Pedigree	Ratoon height (in)	Main crop yield	Ratoon crop yield	Total yield*
			----------lb/A @ 12%----------		
218	RXCL	28	8868	4383	13251 a
230	RICO	33	8782	3493	12275 b
216	LMNT/LBLESC-5	32	7089	4944	12033 b
203	MERC//MERC/KOSH	29	7871	3085	10956 c
208	CPRS//2201/7402003	34	7157	3795	10952 c
228	BNGL	30	6889	4055	10944 c
217	LMNT/86-20001-5	31	6148	4775	10923 cd
219	TXMT/3/...	28	6792	4072	10863 cd
205	MERC//MERC/KOSH	32	7572	3191	10763 cde
220	MARS/CM101	28	6773	3720	10492 cdef
206	RICO1/V4716	34	7150	3235	10385 cdef
225	LGRU	34	6490	3890	10380 cdef
227	KBNT	32	7338	3019	10356 cdef
214	CPRS/LMNT*2//CR1113	29	7436	2905	10342 cdefg
207	CPRS//LMNT*2/CR1113	31	7230	2974	10204 cdefg
215	LBLESC-5/LMNT	32	6181	4016	10197 c-g
212	LCSN/CPRS	29	6893	3255	10148 c-h
209	90 2207X2 (25KR)	29	7279	2842	10121 defgh
213	KATY/CPRS	27	6545	3426	9971 efgh
211	90 2207X2 (25KR)	29	7122	2833	9955 efgh
229	CPRS	29	6829	2975	9803 fgh
226	DLMT	28	5707	3846	9553 ghi
204	MERC/AKIHIKARI	30	6144	3258	9402 hij
221	MARSX2/V4716	31	6845	2523	9368 hij
202	MBLE//82CAY21/LMNT	27	6341	2539	8880 ijk
210	DMSI/DLLAX2//LMNT...	34	6153	2674	8827 ijk
223	SMARS/MARS//MARS/3/...	30	5854	2876	8729 jk
201	LBLE/L201//MBLE	30	5988	2382	8369 kl
224	A301/JSMN	36	4730	3119	7849 l
222	DMSI//LMNT/NWBT...	39	5171	2633	7804 l
C.V.		4.8	6.1	7.5	4.7

* Numbers followed by the same letter are not significantly different (Duncan's MRT, P = 0.05).

Table 38. Agronomic and milling performance of 1994 advanced yield test, five location means, LA.

1994 entry	Pedigree	Grain Type*	Seedling vigor**	Days to 50% heading	Plant height (in)	Lodging (%)	Yield*** (lb/A @ 12%)	Milling % (Whl-Tot)
218	RXCL	M	5	92	38	0	10012 a	60 - 68
230	RICO	M	5	90	43	19	9458 b	65 - 70
206	RICO1/V4716	M	4	89	43	0	8707 c	67 - 73
228	BNGL	M	4	89	36	0	8334 cd	60 - 70
211	90 2207X2 (25KR)	L	4	91	37	0	8195 de	65 - 71
225	LGRU	L	4	89	44	0	8159 de	55 - 68
227	KBNT	L	3	88	43	0	8126 de	63 - 70
205	MERC//MERC/KOSH	M	4	84	39	4	8105 de	66 - 71
208	CFRS//2201/7402003	L	3	87	44	14	8101 de	60 - 70
209	90 2207X2 (25KR)	L	4	91	38	0	8075 def	64 - 70
214	CFRS/LMNT*2//CR1113	L	4	89	38	1	8063 def	62 - 70
229	CFRS	L	3	91	38	0	7956 defg	64 - 71
219	TXMT/3/...	L	4	91	36	0	7914 defg	58 - 70
221	MARSX2/V4716	M	4	89	38	0	7912 defg	65 - 70
207	CFRS//LMNT*2/CR1113	L	4	89	39	0	7859 defg	61 - 71
203	MERC//MERC/KOSH	M	5	84	39	0	7848 defg	69 - 73
220	MARS/CM101	S(W)	5	90	37	0	7754 efgh	64 - 73
216	LMNT/LBLESC-5	L	5	91	41	0	7587 fghi	53 - 70
215	LBLESC-5/LMNT	L	5	93	40	0	7533 ghi	57 - 69
213	KATY/CFRS	L	4	91	35	0	7321 hij	66 - 72
217	LMNT/86-20001-5	L	5	93	37	0	7257 ij	53 - 68
212	LCSN/CFRS	L	5	87	36	0	7137 ijk	64 - 71
224	A301/JSMN	L(A)	5	93	45	11	7018 jkl	50 - 70
223	SMARS/MARS//MARS/3/RICO	M	4	85	39	0	6961 jkl	65 - 71
201	LBLE/L201//MBLE	L	4	80	40	5	6851 jkl	63 - 71
202	MBLE//82CAY21/LMNT	L	4	78	33	0	6759 kl	60 - 70
204	MERC/AKIHIKARI	M	5	81	36	0	6551 l	68 - 73
226	DLMT	L(A)	6	93	37	0	6549 l	59 - 70
210	DMSI/DLLAX2//LMNT...	L(A,E)	4	86	45	9	6537 l	56 - 70
222	DMSI//LMNT/NWBT...	L(A,E)	5	82	48	30	5132 m	50 - 70
C.V.			21.4	2.2	5.7	--	8.9	7.1-3.8

* L = Long grain, M = Medium grain, S = Short grain (A = aromatic, E = elongating, W = waxy).
** Subjective rating 1 to 9, where 1 = excellent, 9 = poor.
*** Numbers followed by the same letter are not significantly different (Duncan's MRT, P = 0.05).

PRELIMINARY YIELD TESTS

The preliminary yield tests provide the first stage of replicated testing of experimental lines in field plots. The 1994 program included 470 experimental lines and representative checks. The more promising selections will be advanced for further testing. Entries 901-940 consisted of those entries derived from anther culture or returned from the spring nursery in Puerto Rico.

Experiment: Preliminary Yield Test - Entries 501-900

Location: Rice Research Station

Seeding Rate/Date: 100 lb/A, Apr 29, 1994

Planting Method: Drill-seeded

Fertilization: 14-42-42 lb/A (N-P_2O_5-K_2O), Apr 29; 92 lb N/A, May 21; 21 lb N/A, June 17; 21 lb N/A, June 27

Plot Size: 4.66 x 16 ft (74.5 ft^2)

Water Management: Flood, May 23; harvest drainage, entries 501-825, Aug 3; entries 826-900, Aug 9

Herbicides: Ordram (molinate) 3 lb ai/A, May 24
Londax (bensulfuron) 1 oz ai/A, June 1

Insecticides: Furadan (carbofuran) .5 lb ai/A, June 8

Harvest: Entries 501-650, Aug 11; entries 651-825, Aug 18; entries 826-900, Sept 2

Experimental Design: Randomized complete block with two replications

Results: Tables 39-54

Table 39. Agronomic and milling performance of 1994 preliminary yield test, Group I, Rice Research Station, Crowley, LA.

1994 entry	Pedigree	Grain Type*	Seedling vigor**	Days to 50% heading	Plant height (in)	Lodging (%)	Yield*** (lb/A @ 12%)	Milling % (Whl-Tot)
511	2207/L82CAY21/TBNT	L	5	72	39	0	7794 a	62 - 70
517	LBLEX2-2/BJ-1*F1//.../3/...	L	5	69	41	0	7513 ab	65 - 72
509	82CAY21/TBNT/3/LBNT//9881	L	6	76	39	0	7179 abc	60 - 69
512	2207/L82CAY21/TBNT	L	6	65	40	0	7170 abc	63 - 71
516	LBLEX2-2/BJ-1*F1//.../3/...	L	6	68	42	0	7102 abcd	58 - 69
514	2207//82CAY21/TBNT	L	6	65	39	0	7091 abcd	62 - 70
515	2207//82CAY21/TBNT	L	6	69	42	0	7046 abcd	58 - 67
522	2207/3/L201//TBNT/BLMT	L	5	68	37	0	6851 bcde	60 - 67
507	ALAN/L202	L	6	72	37	0	6779 bcdef	59 - 69
510	2207/L82CAY21/TBNT	L	5	65	38	0	6731 bcdef	42 - 70
519	L202/MBLE	L	7	75	37	0	6517 cdefg	58 - 68
524	2201//82CAY21/LMNT	L	6	75	35	0	6397 cdefg	55 - 67
523	V7817//LMNT*2/82CAY83	L	6	73	37	0	6366 cdefg	60 - 69
525	MBLE	L	5	65	40	0	6340 cdefg	61 - 69
505	ALAN/MBLE	L	6	67	43	0	6306 cdefg	59 - 69
501	2207/NWBT//2207	L	5	75	40	0	6208 defg	59 - 67
518	L202/MBLE	L	6	70	37	0	6202 defg	53 - 66
508	ALAN/L202	L	5	72	36	0	6104 efg	59 - 68
513	2207//82CAY21/TBNT	L	6	68	38	0	6087 efg	64 - 71
503	ALAN/MBLE	L	6	70	43	0	6039 efg	54 - 65
520	L202/MBLE	L	6	74	32	0	5929 fg	62 - 69
504	ALAN/MBLE	L	5	71	44	0	5792 g	52 - 65
502	ALAN/MBLE	L	4	73	44	0	5633 g	55 - 66
521	MBLE/3/9881/331581//L201	L	6	73	35	0	4781 h	54 - 66
506	RT7015/L202	L	5	69	37	0	4738 h	51 - 63
C.V.			8.8	1.5	4.1	-	5.8	4.3-1.9

* L = Long grain.
** Subjective rating 1 to 9, where 1 = excellent, 9 = poor.
*** Numbers followed by the same letter are not significantly different (Duncan's MRT, P = 0.05).

Table 40. Agronomic and milling performance of 1994 preliminary yield test, Group II, Rice Research Station, Crowley, LA.

1994 entry	Pedigree	Grain Type*	Seedling vigor**	Days to 50% heading	Plant height (in)	Lodging (%)	Yield*** (lb/A @ 12%)	Milling % (Whl-Tot)
544	SMARS/MARS//PCOS	M	5	74	39	0	8117 a	67 - 69
533	2207/MBLE	L	6	71	37	0	7535 b	63 - 70
534	2207/MBLE	L	6	68	36	0	7493 b	62 - 71
529	2207/MBLE	L	5	73	40	0	7300 bc	57 - 68
538	2207/MBLE	L	6	68	39	0	7296 bc	64 - 72
539	7702008*2/LBLE//2207	L	6	75	39	0	7255 bc	62 - 68
531	2207/MBLE	L	6	72	32	0	7229 bc	59 - 69
541	7702008*2/LBLE//2207	L	5	73	40	0	7126 bc	56 - 68
528	2207/MBLE	L	6	73	34	0	7030 bcd	60 - 67
550	JODN	L	5	73	41	0	6988 bcda	57 - 68
536	2207/MBLE	L	6	70	34	0	6892 bcdef	63 - 71
535	2207/MBLE	L	6	76	36	0	6777 cdefg	61 - 68
526	2207/GFMT	L	6	75	41	0	6776 cdefg	55 - 66
540	7702008*2/LBLE//2207	L	6	74	37	0	6750 cdefgh	59 - 68
530	2207/MBLE	L	6	67	34	0	6731 cdefgh	63 - 70
532	2207/MBLE	L	5	74	36	0	6677 cdefgh	64 - 69
527	2207/MBLE	L	6	72	34	0	6389 defghi	63 - 70
537	2207/MBLE	L	6	73	35	0	6382 efghi	62 - 70
547	MERC/AKIHIKARI	M	7	72	43	0	6299 fghi	67 - 70
549	MERC/AKIHIKARI	M	6	70	40	0	6259 fghi	59 - 65
548	MERC/AKIHIKARI	M	5	70	38	0	6229 ghi	62 - 66
542	ALAN/L202	L	6	72	39	0	6181 ghi	52 - 63
546	MERC/AKIHIKARI	M	6	72	41	0	6111 hi	71 - 73
543	TBNT//NWBT/LMNT	L	7	80	40	0	6005 i	63 - 70
545	MERC/AKIHIKARI	M	6	68	41	0	5937 i	69 - 73
C.V.			7.3	1.6	3.3	-	4.0	3.4-2.2

* L = Long grain; M = Medium grain.

** Subjective rating 1 to 9, where 1 = excellent, 9 = poor.

*** Numbers followed by the same letter are not significantly different (Duncan's MRT, P = 0.05).

Table 41. Agronomic and milling performance of 1994 preliminary yield test, Group III, Rice Research Station, Crowley, LA.

1994 entry	Pedigree	Grain Type*	Seedling vigor**	Days to 50% heading	Plant height (in)	Lodging (%)	Yield*** (lb/A @ 12%)	Milling % (Whl-Tot)
561	2207//82CAY21/TBNT	L	5	72	40	0	7118 a	62 - 70
554	2207/NWBT//2207	L	5	74	40	0	7068 ab	60 - 68
573	20001-5/LMNT//L202/LMNT	L	6	76	38	0	7001 abc	59 - 68
552	2207/NWBT//2207	L	5	74	44	0	6988 abcd	57 - 66
572	L202/LMNT//LMNT*2/CR1113	L	6	73	38	0	6966 abcd	59 - 69
562	2207//82CAY21/TBNT	L	5	71	38	0	6773 abcde	58 - 69
575	CPRS	L	5	79	41	0	6745 abcde	59 - 66
565	LBLEX2-2/BJ-1*F1//.../3/...	L	6	77	40	0	6695 abcde	54 - 68
567	LBLEX2-2/BJ-1*F1//.../3/...	L	5	72	43	0	6683 a-f	57 - 67
551	2207/NWBT//2207	L	5	75	40	0	6671 a-f	61 - 69
553	2207/NWBT//2207	L	5	74	38	0	6608 a-f	61 - 69
571	L202/LMNT//LMNT*2/CR1113	L	6	73	40	0	6604 a-f	53 - 67
563	2207//82CAY21/TBNT	L	5	64	39	0	6474 a-g	61 - 69
555	82CAY21/TBNT/3/82CAY21//...	L	5	67	37	0	6435 a-g	60 - 68
556	9881/331581//L201/3/TBNT	L	5	73	40	0	6416 a-g	48 - 67
559	GCHW/LMNT//CB801/3/LBLEX2	L	6	75	39	0	6372 a-h	61 - 69
570	LMNT/4/82CAY21//TTEP/IR-8	L	5	77	37	0	6187 b-h	59 - 67
574	20001-5/LMNT//JKSN	L	7	73	44	0	6145 c-h	57 - 67
569	82CAY21/LMNT//ALAN	L	6	72	47	0	6070 defgh	54 - 66
564	LBLEX2-2/BJ-1*F1//.../3/...	L	6	74	40	0	5905 efghi	58 - 68
560	GCHW/LMNT//CB801/3/LBLEX2	L	6	77	38	0	5776 fghi	57 - 68
558	RT7015/2201	L	5	72	35	0	5650 ghi	52 - 66
568	LEAH/MBLE	L	6	72	48	0	5575 ghi	49 - 65
566	LBLEX2-2/BJ-1*F1//.../3/...	L	6	76	38	0	5488 hi	59 - 69
557	9881/331581//L201/3/TBNT	L	6	73	42	0	5147 i	46 - 63
C.V.			10.5	1.4	3.4	-	5.9	3.7-2.0

* L = Long grain.
** Subjective rating 1 to 9, where 1 = excellent, 9 = poor.
*** Numbers followed by the same letter are not significantly different (Duncan's MRT, P = 0.05).

Table 42. Agronomic and milling performance of 1994 preliminary yield test, Group IV, Rice Research Station, Crowley, LA.

1994 entry	Pedigree	Grain Type*	Seedling vigor**	Days to 50% heading	Plant height (in)	Lodging (%)	Yield*** (lb/A @ 12%)	Milling % (Whl-Tot)
600	KBNT	L	5	77	45	0	8162 a	62 - 69
584	NWBT/LMNT//TBNT/3/V7817	L	6	86	39	0	7424 b	60 - 68
594	MBLE/CB801	L	6	84	34	0	7265 bc	57 - 70
582	NWBT/LMNT//TBNT/3/V7817	L	6	84	40	0	7200 bcd	34 - 69
585	NWBT/LMNT//TBNT/3/V7817	L	6	84	38	0	7155 bcd	57 - 68
577	L201//TBNT/BLMT/3/KATY	L	5	75	46	0	7150 bcd	56 - 68
579	89CAY048//LMNT/NWBT	L	5	75	40	0	7041 bcde	59 - 67
598	LMNT*2/82CAY20//80CAY50/...	L	6	79	41	0	6996 bcdef	56 - 66
578	89CAY048//LMNT/NWBT	L	5	79	39	0	6888 b-g	58 - 67
586	NWBT/LMNT//TBNT/3/V7817	L	5	85	41	0	6787 b-g	50 - 66
576	20001-5/LMNT//JKSN	L	6	78	39	0	6695 c-h	54 - 66
596	MBLE/CB801	L	6	85	34	0	6603 c-i	62 - 69
593	V7817//82CAY82/LMNT	L	6	89	39	0	6528 d-j	57 - 67
580	89CAY048/LEAH	L	6	77	45	0	6472 e-j	65 - 73
595	MBLE/CB801	L	6	84	35	0	6434 e-j	61 - 69
583	NWBT/LMNT//TBNT/3/V7817	L	6	87	39	0	6351 fghij	54 - 68
581	7702008*2/LBLE//SLBL/LEAH	L	6	82	43	0	6336 fghij	57 - 67
599	CB801//80CAY50/LBLE	L	5	89	41	0	6251 ghij	39 - 68
590	CB801//82CAY21/LMNT	L	6	84	37	0	6067 hijk	64 - 71
587	NWBT/LMNT//TBNT/3/V7817	L	6	83	43	0	6020 hijk	29 - 65
588	NWBT/LMNT//TBNT/3/V7817	L	6	83	42	0	5933 ijk	29 - 66
597	CB801/L202	L	6	74	40	0	5856 jk	53 - 65
591	CB801//82CAY21/LMNT	L	5	84	36	0	5495 kl	68 - 72
592	CB801//82CAY21/LMNT	L	6	82	35	0	5431 kl	60 - 66
589	CB801//82CAY21/LMNT	L	5	89	37	0	5205 l	57 - 67
C.V.			8.8	1.0	3.2	-	4.3	12.7-2.2

* L = Long grain.
** Subjective rating 1 to 9, where 1 = excellent, 9 = poor.
*** Numbers followed by the same letter are not significantly different (Duncan's MRT, P = 0.05).

Table 43. Agronomic and milling performance of 1994 preliminary yield test, Group V, Rice Research Station, Crowley, LA.

1994 entry	Pedigree	Grain Type*	Seedling vigor**	Days to 50% heading	Plant height (in)	Lodging (%)	Yield*** (lb/A @ 12%)	Milling % (Whl-Tot)
620	2207/MBLE	L	5	76	38	0	7525 a	61 - 69
612	2207/GFMT	L	6	78	37	0	7165 ab	64 - 70
602	CB801//80CAY50/LBLE	L	5	75	42	0	7102 ab	60 - 68
621	2207/MBLE	L	6	73	35	0	7018 abc	60 - 68
611	2207/GFMT	L	6	78	36	0	7011 abc	65 - 70
610	2207/GFMT	L	6	78	38	0	6992 abcd	63 - 69
615	2207/GFMT	L	5	79	38	0	6921 abcd	57 - 68
623	2207/MBLE	L	5	72	39	0	6910 abcd	60 - 68
617	2207/GFMT	L	6	79	38	0	6904 abcd	65 - 71
607	2201//82CAY21/LMNT	L	5	77	38	0	6896 abcd	55 - 67
622	2207/MBLE	L	5	73	39	0	6739 bcde	63 - 69
618	2207/MBLE	L	5	77	38	0	6683 bcde	62 - 68
616	2207/GFMT	L	6	80	38	0	6619 bcde	65 - 71
603	L202//80CAY50/LBLE	L	5	78	38	0	6503 bcdef	61 - 69
606	V7817//LMNT*2/82CAY83	L	6	85	38	0	6497 bcdef	48 - 69
601	CB801//80CAY50/LBLE	L	5	89	38	0	6493 bcdef	45 - 66
619	2207/MBLE	L	6	76	35	0	6358 cdef	61 - 68
609	L202//LEAH/8003050	L	6	81	38	0	6315 cdef	54 - 66
614	2207/GFMT	L	5	78	38	0	6269 def	59 - 69
625	LCSN	L	6	79	38	0	6175 ef	53 - 66
613	2207/GFMT	L	6	76	39	0	6146 ef	58 - 68
608	L202//LEAH/8003050	L	6	79	39	0	6128 ef	60 - 70
624	2207/MBLE	L	5	75	36	0	6090 ef	61 - 69
604	V7817//LMNT*2/82CAY83	L	6	84	38	0	5810 f	65 - 71
605	V7817//LMNT*2/82CAY83	L	5	80	36	0	5796 f	59 - 68
C.V.			5.9	1.4	2.6	-	4.5	6.9-1.9

* L = Long grain.
** Subjective rating 1 to 9, where 1 = excellent, 9 = poor.
*** Numbers followed by the same letter are not significantly different (Duncan's MRT, P = 0.05).

Table 44. Agronomic and milling performance of 1994 preliminary yield test, Group VI, Rice Research Station, Crowley, LA.

1994 entry	Pedigree	Grain Type*	Seedling vigor**	Days to 50% heading	Plant height (in)	Lodging (%)	Yield*** (lb/A @ 12%)	Milling % (Whl-Tot)
636	7702008*2/LBLE//2207	L	5	79	39	0	7420 a	59 - 69
639	2207//2201/7402003	L	6	76	41	0	7346 ab	57 - 66
632	2207/MBLE	L	6	76	36	0	7335 abc	60 - 68
641	LCSN/CFRS	L	6	75	39	0	7120 abcd	55 - 68
627	2207/MBLE	L	6	77	34	0	7112 abcd	61 - 69
648	82CAY21//LMNT/LEAH/3/TTEP	L	6	84	36	0	7058 abcde	56 - 68
644	82CAY21//LMNT/LEAH/3/TBNT	L	6	84	37	0	7043 abcde	68 - 72
637	KATY//CI11048/LEAH	L	6	82	46	0	6983 abcde	64 - 73
647	TBNT//NWBT/LMNT	L	7	82	41	0	6678 abcdef	64 - 71
626	2207/MBLE	L	6	68	35	0	6584 bcdefg	42 - 70
642	LMNT/NWBT//82CAY21/LEAH	L	7	82	35	0	6566 bcdefg	54 - 68
631	2207/MBLE	L	6	74	36	0	6522 cdefg	62 - 69
629	2207/MBLE	L	6	72	34	0	6473 defg	53 - 70
645	82CAY21//LMNT/LEAH/3/TBNT	L	6	74	39	0	6410 defg	63 - 70
640	82CAY21//LMNT//L202	L	7	75	41	0	6353 defgh	52 - 65
635	7702008*2/LBLE//2207	L	5	82	40	0	6298 defgh	57 - 67
628	2207/MBLE	L	5	74	32	0	6282 efgh	61 - 69
634	2207/LMNT	L	6	83	32	0	6106 fghi	63 - 70
630	2207/MBLE	L	5	73	34	0	6087 fghi	64 - 71
649	TBNT//LMNT*2/CR1113	L	7	80	38	0	6068 fghi	63 - 70
646	LMNT//NWBT/LMNT	L	6	82	38	0	5811 ghi	50 - 67
638	2207/NWBT	L	5	74	38	0	5575 hij	43 - 64
633	2207/LMNT	L	5	82	39	0	5483 ij	56 - 66
643	LMNT/NWBT//TBNT	L	6	82	39	0	5223 j	43 - 65
650	RSMT	L	6	72	37	0	3366 k	37 - 58
C.V.			8.7	0.9	2.4	-	5.3	11.8-1.7

* L = Long grain.
** Subjective rating 1 to 9, where 1 = excellent, 9 = poor.
*** Numbers followed by the same letter are not significantly different (Duncan's MRT, P = 0.05).

Table 45. Agronomic and milling performance of 1994 preliminary yield test, Group VII, Rice Research Station, Crowley, LA.

1994 entry	Pedigree	Grain Type*	Seedling vigor**	Days to 50% heading	Plant height (in)	Lodging (%)	Yield*** (lb/A @ 12%)	Milling % (Whl-Tot)
672	2031/LBLE SC-5	L	6	76	43	0	7770 a	53 - 64
673	2031/LBLE SC-5	L	4	74	39	0	7185 ab	60 - 68
868	20001-5/LMNT//L202/LMNT	L	6	80	51	0	7183 ab	63 - 70
671	LMNT/20001-5//GFMT	L	6	81	48	0	7173 ab	61 - 67
666	20001-5/LMNT//L202/LMNT	L	5	83	41	0	7098 ab	54 - 66
664	2207//2201/7402003	L	6	79	44	0	7028 b	64 - 70
667	20001-5/LMNT//L202/LMNT	L	5	82	40	0	6797 bc	53 - 66
670	2207//20001-5/LMNT	L	5	79	48	0	6712 bcd	59 - 68
669	20001-5/LMNT//JKSN	L	6	76	47	0	6599 bcde	57 - 68
652	NWBT/LMNT//TBNT/3/LMNT*2/...	L	6	80	40	0	6522 bcdef	58 - 68
653	82CAY21/LMNT//GFMT	L	6	76	41	0	6504 bcdefg	61 - 69
662	82CAY21/LMNT//L202	L	6	73	36	0	6303 cdefgh	60 - 68
675	KATY	L	4	80	48	0	6239 cdefgh	66 - 71
659	LMNT//82CAY21/LMNT	L	5	83	38	0	6185 cdefgh	45 - 70
660	RXMT//80Y50/LBLE	L	6	82	35	0	6150 cdefgh	39 - 66
661	RXMT//80Y50/LBLE	L	7	80	35	0	6032 defghi	47 - 64
654	LEAH/MBLE	L	5	85	42	0	5946 efghi	59 - 69
657	LEAH/MBLE	L	7	81	37	0	5931 efghi	39 - 67
665	GFMT/KATY	L	6	82	34	0	5854 fghi	64 - 72
655	LEAH/MBLE	L	6	73	41	0	5794 ghij	53 - 64
656	LEAH/MBLE	L	6	82	38	0	5665 hij	59 - 67
663	NWBT/LMNT//82CAY21/LMNT	L	6	81	37	0	5428 ij	41 - 67
658	2207//LEAH/7802010	L	5	79	41	0	5381 ij	42 - 67
651	LBLE/MBLE	L	5	69	39	0	5118 jk	64 - 69
674	20001-5/LMNT//KATY	L	6	75	45	0	4681 k	50 - 63
C.V.			9.1	1.4	2.8	-	4.7	17.9-2.1

* L = Long grain.
** Subjective rating 1 to 9, where 1 = excellent, 9 = poor.
*** Numbers followed by the same letter are not significantly different (Duncan's MRT, P = 0.05).

Table 46. Agronomic end milling performance of 1994 preliminary yield test, Group VIII, Rice Research Station, Crowley, LA.

1994 entry	Pedigree	Grain Type*	Seedling vigor**	Days to 50% heading	Plant height (in)	Lodging (%)	Yield*** (lb/A @ 12%)	Milling % (Whl-Tot)
692	SMARS/MARS//MARS/3/2214	M	5	80	41	0	8412 a	58 - 72
682	MBLE//LMNT/20001-5	L	5	72	44	0	8274 ab	63 - 69
696	89Y485/RICO	M	4	74	48	35	8058 abc	64 - 71
697	ORIN/4/M101/MARS/3/NTAI//...	M	5	78	45	0	7922 abcd	67 - 73
689	2214/RICO1	M	5	76	48	0	7829 abcde	57 - 73
687	2214/RICO1	M	4	74	46	10	7808 a-f	50 - 71
695	MERC/RICO//2214	M	5	76	43	0	7745 a-f	63 - 71
698	ORIN/89Y246	M	5	77	46	0	7535 b-g	60 - 71
699	ORIN/89Y246	M	4	77	47	0	7485 b-h	65 - 70
685	82CAY21/LMNT//KATY...	L	6	78	40	0	7286 c-i	58 - 68
688	2214/RICO1	M	5	77	44	0	7244 c-j	56 - 70
680	L202/TBNT//L202/LMNT	L	4	85	47	0	7123 d-j	61 - 70
693	SMARS/MARS//MARS/3/2214	M	4	77	43	0	7003 e-j	64 - 72
664	LMNT/3/BP87/9902//...	L	6	80	37	0	6966 fghij	48 - 70
686	RICO1/2*MERC	M	5	76	42	0	6862 ghij	55 - 68
679	L202/TBNT//L202/LMNT	L	5	75	41	0	6835 ghij	50 - 66
677	LMNT*2/CR1113//3072	L	5	75	47	0	6753 ghijk	58 - 68
691	SMARS/MARS//MARS/3/2214	M	4	80	40	0	6650 hijkl	62 - 71
676	LMNT*2/CR1113//3072	L	4	79	46	0	6514 ijkl	53 - 65
700	LMNT/LBLE SC-5	L	5	67	36	0	6414 jkl	59 - 70
681	L202/LMNT//LMNT*2/CR1113/...	L	5	80	39	0	5931 kl	49 - 62
690	2214/RICO1	M	5	79	42	0	5873 l	47 - 68
678	L202/TBNT//L202/LMNT	L	4	80	42	0	4803 m	53 - 65
683	MBLE//LMNT/20001-5	L	6	74	43	0	4574 m	38 - 60
C.V.			10.9	1.0	3.1	-	5.1	13.3-2.5

* L = Long grain; M = Medium grain.
** Subjective rating 1 to 9, where 1 = excellent, 9 = poor.
*** Numbers followed by the same letter are not significantly different (Duncan's MRT, P = 0.05).

Table 47. Agronomic and milling performance of 1994 preliminary yield test, Group IX, Rice Research Station, Crowley, LA.

1994 entry	Pedigree	Grain Type*	Seedling vigor**	Days to 50% heading	Plant height (in)	Lodging (%)	Yield*** (lb/A @ 12%)	Milling % (Whl-Tot)
721	V4916/NTAI	M	6	78	43	0	7988 a	64 - 69
722	V4916/NTAI	M	5	81	47	90	7960 a	59 - 63
719	PCOS/MERC	M	6	80	38	0	7501 ab	59 - 72
715	MARS/M201//MARS/3/MERC/RICO	M	5	76	41	0	7447 abc	64 - 68
708	MERC/LMNT//MERC/4/M101/...	M	5	77	41	0	7027 bcd	64 - 68
714	MERC/LMNT//MERC/3/2214	M	5	81	42	0	6987 bcd	67 - 71
709	LMNT/MERC//MERC/4/M101/...	M	5	76	39	0	6910 bcde	65 - 69
717	MARS/M201//MARS/3/SMARS/...	M	5	79	37	0	6885 bcde	54 - 71
712	LMNT/MERC//MERC/4/M101/...	M	5	77	39	0	6856 bcde	65 - 68
723	V4916/NTAI	M	4	81	49	90	6850 bcde	62 - 67
716	MARS/M201//MARS/3/SMARS/...	M	5	80	40	0	6841 bcde	43 - 68
710	LMNT/MERC//MERC/4/M101/...	M	5	77	40	0	6841 bcde	64 - 68
703	MERC/LMNT//MERC/4/M101/...	M	5	76	37	0	6686 bcde	65 - 69
704	MERC/LMNT//MERC/4/M101/...	M	6	77	40	0	6657 cde	65 - 70
711	LMNT/MERC//MERC/4/M101/...	M	6	77	38	0	6608 de	56 - 68
718	MARS/M201//MARS/3/SMARS/...	M	5	81	40	0	6569 de	58 - 68
707	MERC/LMNT//MERC/4/M101/...	M	5	76	40	0	6363 def	61 - 67
705	MERC/LMNT//MERC/4/M101/...	M	6	78	40	0	6144 efg	40 - 70
713	MERC/LMNT//MERC/3/2214	M	5	76	42	0	6084 efg	59 - 66
724	MARS/M201//2*MARS	M	5	77	46	45	5757 fgh	59 - 67
706	MERC/LMNT//MERC/4/M101/...	M	6	76	36	0	5694 fgh	59 - 66
720	STRN/3/MARS/M201//MARS	M	5	76	40	0	5662 fgh	62 - 67
701	MERC/LMNT//MERC/4/M101/...	M	5	75	40	0	5547 gh	59 - 67
725	BNGL	M	4	76	38	0	5515 gh	56 - 65
702	MERC/LMNT//MERC/4/M101/...	M	6	75	39	0	5178 h	60 - 66
C.V.			10.4	1.2	2.3	--	5.2	14.8-2.1

* M = Medium grain.
** Subjective rating 1 to 9, where 1 = excellent, 9 = poor.
*** Numbers followed by the same letter are not significantly different (Duncan's MRT, P = 0.05).

Table 48 Agronomic and milling performance of 1994 preliminary yield test, Group X, Rice Research Station, Crowley, LA.

1994 entry	Pedigree	Grain Type*	Seedling vigor**	Days to 50% heading	Plant height (in)	Lodging (%)	Yield*** (lb/A @ 12%)	Milling % (Whl-Tot)
741	2214/RICO1	M	6	78	39	0	8936 e	60 - 72
735	MERC/RICO1	M	5	75	42	0	8105 b	70 - 72
733	MERC/RICO1	M	5	74	47	0	7991 bc	64 - 70
734	MERC/RICO1	M	6	74	43	0	7901 bc	69 - 72
748	90RICOX2(20KR)	M	6	75	44	30	7790 bcd	60 - 73
739	2214/RICO1	M	6	81	44	0	7621 bcd	56 - 69
743	2214/RICO1	M	6	78	39	0	7590 bcd	63 - 71
750	ORIN	M	5	77	44	0	7424 bcd	59 - 71
729	MARS/M201//2*MARS	M	5	78	39	0	7407 bcd	63 - 70
738	2214/RICO1	M	6	81	43	0	7355 bcd	67 - 73
740	2214/RICO1	M	5	76	46	0	7214 cd	60 - 70
737	2214/RICO1	M	5	77	38	0	7160 cd	69 - 71
730	MARS/M201//2*MARS	M	5	77	41	0	7148 cd	50 - 69
728	MARS/M201//2*MARS	M	5	78	38	0	6933 de	65 - 69
742	2214/RICO1	M	5	80	40	0	6921 de	64 - 71
736	MARS/M201//MARS/3/MERC	M	6	78	37	0	6918 de	62 - 71
746	MERC/2214	M	5	76	39	0	6905 de	53 - 71
745	MERC/2214	M	5	75	41	0	6292 ef	62 - 68
731	MARS/M201//2*MARS	M	5	76	37	0	6028 f	43 - 67
727	MARS/M201//2*MARS	M	5	76	47	0	5995 f	49 - 69
749	M203//MERC/RICO	M	5	69	39	0	5930 f	61 - 67
732	MARS/MERC	M	5	76	40	0	5634 f	61 - 68
726	MARS/M201//2*MARS	M	4	76	39	0	5500 f	58 - 66
747	MERC/3/SMARS/MARS//MARS	M	5	80	35	0	5487 f	60 - 71
744	MERC/2214	M	5	77	36	0	5459 f	59 - 66
C.V.			9.4	1.3	2.9	--	5.3	13.4-2.1

* M = Medium grain.
** Subjective rating 1 to 9, where 1 = excellent, 9 = poor.
*** Numbers followed by the same letter are not significantly different (Duncan's MRT, P = 0.05).

Table 49. Agronomic and milling performance of 1994 preliminary yield test, Group XI, Rice Research Station, Crowley, LA.

1994 entry	Pedigree	Grain Type*	Seedling vigor**	Days to 50% heading	Plant height (in)	Lodging (%)	Yield*** (lb/A @ 12%)	Milling % (Whl-Tot)
771	BNGL/RICO1	M	5	78	48	0	9064 a	56 - 70
763	RICO1/V4716	M	5	77	45	5	8324 ab	66 - 72
752	RICO/MERC	M	5	76	43	0	8043 bc	69 - 73
764	RICO1/V4716	M	5	77	45	10	8007 bcd	69 - 71
770	SMARS/MARS//PCOS	M	5	72	38	0	7966 bcde	67 - 69
775	RICO	M	6	81	49	25	7846 bcdef	59 - 72
757	V4916/MARS	M	4	75	36	0	7791 bcdef	62 - 67
769	MERC/KOSHIHIKARI//MERC	M	5	75	43	5	7761 bcdef	57 - 68
751	RICO/MERC	M	6	76	47	5	7585 bcdefg	67 - 73
755	RICO//82CAY21/LMNT	M	6	77	43	0	7554 bcdefg	48 - 71
753	RICO/MERC	M	5	80	37	0	7487 bcdefg	61 - 72
766	RICO1/MERC	M	6	75	39	0	7453 bcdefg	70 - 74
768	MERC/KOSHIHIKARI//MERC	M	5	75	41	5	7370 bcdefg	60 - 68
756	V4916/MARS	M	5	76	39	0	7317 cdefg	59 - 68
754	RICO/MERC	M	5	80	37	0	7254 cdefg	66 - 73
761	1711X2/MARS//MERC	M	6	73	42	40	7233 cdefg	69 - 72
772	BNGL/RICO1	M	4	76	41	0	7207 cdefg	60 - 66
773	MERC/RICO//BNGL	M	5	74	47	25	7056 defgh	50 - 71
774	RICO/89Y458	M	5	73	45	0	7011 efgh	63 - 69
762	MERC/GCHW	M	6	89	43	0	6894 fgh	57 - 66
765	RICO1/MERC	M	6	75	39	0	6773 gh	67 - 75
760	NTAI/NVDF//M401/3/MERC	M	6	78	37	0	6199 hi	64 - 70
759	MERC//MERC/GUICHOW	M	5	80	37	0	5900 i	52 - 71
767	RADIATED MERC/MERC	M	6	75	38	0	5505 ij	61 - 68
758	RADIATED MERC/MERC	M	5	75	35	0	4919 j	58 - 67
C.V.			13.1	1.3	3.9	--	5.5	9.6-1.5

* M = Medium grain.
** Subjective rating 1 to 9, where 1 = excellent, 9 = poor.
*** Numbers followed by the same letter are not significantly different (Duncan's MRT, P = 0.05).

Table 50. Agronomic and milling performance of 1994 preliminary yield test, Group XII, Rice Research Station, Crowley, LA.

1994 entry	Pedigree	Grain Type*	Seedling vigor**	Days to 50% heading	Plant height (in)	Lodging (%)	Yield*** (lb/A @ 12%)	Milling % (Whl-Tot)
776	SMARS/MARS//MARS/3/RICO	M	4	76	37	0	8318 a	64 - 70
782	SMARS/MARS//MARS/3/RICO	M	6	80	49	0	7991 ab	48 - 69
781	SMARS/MARS//MARS/3/RICO	M	6	82	44	0	7906 abc	47 - 69
760	SMARS/MARS//MARS/3/RICO	M	5	80	45	0	7826 abc	48 - 69
779	SMARS/MARS//MARS/3/RICO	M	6	80	46	0	7754 abcd	55 - 70
789	ORIN//MERC/RICO	M	4	76	41	0	7700 abcde	59 - 67
796	V4718/4/M101/MARS/3/NTAI/...	M	4	76	44	0	7580 abcde	81 - 67
787	ORIN//MERC/RICO	M	5	76	45	0	7486 abcde	64 - 68
794	ORIN/3/SMARS/MARS//MARS	M	5	77	48	0	7474 abcde	65 - 70
793	ORIN/3/SMARS/MARS//MARS	M	4	79	44	0	7325 bcde	58 - 72
778	SMARS/MARS//MARS/3/RICO	M	5	77	44	0	7301 bcdef	53 - 69
786	MARS/M201//MARS/3/SMARS/...	M	5	80	41	0	7075 bcdef	58 - 70
788	ORIN//MERC/RICO	M	5	78	47	0	7073 bcdef	47 - 70
795	ORIN/3/SMARS/MARS//MARS	M	4	79	47	0	7058 bcdef	67 - 71
791	MERC/LMNT//MERC/3/2214	M	5	79	39	0	7028 cdef	63 - 69
790	STRN//MERC/RICO	M	5	76	41	0	7017 cdef	60 - 66
784	MARS/M201//MARS/3/MERC/...	M	5	80	50	0	7001 cdef	55 - 66
777	SMARS/MARS//MARS/3/RICO	M	6	81	38	0	6856 def	60 - 68
783	M203//MERC/RICO	M	6	72	45	0	6768 ef	60 - 69
797	MERC/RICO/4/MARS/M201//...	M	5	76	41	0	6380 fg	55 - 67
792	MERC/LMNT//MERC/3/2214	M	4	75	44	0	5934 gh	61 - 68
785	LMNT/MERC//MERC/3/2214	M	5	77	38	0	5525 h	48 - 70
798	MERC/RICO/4/MARS/M201//...	M	5	76	40	0	5388 hi	48 - 62
800	AKIT	S	7	67	43	90	5388 i	67 - 73
799	MERC/RICO/4/MARS/M201//...	M	4	77	39	0	4569 i	45 - 62
C.V			12.9	1.2	4.0	--	5.6	10.0-2.3

* M = Medium grain; S = Short grain.
** Subjective rating 1 to 9, where 1 = excellent, 9 = poor.
*** Numbers followed by the same letter are not significantly different (Duncan's MRT, P = 0.05).

Table 51. Agronomic and milling performance of 1994 preliminary yield test, Group XIII, Rice Research Station, Crowley, LA.

1994 entry	Pedigree	Grain Type*	Seedling vigor**	Days to 50% heading	Plant height (in)	Lodging (%)	Yield*** (lb/A @ 12%)	Milling % (Whl-Tot)
807	STRN/MERC/RICO/4/MARS/...	M	5	81	44	0	8237 a	62 - 67
823	MERC/CAM9/MARS (9202795)	M	5	75	42	0	7800 ab	66 - 72
817	RICO/MERC	M	7	75	48	0	7715 ab	64 - 70
806	STRN/MERC/RICO/4/MARS/...	M	6	79	39	0	7695 abc	58 - 65
808	STRN/MERC/RICO/4/MARS/...	M	5	81	44	0	7506 abcd	60 - 66
818	MERC/RICO (92URN025)	M	5	75	42	0	7382 bcde	64 - 73
811	ORIN//MERC/RICO	M	6	77	38	0	7313 bcde	65 - 71
809	ORIN//MERC/RICO	M	5	76	47	35	7173 bcdef	65 - 72
813	ORIN//MERC/RICO	M	5	81	37	0	7047 bcdef	52 - 69
819	MARS/M201/MARS (92URN051)	M	5	81	41	0	6919 cdef	51 - 70
810	ORIN//MERC/RICO	M	5	76	45	0	6918 cdef	65 - 70
816	SMARS/MARS//MARS/3/STRN	M	5	82	40	0	6836 def	56 - 68
820	MARS/M201/MARS (92URN051)	M	6	81	40	0	6833 def	61 - 69
821	MARS/M201/MARS (92URN051)	M	5	80	40	0	6826 def	62 - 69
804	MERC/RICO/4/MARS/M201//...	M	5	76	38	0	6670 efg	63 - 69
805	STRN/MERC/RICO/4/MARS/...	M	4	76	46	0	6657 efg	56 - 66
822	MERC//401/NTAI (9202778)	M	5	68	43	20	6602 efg	65 - 70
815	LMNT/MERC/MERC/4/M101/...	M	5	75	38	0	6429 fgh	57 - 68
814	LMNT/MERC/MERC/4/M101/...	M	5	75	39	0	6422 fgh	43 - 69
812	ORIN//MERC/RICO	M	4	75	40	0	6379 fgh	58 - 65
802	MERC/RICO/4/MARS/M201//...	M	5	75	41	0	6363 fgh	52 - 66
824	2214/4/MARS/M201//MARS/3/...	M	5	77	38	0	5920 ghi	58 - 67
825	LGRU	L	5	74	45	0	5767 hi	37 - 62
801	MERC/RICO/4/MARS/M201//...	M	5	75	39	0	5420 i	46 - 68
803	MERC/RICO/4/MARS/M201//...	M	5	74	39	0	4343 j	55 - 65
C.V.			10.2	0.8	3.0	--	4.9	13.4-2.3

* L = Long grain; M = Medium grain.

** Subjective rating 1 to 9, where 1 = excellent, 9 = poor.

*** Numbers followed by the same letter are not significantly different (Duncan's MRT, P = 0.05).

Table 52. Agronomic and milling performance of 1994 preliminary yield test, Group XIV, special purpose entries. Rice Research Station, Crowley, LA.

1994 entry	Pedigree	Grain Type*	Seedling vigor**	Days to 50% heading	Plant height (in)	Lodging (%)	Yield*** (lb/A @ 12%)	Milling % (Whl-Tot)
835	A301/JSMN	L	5	84	47	0	6584 a	48 - 69
827	LMNT/DLLA//82CAY2/LMNT	L	5	73	43	0	6533 ab	54 - 68
845	A301/JSMN	L	6	88	47	0	6212 abc	52 - 70
848	A301/JSMN	L	5	86	47	0	5948 abcd	59 - 69
849	A301/JSMN	L	5	85	46	0	5933 abcd	59 - 89
838	MERC//DLLA//MERC	M	5	75	40	0	5843 bcde	61 - 67
828	DLLA//82CAY21/LMNT	L	4	71	42	0	5817 bcde	49 - 67
833	LEAH/DLLA	L	5	81	46	0	5673 cdef	55 - 70
843	82CAY21/LEAH//TORO2	L	4	82	43	0	5639 cdef	56 - 69
848	A301/JSMN	L	6	87	45	0	5608 cdef	50 - 70
850	DLMT	L	5	79	36	0	5339 defg	44 - 65
837	A301/JSMN	L	5	84	47	0	5322 defg	58 - 69
841	TORO2/A301	L	5	85	46	0	5294 defg	43 - 64
834	A301/JSMN	L	5	91	47	0	5278 defg	44 - 66
840	LMNT/DLLA//L202	L	5	72	42	0	5136 efg	51 - 66
832	82CAY21/LMNT//DLLA	L	5	84	39	0	4953 fgh	49 - 65
839	MERC//DLLA//MERC	M	5	74	41	0	4744 ghi	51 - 62
831	BNGL/CM101	M	5	70	40	0	4672 ghij	52 - 70
844	A301/JSMN	L	5	92	44	0	4412 hij	47 - 64
836	A301/JSMN	L	5	80	36	0	4359 hij	60 - 89
830	BNGL/CM101	M	6	67	37	0	4202 ijkl	55 - 64
842	82CAY21/LMNT//DLLA	L	5	71	37	0	4088 ijkl	52 - 64
829	A301/LBNTX2	L	6	77	34	0	3992 jkl	48 - 68
847	A301/JSMN	L	5	89	46	0	3647 kl	55 - 67
826	MERC/DLLA//MERC	M	4	73	38	0	3602 l	44 - 60
C.V.			11.5	1.1	3.6	-	6.1	9.0-2.1

* L = Long grain; M = Medium grain.
** Subjective rating 1 to 9, where 1 = excellent, 9 = poor.
*** Numbers followed by the same letter are not significantly different (Duncan's MRT, P = 0.05).

Table 53. Agronomic and milling performance of 1994 preliminary yield test, Group XV, special purpose entries. Rice Research Station, Crowley, LA.

1994 entry	Pedigree	Grain Type*	Seedling vigor**	Days to 50% heading	Plant height (in)	Lodging (%)	Yield*** (lb/A @ 12%)	Milling % (Whl-Tot)
868	A301/JSMN	L	6	88	44	0	7634 a	49 - 64
865	A301/TORO2	L	5	82	48	0	6540 b	48 - 68
854	A301/JSMN	L	5	82	44	0	6022 bc	49 - 69
869	MERC/DLLA/MERC	M	5	78	39	0	5964 bcd	63 - 68
855	A301/JSMN	L	5	89	46	0	5934 bcd	40 - 69
858	A301/JSMN	L	5	85	45	0	5913 bcde	40 - 67
867	A301/JSMN	L	6	84	49	0	5782 cdef	54 - 67
864	A301/TORO2	L	6	81	51	0	5707 cdefg	55 - 67
873	DMSI/DLLAX2//A301	L	7	81	45	0	5622 cdefg	43 - 68
868	DMSI/DLLAX2//LMNT	L	5	88	42	0	5565 cdefgh	43 - 66
857	MERC//DLLA/MERC	M	4	72	40	0	5502 cdefgh	62 - 68
851	CPRS/ESD	L	5	62	34	0	5244 defghi	59 - 69
870	2214/CM101	M	6	74	34	0	5159 efghi	56 - 73
874	A301/JSMN	L	5	82	42	0	5135 fghij	45 - 67
656	2207/E. LONG SD	L	5	85	33	0	5062 fghij	41 - 71
852	DMSI/DLLAX2//A301	L	6	75	41	0	4973 ghij	52 - 67
872	62CAY21/LMNT//DLLA	L	6	73	39	0	4819 hij	54 - 66
871	BNGL/2*LMNT	M	5	81	41	0	4685 ijk	59 - 68
859	2207/E. LONG SD	L	5	82	33	0	4647 ijk	54 - 69
853	A301/DLLA	L	5	80	36	0	4643 ijk	56 - 70
863	BNGL/CM101	M	5	67	35	0	4561 ijk	29 - 68
861	BNGL/CM101	M	8	77	42	0	4382 jk	51 - 70
860	82CAY21/LMNT//DLLA	L	5	77	36	0	3987 kl	45 - 64
862	BNGL/CM101	M	7	72	38	0	3612 l	33 - 61
C.V			8.3	0.9	2.9	-	6.0	13.2-2.7

* L = Long grain; M = Medium grain.
** Subjective rating 1 to 9, where 1 = excellent, 9 = poor.
*** Numbers followed by the same letter are not significantly different (Duncan's MRT, P = 0.05).

Table 54. Agronomic and milling performance of 1994 preliminary yield test, Group XVI, special purpose entries. Rice Research Station, Crowley, LA.

1994 entry	Pedigree	Grain Type*	Seedling vigor**	Days to 50% heading	Plant height (in)	Lodging (%)	Yield*** (lb/A @ 12%)	Milling % (Whl-Tot)
900	JSMN	L	4	89	45	0	8167 a	55 - 67
885	JSMN/3/82CAY21//LMNT/...	L	5	86	39	0	7900 ab	47 - 70
880	JSMN/TORO2	L	5	84	44	0	7599 abc	52 - 65
881	JSMN/TORO2	L	5	87	41	0	7507 abc	47 - 65
888	V7713/JSMN	L	5	75	33	0	7221 abcd	55 - 69
876	JSMN/DLLA	L	5	90	42	0	7103 abcde	54 - 68
877	TORO2/JSMN	L	6	91	35	0	6738 a-f	53 - 68
878	JASMINE/TRO2	L	5	79	41	0	6529 a-f	59 - 71
879	LEAH/DLLA	L	5	84	47	0	6326 a-g	61 - 70
891	A301/JSMN(16.3-6-7)	L	5	83	46	0	6292 a-g	60 - 71
883	A301/JSMN	L	6	82	42	0	6271 a-g	51 - 67
890	A301/JSMN(16.3-6-7)	L	5	83	48	0	6192 b-g	57 - 70
887	JSMN/3/83CAY21//LMNT/...	L	7	82	37	0	6084 b-h	50 - 65
882	TORO2/JSMN	L	5	82	38	0	5806 c-i	53 - 67
896	DMSI//LMNT/NWBT/3/LMNT/...	L	5	73	44	0	5750 c-i	55 - 68
893	DMSI//LMNT/NWBT/3/LMNT/...	L	5	74	45	0	5652 c-i	63 - 70
897	DMSI/DLLAX2//LMNT/DLLA	L	5	80	48	0	5629 c-i	54 - 69
894	DMSI//LMNT/NWBT/3/LMNT/...	L	7	77	43	0	5344 d-i	43 - 70
886	JSMN/3/82CAY21//LMNT/...	L	5	98	38	0	5131 efghi	54 - 65
899	DLLA	L	4	83	55	0	5007 fghi	56 - 67
895	DMSI/203//TTEP/4*LMNT/3/...	L	6	74	40	0	4543 ghi	39 - 66
898	DMSI/L202	L	5	73	43	0	4528 ghi	60 - 72
892	V7713/JSMN	L	4	91	35	0	4507 ghi	54 - 68
889	A301/JSMN(16.3-6-7)	L	6	86	44	0	4154 hi	52 - 67
884	JSMN/3/82CAY21//LMNT/...	L	6	84	34	0	3888 i	38 - 55
C.V.			8.4	1.1	3.4	-	13.5	5.6-2.9

* L = Long grain.
** Subjective rating 1 to 9, where 1 = excellent, 9 = poor.
*** Numbers followed by the same letter are not significantly different (Duncan's MRT, P = 0.05).

Experiment: Preliminary Yield Test Entries 901-940

Location: Rice Research Station

Seeding Rate/Date: 100 lb/A, May 19, 1994

Planting Method: Drill-seeded

Fertilization: 17-52-52 lb/A (N-P_2O_5-K_2O), May 18; 92 lb N/A, June 12;

Plot Size: 4.66 x 16 ft (74.5 ft^2)

Water Management: Flood, June 12; harvest drainage, Sept 14

Herbicides: Stam (propanil) 4 lb ai/A, June 11

Insecticides: Furadan (carbofuran) .5 lb ai/A, June 21

Harvest: Sept 27

Experimental Design: Randomized complete block with two replications

Results: Tables 55-56

Table 55. Agronomic and milling performance of 1994 preliminary yield test, Group XVII, anther culture and Puerto Rico entries. Rice Research Station, Crowley, LA.

1994 entry	Pedigree	Grain Type*	Seedling vigor**	Days to 50% heading	Plant height (in)	Lodging (%)	Yield*** (lb/A @ 12%)	Milling % (Whl-Tot)
925	KBNT	L	4	86	40	0	7676 a	63 - 69
914	STRN//MERC/RICO	M	5	93	36	0	6522 b	59 - 65
924	CPRS	L	4	91	38	0	6115 bc	61 - 69
913	STRN//MERC/RICO	M	5	93	37	0	5949 bcd	57 - 64
901	RICO1/2*MERC	M	6	90	38	0	5763 bcde	61 - 70
909	MERC/ORIN	M	5	84	35	0	5694 bcdef	62 - 69
916	MARS/M201//MARS/3/MERC/RICO	M	6	90	37	0	5640 bcdef	59 - 65
910	ORIN/4/M101/MARS/3/NTAI//...	M	6	88	32	0	5489 cdefg	63 - 70
906	ALAN/L202	L	6	85	35	0	5454 cdefg	49 - 60
907	ALAN/L202	L	6	86	35	0	5390 cdefg	47 - 60
918	MARS/M201//MARS/3/MERC/RICO	M	7	90	40	0	5384 cdefg	62 - 66
905	ALAN/L202	L	5	83	37	0	5361 cdefg	50 - 62
917	MARS/M201//MARS/3/MERC/RICO	M	5	91	41	0	5330 cdefg	59 - 67
908	MERC/ORIN	M	5	84	42	0	5243 cdefg	61 - 67
922	MARS/M201/MARS/3/SMARS/...	M	6	90	37	0	5222 cdefg	54 - 65
919	MARS/M201//MARS/3/MERC/RICO	M	7	90	37	0	5220 cdefg	59 - 64
921	MARS/M201//MARS/3/MERC/RICO	M	8	89	36	0	5042 defgh	62 - 67
911	LMNT//20001-5/LMNT	L	6	91	38	0	4977 defgh	58 - 70
915	MARS/M201//MARS/3/MERC/RICO	M	6	92	40	0	4969 defgh	57 - 68
923	ORIN//MERC/RICO	M	7	88	40	0	4830 efgh	56 - 64
912	LMNT//20001-5/LMNT	L	7	99	41	0	4698 efgh	45 - 62
904	ALAN/L202	L	6	87	34	0	4623 fgh	53 - 64
920	MARS/M201//MARS/3/MERC/RICO	M	7	91	35	0	4536 gh	55 - 65
903	ALAN/L202	L	6	84	33	0	4171 hi	20 - 61
902	ALAN/TBNT	L	5	77	41	0	3584 i	27 - 61
C.V.			10.9	1.6	2.8	-	8.2	3.4-0.7

* L = Long grain; M = Medium grain.
** Subjective rating 1 to 9, where 1 = excellent, 9 = poor.
*** Numbers followed by the same letter are not significantly different (Duncan's MRT, P = 0.05).

Table 56. Agronomic and milling performance of 1994 preliminary yield test, Group XVIII, special purpose entries. Rice Research Station, Crowley, LA.

1994 entry	Pedigree	Grain Type*	Seedling vigor**	Days to 50% heading	Plant height (in)	Lodging (%)	Yield*** (lb/A @ 12%)	Milling % (Whl-Tot)
937	92R6671-RED BRAN	L	4	94	47	0	7067 a	52 - 62
935	9217217-RED BRAN	L	4	95	41	0	6755 ab	52 - 65
936	9217227-RED BRAN	L	4	97	42	0	6194 abc	49 - 63
934	DMSI/L202	L	5	96	47	0	5716 bcd	53 - 61
932	DMSI/L202	L	3	96	43	0	5510 bcde	50 - 58
938	DLLA/2214(#2)	M	6	90	37	0	5449 cde	54 - 63
933	DMSI/L202	L	5	96	49	0	4835 def	48 - 64
931	DMSI/DLLAX2//LMNT/DLLA/3/...	L	6	88	46	0	4561 defg	41 - 61
927	DMSI/203//TTEP/4*LMNT/3/...	L	8	93	40	0	4278 efg	42 - 67
928	DMSI//LMNT/NWBT/3/...	L	6	90	40	0	3969 fg	42 - 63
929	DMSI/203//TTEP/4*LMNT/3/...	L	7	93	40	0	3709 fgh	25 - 70
940	KASTURI	L	7	101	56	0	3545 fgh	56 - 66
939	DLLA/BNGL(#2)	M	8	96	39	0	3502 gh	50 - 61
926	DMSI//LMNT/NWBT/3/LMNT/...	L	6	85	45	0	3366 gh	36 - 70
930	SDRI/MBLE	L	5	101	50	0	2567 h	46 - 66
C.V.			10.7	1.9	4.1	-	11.6	23.8-2.5

* L = Long grain; M = Medium grain.
** Subjective rating 1 to 9, where 1 = excellent, 9 = poor.
*** Numbers followed by the same letter are not significantly different (Duncan's MRT, P = 0.05).

Experiment: Non-replicated Preliminary Yield Test (Entries 1-150)

Location: Rice Research Station

Seeding Rate/Date: 100 lb/A, April 29, 1994

Planting Method: Drill-seeded

Fertilization: 14-42-42 lb/A (N-P_2O_5-K_2O) Apr 29; 92 lb N/A, May 21; 21 lb N/A, June 17; 21 lb N/A, June 27

Plot Size: 4.66 x 16 ft (74.5 ft^2)

Water Management: Flood, May 23; harvest drainage, Aug 3

Herbicides: Ordram (molinate) 3 lb ai/A, May 24;
Londax (bensulfuron) 1 oz ai/A, June 1

Insecticides: Furadan (carbofuran) .5 lb ai/A, June 8

Harvest: Sept 1

Experimental Design: Single plot test

Results: Table 57.

Table 57. Agronomic and milling performance of 1994 non-replicated preliminary yield test (entries 1-150). Rice Research Station, Crowley, LA.

Plot	Pedigree	Seedling vigor*	Days to 50% heading	Plant height (in)	Lodging (%)	Yield (lb/A @ 12%)	Milling %** (Whl-Tol)
50	KBNT	4	77	46	0	7743	66 - 70
55	LMNT//20001-5/LMNT	5	76	43	0	7233	65 - 70
43	ORIN/89Y246	5	81	44	0	7228	63 - 70
45	ORIN/89Y246	5	79	45	0	7194	66 - 71
92	2207/MBLE	6	80	39	0	7186	60 - 68
132	2207//2201/7402003	6	77	40	0	7177	59 - 68
149	LMNT//82CAY21/LMNT	6	80	39	0	7094	65 - 70
109	KATY//CI11048/LEAH	5	76	44	90	6991	51 - 71
146	2201/3/82CAY21//TTEP/...	5	84	43	0	6982	63 - 70
93	2207/MBLE	5	75	39	0	6864	62 - 70
120	ORIN	5	80	43	0	6829	64 - 69
112	MERC/RICO1	5	77	46	0	6814	63 - 69
145	V4916/MARS	5	76	43	0	6810	63 - 70
95	2207/MBLE	5	77	37	0	6732	65 - 72
40	CFRS	4	80	38	0	6716	58 - 67
39	2207//82CAY21/TBNT	4	70	41	0	6685	58 - 70
102	7702008*2/LBLE//2207	5	77	38	0	6520	60 - 70
101	7702008*2/LBLE//2207	5	77	39	0	6509	60 - 69
105	MARS/M201//2*MARS	4	80	38	0	6493	62 - 69
77	LMNT*2/82CAY20//80CAY...	5	80	42	0	6479	55 - 66
80	KATY	4	82	47	0	6434	65 - 70
68	NWBT/LMNT//TBNT/3/V7817	6	85	34	0	6432	47 - 61
127	MERC/3/SMARS/MARS//MARS	5	80	47	0	6406	66 - 71
98	2207/MBLE	6	69	36	0	6403	60 - 71
116	2207/NWBT	6	81	33	0	6390	60 - 68
133	82CAY21/LMNT//TTEP/4*LMNT	5	81	41	0	6379	58 - 67
147	2201/3/82CAY21//TTEP/...	5	82	37	0	6367	55 - 66
94	2207/MBLE	5	69	39	0	6351	62 - 70
44	ORIN/89Y246	9	82	49	0	6344	63 - 70
48	L202/LMNT//LMNT*2/...	6	77	39	0	6323	54 - 68
96	2207/MBLE	6	82	33	0	6279	59 - 67
134	82CAY21/LMNT//L202	5	81	40	0	6207	56 - 66
53	LMNT/MERC//MERC/4/M101	5	79	37	0	6191	64 - 68
143	LMNT*2/82CAY83//LEAH	6	82	36	0	6178	60 - 71
137	M203//MERC/RICO	5	81	41	0	6175	56 - 70
135	NWBT/LMNT//82CAY21/LMNT	6	75	39	0	6159	71 - 74
148	2201/3/82CAY21//TTEP/...	6	83	36	0	6157	62 - 72
107	MARS/M201//2*MARS	5	82	36	0	6142	62 - 70
91	2207/MBLE	6	74	36	0	6132	62 - 72
150	AB869	5	75	43	0	6132	64 - 67
130	RICO 1	5	83	46	0	6128	59 - 71
47	L202/LMNT//LMNT*2/CR1113	5	77	39	0	6127	58 - 69
142	LMNT*2/82CAY83//LEAH	6	79	37	0	6106	54 - 65
86	LMNT//LMNT*2/82CAY83	5	77	38	0	6020	64 - 72
139	SKBT//LMNT*2/CR1113	6	84	36	0	6017	58 - 68
141	EMERC/STRNX2(E)	6	79	39	0	6003	70 - 73
78	LMNT*2/82CAY20//80CAY...	5	82	43	0	5995	50 - 64
138	SC33-LMNT	5	83	40	0	5941	63 - 70
54	LMNT/MERC//MERC/4/M101	5	79	37	0	5898	61 - 67
61	LBNT/L201/3/NWBT/LMNT/...	6	80	33	0	5881	60 - 71
136	LMNT/3/82CAY21//LMNT/...	5	78	37	0	5879	62 - 71
115	2207//CI11048/LEAH	5	80	38	0	5865	55 - 70
63	GFMT/KATY	5	83	34	0	5862	68 - 72
52	MERC/LMNT//MERC/4/M101	6	80	38	0	5853	64 - 72
42	82CAY21/LMNT//ALAN	4	74	39	0	5842	54 - 66
108	KATY//CI11048/LEAH	5	80	45	90	5838	57 - 72
88	2207/GFMT	6	82	35	0	5832	60 - 69
83	LMNT R2/L202	5	79	36	0	5820	57 - 68
103	MARS/M201//2*MARS	4	80	45	0	5812	61 - 66
64	L201/3/9881/331581//...	5	82	37	0	5809	53 - 65
100	9202071	5	69	37	0	5805	60 - 71
46	L202/LMNT//LMNT*2/...	5	80	39	0	5797	57 - 69

Continued.

Table 57. Continued.

Plot	Pedigree	Seedling vigor*	Days to 50% heading	Plant height (in)	Lodging (%)	Yield (lb/A @ 12%)	Milling %** (Whl-Tol)
122	MERC/3/SMARS/MARS//MARS	5	81	40	0	5784	59 - 66
81	L202//80CAY50/LBLE	5	81	38	0	5767	49 - 66
140	MARS	4	80	44	0	5756	55 - 63
56	PCOS/MERC	5	77	39	0	5749	60 - 68
97	2207/MBLE	6	75	34	0	5713	54 - 67
66	NWBT/LMNT//TBNT/3/V7817	5	88	38	0	5671	39 - 63
124	MERC/3/SMARS/MARS//MARS	5	75	40	0	5616	57 - 66
49	MERC/LMNT//MERC/4/M101	5	77	37	0	5609	56 - 69
114	82CAY21//LMNT/LEAH/3/...	6	82	40	0	5603	54 - 68
38	MERC/3/SMARS/MARS//MARS	3	79	37	0	5599	58 - 67
110	BNGL	4	80	39	0	5590	56 - 64
62	L202/MBLE	6	80	31	0	5554	61 - 70
76	SLBL/LEAH//LMNT*2/82CAY21	6	88	42	0	5548	38 - 58
82	LMNT R2/L202	6	76	33	0	5534	60 - 68
126	MERC/3/SMARS/MARS//MARS	5	80	46	0	5527	59 - 66
87	L202//LEAH/8003050	5	83	34	0	5525	56 - 69
104	MARS/M201//2*MARS	5	80	34	0	5524	62 - 70
90	LGRU	4	77	46	0	5522	44 - 66
65	7702008*2/LBLE//LMNT*2	4	82	38	0	5508	52 - 67
69	NWBT/LMNT//TBNT/3/V7817	5	87	36	0	5496	52 - 67
128	MERC/3/SMARS/MARS//MARS	5	80	42	0	5467	62 - 69
73	LMNT*2/800190//SLBL/...	5	81	43	0	5458	41 - 64
131	MERC/3/SMARS/MARS//MARS	6	79	40	0	5438	57 - 66
67	NWBT/LMNT//TBNT/3/V7817	5	89	38	0	5421	7 - 59
99	2207/LMNT	6	84	43	0	5384	53 - 64
121	MERC/2214	5	79	38	0	5365	54 - 68
60	LCSN	5	80	37	0	5355	49 - 65
51	MERC/LMNT//MERC/4/M101	6	77	37	0	5340	65 - 70
41	GCBW/LMNT//CB801/3/LMNT	5	80	41	0	5304	49 - 65
123	MERC/3/SMARS/MARS//MARS	5	81	43	0	5294	60 - 66
129	MERC/3/SMARS/MARS//MARS	4	81	42	0	5278	62 - 68
59	LMNT*2/CR1113//LBNT/...	6	83	39	0	5272	56 - 67
111	MERC/RICO1	4	77	39	0	5259	57 - 66
33	2207/NWBT//2207	5	80	39	0	5197	50 - 64
118	MARS/M201//MARS/3/MERC	5	80	39	0	5151	63 - 69
125	MERC/3/SMARS/MARS//MARS	6	82	39	0	5149	65 - 71
75	SLBL/LEAH//LMNT*2/82CAY21	6	81	41	0	5142	47 - 68
57	PCOS/MERC	5	80	36	0	5132	54 - 64
85	V7817//LMNT*2/82CAY83	5	89	38	0	5072	52 - 65
71	NWBT/LMNT//TBNT/3/V7817	5	85	35	0	5044	51 - 64
58	PCOS/MERC	5	75	37	0	4925	55 - 66
36	ALAN/L202	5	73	38	0	4924	49 - 66
119	ALAN/L202	5	75	37	0	4879	51 - 66
106	MARS/M201//2*MARS	5	79	37	0	4854	57 - 66
89	2207/GFMT	6	80	37	0	4804	56 - 68
113	MERC/3/MARS/M201//MARS	4	77	38	0	4761	60 - 68
84	LMNT R2/L202	5	75	38	0	4732	51 - 67
144	2207//LEAH/7802010	6	82	42	0	4695	64 - 88
34	ALAN/MBLE	4	73	43	0	4655	45 - 63
72	LMNT*2/800190//SLBL/...	6	90	47	0	4623	30 - 57
28	90Y686	3	83	39	0	4507	54 - 66
117	MARS/M201//MARS/3/MERC	5	77	38	0	4470	59 - 67
20	JODN	4	74	36	0	4426	47 - 64
30	JKSN	5	74	39	0	4424	. - .
37	ALAN/LMNT	5	78	39	0	4308	43 - 63
25	S301	5	67	40	0	4268	58 - 68
74	LMNT*2/800190//SLBL/...	6	87	44	0	4147	39 - 60
79	CB801//80CAY50/LBLE	5	82	38	0	4052	38 - 59
6	93Y198	5	67	39	0	3798	56 - 69
16	L202	4	72	37	0	3762	. - .
10	MBLE	4	67	38	0	3285	. - .
2	S201	5	74	38	0	3248	. - .

Continued.

Table 57. Continued.

Plot	Pedigree	Seedling vigor*	Days to 50% heading	Plant height (in)	Lodging (%)	Yield (lb/A @ 12%)	Milling %** (Whl-Tol)
1	CM101	4	70	39	0	3224	48 - 67
35	RT7015/L202	5	74	39	0	3200	. - .
5	93Y195	5	62	36	0	3049	47 - 68
3	91Y171	4	63	36	0	2612	. - .
8	M103	5	63	37	0	2448	. - .
31	M401	4	89	38	0	2352	. - .
13	92Y231	5	66	31	0	2295	. - .
15	92Y207	5	61	32	0	2133	. - .
29	93Y569	4	83	31	0	1797	. - .
22	93Y075	4	61	35	0	1697	. - .
70	RSMT	5	75	38	0	1508	. - .
12	M204	4	65	30	0	1187	. - .
21	93T312	4	65	30	0	1157	. - .
27	91Y581	3	65	36	0	1133	. - .
14	92Y260	5	63	31	0	1075	. - .
19	92Y328	4	64	28	0	1074	. - .
26	93Y657	5	69	34	0	1055	. - .
7	M303	5	63	35	0	1046	. - .
4	93Y023	5	68	36	0	894	. - .
9	M201	5	63	26	0	678	. - .
18	93Y308	5	64	28	0	553	. - .
23	91Y381	5	63	29	0	534	. - .
17	L203	4	67	38	0	496	. - .
11	M202	5	64	30	0	486	. - .
24	92Y624	5	65	31	0	.	. - .
32	92Y612	5	66	28	0	.	. - .

* Subjective reting, 1 to 9, where 1 = excellent, 9 = poor.
** No milling data available on some entries because of severe blast pressure.

Experiment: Non-replicated Preliminary Yield Test (Entries 151-315)

Location: Rice Research Station

Seeding Rate/Date: 100 lb/A, May 11, 1994

Planting Method: Drill-seeded

Fertilization: 14-42-42 lb/A (N-P_2O_5-K_2O) May 11; 92 lb N/A, June 6; 21 lb N/A, June 26

Plot Size: 4.66 x 16 ft (74.5 ft^2)

Water Management: Flush, May 13; flood, June 7; harvest drainage, Sept 1

Herbicides: Stam (propanil) 4 lb ai/A, May 19 and June 6

Insecticides: Furadan (carbofuran) .5 lb ai/A, June 20

Harvest: Sept 26

Experimental Design: Single plot test

Results: Table 58

Table 58. Agronomic and milling performance of 1994 non-replicated preliminary yield test (entries 151-315). Rice Research Station, Crowley, LA.

Plot	Pedigree	Seedling vigor*	Days to 50% heading	Plant height (in)	Lodging (%)	Yield (lb/A @ 12%)	Milling %** (Whl-Tol)
274	RED BRAN	5	93	39	0	8095	48 - 65
305	JSMN/3/82CAY21//LMNT/...	7	88	35	0	8049	58 - 68
169	SMARS/MARS//MARS/3/RICO	7	84	39	0	8026	60 - 66
159	BNGL/RICO1	6	77	34	0	7951	64 - 71
304	JSMN/3/82CAY21//LMNT/...	6	89	35	0	7771	59 - 68
236	DMSI/203//TTEP/RSMT	5	80	41	0	7754	62 - 70
222	8902031/LBLE SC-5//89...	6	78	43	0	7748	55 - 69
308	JSMN/3/82CAY21//LMNT/..	7	88	35	0	7553	55 - 65
196	ORIN/3/SMARS/MARS//MARS	4	78	36	0	7541	60 - 67
228	MERC/RICO (92URN025)	5	77	44	0	7473	64 - 72
174	JKSN/8902031	6	80	35	0	7426	60 - 70
220	KBNT	4	78	46	0	7374	51 - 71
154	MERC/BRAZ	6	77	39	0	7373	66 - 72
155	MERC/BRAZ	6	80	36	0	7347	59 - 70
201	MERC/RICO/4/MARS/M201...	5	80	37	0	7323	58 - 68
168	2207//2201/7402003	6	84	41	0	7288	59 - 68
276	JSMN/3/82CAY21//LMNT/...	6	94	39	0	7261	54 - 69
214	L202/TBNT//L202/LMNT	6	78	36	0	7198	63 - 71
234	V7713/JSMN -F4	6	91	42	0	7178	56 - 68
182	2214//MERC/RICO	5	78	42	0	7081	65 - 72
186	MARS/M201//MARS/3/SMARS	5	79	39	0	7004	62 - 68
218	ORIN//MERC/RICO	4	75	34	0	7000	58 - 65
284		5	91	43	0	6942	42 - 68
231	RICO/MERC (9202841)	6	89	43	0	6928	61 - 69
183	MARS/M201//MARS/3/SMARS	5	77	39	0	6913	61 - 68
187	MARS/M201//MARS/3/SMARS	7	79	39	0	6891	58 - 65
197	SMARS/MARS//MARS/3/LMNT	5	79	38	0	6867	54 - 68
189	MARS/M201//MARS/3/SMARS	6	84	39	0	6819	55 - 63
151	LMNT//82CAY21/LMNT	6	80	38	0	6813	59 - 68
210	CPRS	4	80	38	0	6752	60 - 69
164	2207//82CAY21/TBNT	5	83	39	0	6725	61 - 70
275	A301/JSMN	6	89	41	0	6694	62 - 68
211	STRN/MERC/RICO/4/MARS...	5	80	39	0	6690	37 - 67
216	L202/LMNT//LMNT*2/...	6	88	46	0	6685	59 - 67
167	2207//2201/7402003	5	84	40	0	6672	56 - 65
272	CPRS/ESD	5	91	43	0	6641	56 - 66
224	LMNT/MERC/MERC/4/M101...	6	80	42	0	6572	59 - 70
184	MARS/M201//MARS/3/SMARS	5	82	40	0	6571	61 - 67
165	2207//82CAY21/TBNT	6	80	41	0	6500	52 - 64
157	RICO/MERC	6	77	38	0	6495	56 - 70
173	2207/3/GCHW/LMNT//CB801	4	90	40	0	6486	56 - 65
217	LMNT/MERC//MERC/3/2214	5	84	39	0	6473	23 - 69
179	2214//MERC/RICO	7	77	42	0	6439	62 - 68
302	A301/3/DMSI/203//TTEP...	7	84	44	0	6427	42 - 68
215	L202/TBNT//L202/LMNT	7	83	40	0	6413	52 - 65
158	RICO/MERC	6	78	36	0	6343	65 - 70
185	MARS/M201//MARS/3/SMARS	4	78	40	0	6329	61 - 67
193	MERC/LMNT//MERC/3/2214	5	78	41	0	6298	22 - 68
213	STRN/MERC/RICO/4/MARS...	6	82	42	0	6294	46 - 64
190	JODN	5	77	39	0	6281	53 - 65
188	MARS/M201//MARS/3/SMARS	7	83	39	0	6273	58 - 64
175	MERC/LMNT//MERC/4/M101...	6	83	39	0	6270	59 - 66
278	2207/E. LONG SD	6	90	36	0	6270	55 - 67
223	LMNT/MERC/MERC/4/M101...	6	80	39	0	6260	55 - 68
163	MERC/BNGL	5	78	36	0	6227	58 - 66
266	A301/JSMN	5	82	42	0	6181	50 - 68
226	MBLE//LMNT/20001-5	5	73	44	50	6174	61 - 69
233	LMNT/3/82CAY21//LMNT/...	7	85	37	0	6157	53 - 66
191	MARS/M201//MARS/3/SMARS	6	83	39	0	6151	58 - 65
181	2214//MERC/RICO	5	76	39	0	6144	47 - 71
259	TORO2/A301	7	89	50	0	6133	40 - 65

Continued.

Table 58. Continued.

Plot	Pedigree	Seedling vigor*	Days to 50% heading	Plant height (in)	Lodging (%)	Yield (lb/A @ 12%)	Milling %** (Whl-Tol)
245	82CAY21/LEAH//TORO2	6	85	42	0	6128	55 - 65
172	2207/3/GCHW/LMNT//CB801	5	90	40	0	6115	50 - 67
299	A301/TORO2	6	85	43	0	6046	39 - 70
178	SMARS/MARS//MARS/3/MERC	6	78	39	0	6030	58 - 65
203	MERC/RICO/4/MARS/M201...	7	79	39	0	6023	48 - 66
219	ORIN//MERC/RICO	6	76	43	0	6022	60 - 66
225	LMNT/MERC/MERC/4/M101...	6	79	39	0	5980	51 - 69
227	SMARS/MARS//MARS/3/STRN	4	80	44	0	5969	58 - 68
265	DMSI//LMNT/NWBT/3/LMNT	4	80	45	0	5936	40 - 63
253	A301/JSMN	4	93	41	0	5922	45 - 70
176	MERC/ORIN	5	79	43	0	5905	63 - 69
241	TORO2/JSMN	5	91	37	0	5866	54 - 65
280	2085	6	82	39	0	5863	58 - 68
246	SKBT/TORO2	6	90	46	0	5862	52 - 66
287	V7713/JSMN	5	97	35	0	5832	47 - 63
261	A301/3/DMSI//DLLAX2//...	5	83	43	0	5820	44 - 66
283	MARS/CM101	7	89	40	0	5820	35 - 66
177	MERC/ORIN	6	83	44	0	5814	64 - 69
212	STRN/MERC/RICO/4/MARS...	5	80	46	0	5788	46 - 67
207	NWBT/LMNT//TBNT/4/LMNT	6	80	38	0	5784	53 - 66
314	DLLA/2214	5	80	36	0	5781	42 - 66
294	BNGL/CM101	7	77	43	0	5762	43 - 71
200	JKSN	5	80	44	0	5705	51 - 64
249	LMNT*2/CR1113//TORO2	5	80	45	0	5699	50 - 68
229	MARS/M201/MARS	5	83	39	0	5677	26 - 64
237	BNGL/CM101	6	71	36	0	5643	46 - 72
171	SMARS/MARS//MARS/3/RICO	6	85	42	0	5600	54 - 62
170	AKIT	6	73	34	90	5593	69 - 73
202	MERC/RICO/4/MARS/M201...	5	84	38	0	5582	60 - 66
232	2207/MBLE	7	73	34	0	5567	44 - 70
194	MERC/LMNT//MERC/3/2214	5	80	37	0	5531	36 - 66
289	M201/3/5242/UKN//RXRE...	6	77	44	0	5480	57 - 66
221	8902031/LBLE SC-5//...	6	79	37	0	5436	62 - 69
277	A301/JSMN	5	99	44	0	5391	46 - 67
238	BNGL/CM101	5	73	42	0	5388	1 - 67
208	NWBT/LMNT//TBNT/4/LMNT	5	82	41	0	5387	52 - 64
205	MERC/RICO/4/MARS/M201...	6	79	40	0	5381	53 - 64
209	NWBT/LMNT//TBNT/4/LMNT	4	80	40	0	5361	51 - 66
248	LMNT*2/CR1113//TORO2	6	83	40	0	5356	51 - 65
312	A301/JSMN...	6	85	46	0	5346	52 - 66
288	JSMN/MBLE	6	99	43	0	5303	58 - 68
199	MERC/RICO/4/MARS/M201...	6	83	37	0	5215	53 - 66
313	V7713/JSMN	5	99	39	0	5182	50 - 67
156	LMNT/NWBT//TBNT	6	88	38	0	5171	13 - 72
263	82CAY21/LMNT//DLLA	6	82	39	0	5135	48 - 68
306	JSMN/3/82CAY21//LMNT/...	8	94	37	0	5124	45 - 59
160	8902192	4	103	37	0	5044	62 - 68
256	NWBT/LEAH//DLLAX2	5	88	39	0	5010	52 - 63
300	9302987	6	73	39	0	5000	43 - 67
251	A301//LMNT/DLLA	6	82	41	0	4993	48 - 64
198	8303116/LMNT//MBLE	5	79	45	0	4985	49 - 62
311	A301/JSMN	6	84	48	60	4972	54 - 66
315	A301/LBNTX2	6	89	39	0	4964	54 - 66
273	A301/JSMN	5	96	41	0	4900	43 - 65
206	NWBT/LMNT//TBNT/4/LMNT	6	79	40	0	4892	13 - 65
301	DMSI/DLLAX2//LMNT	8	85	43	0	4855	31 - 62
262	A301/JSMN	5	91	39	0	4841	58 - 68
292	DMSI/DLLAX2//LMNT/DLLA	7	82	41	0	4797	53 - 63
243	LEAH/DLLA	4	79	46	30	4783	46 - 66
255	NWBT/LEAH//DLLAX2	5	91	39	0	4755	44 - 60
166	MERC/RICO//BNGL	6	76	43	0	4752	50 - 70
240	DLMT	5	82	36	0	4690	25 - 65

Continued.

Table 58. Continued.

Plot	Pedigree	Seedling vigor*	Days to 50% heading**	Plant height (in)	Lodging (%)	Yield** (lb/A @ 12%)	Milling %** (Whl-Tol)
270	JSMN	5	106	40	0	4674	54 - 65
297	BNGL/CM101	7	77	41	0	4662	25 - 64
258	TORO2/A301	6	90	51	80	4631	36 - 61
244	LEAH/DLLA	6	89	52	0	4617	37 - 63
204	MERC/RICO/4/MARS/M201...	6	80	39	0	4813	51 - 63
235	DMSI/DLLAX2//A301/L202	5	88	54	80	4611	39 - 87
162	MERC/BNGL	7	77	48	0	4554	59 - 68
230	LCSN	6	83	37	0	4469	25 - 62
152	MERC/PCOS//MERC	5	79	38	0	4440	54 - 65
260	CM101	7	76	39	0	4304	31 - 68
296	BNGL/CM101	6	72	36	0	4273	22 - 71
282	DMSI/203/TTEP/...	7	89	39	0	4194	38 - 65
242	DLLA//TTEP*4/LMNT	5	77	47	0	4162	48 - 66
192	20001-5/LMNT//L202/TBNT	6	79	40	0	4064	46 - 65
298	KOKAHUROSE/BNGL	5	96	51	0	4061	45 - 66
252	A301/JSMN	5	96	41	0	4042	46 - 64
254	DMSI/DLLAX2//A301	6	85	48	0	3997	11 - 63
267	DMSI/LLMNT/NWBT/3/LMNT	5	82	45	0	3975	27 - 62
295	BNGL/CM101	7	77	35	0	3972	39 - 66
161	MERC/BNGL	6	79	47	0	3917	47 - 66
269	JSMN/TORO2	5	105	39	0	3903	39 - 60
268	A301/JSMN	7	97	37	0	3895	57 - 69
309	A301/JSMN	6	88	48	0	3875	48 - 62
310	KASTURI	7	99	53	70	3861	59 - 68
153	MERC/AS3058	4	73	36	0	3755	47 - 60
307	JSMN/3/82CAY21//LMNT/...	6	94	36	0	3716	. - .
250	DLLA	5	83	51	80	3596	50 - 63
247	V7713/JSMN	5	104	34	0	3566	50 - 63
293	BNGL/CM101	7	80	37	0	3485	19 - 59
257	MERC//DLLA//MERC	6	75	40	0	3326	41 - 59
303	DMSI/DLLAX2//LMNT	6	85	42	0	3182	47 - 63
286	DMSI/DLLAX2//A301	7	91	33	0	3140	49 - 64
271	JSMN/TORO2	6	103	39	0	3092	41 - 62
195	MERC/LMNT//MERC/3/2214	5	80	38	0	3050	25 - 57
180	MBLE	4	69	41	0	3047	38 - 70
239	BNGL/CM101	5	70	37	0	2918	24 - 63
264	A301/JSMN	6	97	39	0	2908	47 - 68
285	BSMT	5	.	48	0	1305	. - .
291	RSMT/CM101//CPRS	7	85	34	0	1300	52 - 63
279	RED BRAN	5	104	39	0	1181	43 - 61
281	V7713/JSMN	6	.	34	0	.	49 - 65
290	BSMT 370	6	.	50	0	.	. - .

* Subjective rating, 1 = excellent, 9 = poor.
** Some variables not measured because of severe blast pressure.

Experiment: Non-replicated Preliminary Yield Test (Entries 316-385)

Location: Rice Research Station

Seeding Rate/Date: 100 lb/A, May 19, 1994

Planting Method: Drill-seeded

Fertilization: 17-52-52 lb/A (N-P_2O_5-K_2O), May 18; 92 lb N/A, June 12

Plot Size: 4.66 x 16 ft (74.5 ft^2)

Water Management: Flood, June 12; harvest drainage, Sept 14

Herbicides: Stam (propanil) 4 lb ai/A, June 11

Insecticides:

Harvest: Sept 27

Experimental Design: Single plot test

Results: Table 59

Table 59. Agronomic and milling performance of 1994 non-replicated preliminary yield test (entries 316-385). Rice Research Station, Crowley, LA.

Plot	Pedigree	Seedling vigor*	Days to 50% heading	Plant height (in)	Lodging (%)	Yield (lb/A @ 12%)	Milling % (Whl-Tol)
357	22D-WHITE	5	97	41	0	8027	63 - 69
361	LBLE X SC-33	7	97	39	0	6895	41 - 64
381	RICO	6	92	41	0	6683	64 - 70
343	24D-RED	3	92	47	0	6646	60 - 64
356	20D-WHITE	5	93	43	0	6294	65 - 69
355	LMNT X LBSC-5	5	96	42	0	6219	52 - 65
353	ORIN/4/M101/MARS/3/...	4	82	41	0	6175	63 - 67
360	JODN	4	87	38	0	6037	51 - 62
318	#2 DLLA/2214	4	86	39	0	5927	55 - 65
370	JKSN	4	86	41	0	5907	54 - 64
342	38D-WHITE-LONG	7	102	39	0	5889	61 - 69
320	DLMT	5	90	35	0	5875	56 - 66
346	JSMN/DLLA	6	94	44	0	5777	52 - 64
375	EMERC/STRNX2(E)	5	92	37	0	5721	30 - 68
362	SC-33 X LMNT	6	97	41	0	5651	51 - 62
378	2071	4	78	34	0	5538	42 - 70
338	DMSI/DLLAX2//LMNT/DLLA	5	90	42	0	5492	42 - 68
352	MERC/ORIN	4	85	36	0	5483	64 - 70
372	SC-5 X LMNT	7	94	41	0	5470	55 - 65
368	LMNT X SC-5	5	97	37	0	5337	50 - 64
380	MERC/RICO/4/M101/MARS...	5	87	44	0	5302	58 - 64
376	MERC/RICO/4/M101/MARS...	3	86	43	0	5224	61 - 66
339	DLLA/36MA MUTANT	5	87	44	0	5094	27 - 67
358	LBLE X SC-33	7	91	46	0	5001	61 - 67
377	LGRU	4	86	42	0	4989	39 - 60
364	SC-5 X LMNT	6	96	45	0	4968	51 - 61
315	A301/LBNTX2	6	89	39	0	4964	54 - 66
382	MARS	4	87	44	0	4917	61 - 67
383	AB869	4	82	38	0	4896	62 - 66
348	A301/BNGL	5	92	41	0	4854	63 - 71
373	24D-RED B *	6	97	47	0	4744	48 - 62
336	DMSI/DLLAX2//LMNT/DLLA	5	83	38	0	4731	56 - 67
340	2085	5	87	38	0	4727	61 - 69
366	SC-5 X LMNT	6	94	43	0	4719	58 - 66
379	BNGL	4	85	38	0	4672	60 - 67
317	KDM115	3	102	50	60	4598	33 - 56
371	LMNT X SC-5	7	103	40	40	4550	30 - 53
374	LBLE X SC-33	7	93	39	0	4443	56 - 63
365	SC-5 X LMNT	7	97	41	0	4435	51 - 63
335	SDRI/MBLE	4	88	54	90	4427	67 - 71
384	EMERC/STRNX2(E)	6	94	36	0	4406	63 - 68
359	LBLE X SC-33	7	90	46	0	4392	57 - 65
323	2214/CM101	6	86	36	0	4354	58 - 70
319	DMSI//LMNT/NWBT/3/LMNT	4	82	43	0	4304	50 - 70
325	2214/CM101	6	84	34	0	4183	54 - 71
330	DLLA	6	92	49	0	4137	56 - 67
329	2214/CM101	6	86	36	0	4118	60 - 70
316	KDM105	3	102	50	70	4093	40 - 60
385	AKIT	6	78	37	0	4088	70 - 73
332	DMSI/203//TTEP/4*LMNT...	6	89	40	0	4015	25 - 68
351	LCSN X2	4	91	37	0	3979	42 - 58
350	MBLE	4	81	34	0	3975	37 - 62
327	2214/CM101	6	84	38	0	3966	53 - 69
334	DMSI/203//TTEP/4*LMNT...	5	89	39	0	3910	31 - 69
322	DMSI//LMNT/NWBT/3/LMNT	6	85	39	0	3879	52 - 70
344	DMSI/203/TTEP 4*LMNT/...	6	90	45	0	3738	58 - 68
369	LMNT X SC-5	6	102	44	0	3713	31 - 54
363	SC-5 X LMNT	7	97	44	0	3607	57 - 66
321	DMSI//LMNT/NWBT/3/LMNT	7	90	42	0	3602	49 - 69
324	2214/CM101	6	84	37	0	3596	56 - 68
331	DMSI/203//TTEP/4*LMNT...	7	91	39	0	3593	37 - 67

Continued.

Table 59. Continued.

Plot	Pedigree	Seedling vigor*	Days to 50% heading	Plant height (in)	Lodging (%)	Yield (lb/A @ 12%)	Milling % (Whl-Tol)
341	24D-RED-LONG	4	97	40	0	3580	46 - 65
333	DMSI/203//TTEP/4*LMNT...	6	89	38	0	3474	33 - 66
367	SC-5 X LMNT	7	92	37	0	3318	55 - 65
345	3072/DLLA/3/DMSI/203	7	90	42	0	3309	59 - 69
349	LBNTX2/A301	7	94	38	0	3127	28 - 63
337	DMSI/DLLAX2//LMNT/DLLA	6	86	36	0	3124	58 - 70
347	Ø2 DLLA/BNGL	8	97	39	0	3040	49 - 63
354	LMNT//20001-5/LMNT	9	96	35	0	1947	59 - 68
328	2214/CM101	7	88	22	0	1777	33 - 68
326	2214/CM101	8	94	23	0	1164	. .**

* Subjective rating, 1 = excellent, 9 = poor.
** No milling data available because of severe blast pressure.

FIELD EVALUATION OF GENETICALLY ENGINEERED GLUFOSINATE-RESISTANT RICE LINES

S.D. Linscombe, P. Christou, F. Jodari, M.P. Braverman, and J.H. Oard

A study was conducted in 1994 to field evaluate rice lines that have been genetically engineered to contain the BAR gene, which imparts resistance to the broad spectrum herbicide glufosinate. This is a non-selective, contact herbicide that has activity on non-transformed rice, as well as on red rice and most other rice weeds. Since rice and red rice are very closely related genetically, no herbicide is currently available that will selectively control red rice in an established rice crop. Glufosinate is very efficacious on red rice and the concept this research is exploring could lead to the development of glufosinate-resistant rice varieties on which the herbicide could be used to selectively kill red rice (as well as other rice weeds) without damage to the commercial crop.

The genetic engineering was accomplished by Dr. Paul Christou with John Innes Center, Norwich England (formerly with Agracetus, Inc., Madison, WI). Glufosinate is an active ingredient of a registered product of AgrEvo.

The transgenic lines evaluated in the study were derived from Gulfmont (a semidwarf southern long grain variety) and Koshihikari (a Japanese premium quality short grain variety).

Experiment: Transgenic (glufosinate resistance) study

Location: Rice Research Station

Seeding Rate/Date: 100 lb/A, May 25, 1994

Planting Method: Drill seeded

Fertilization: 17-52-52 lb/A (N-P_2O_5-K_2O) preplant incorporated, May 24;
92 lb N/A, June 26

Plot Size: 4.66 x 12 ft (56 ft^2)

Water Management: Flushed, May 25; flooded, June 26; harvest drainage, Sept 16

Rice Lines: Transgenic Gulfmont derived lines

1. GFMT 517-1-R1
2. GFMT 517-2-R1
3. GFMT 517-3-R1
4. GFMT 517-5-R1
5. GFMT 517-7-R1
6. GFMT 526-1

Transgenic Koshihikari-derived lines

7. KOSH 495-1-R1
8. KOSH 495-1-R2
9. KOSH 496-1-R1
10. KOSH 496-1-R2
11. KOSH 496-2-R1
12. KOSH 496-3-R1
13. KOSH 496-3-R2
14. KOSH 496-4-R1
15. KOSH 496-4-R2

Non-transformed lines

16. Gulfmont
17. Koshihikari
18. Bengal
19. Cypress
20. Katy
21. Jodon
22. LA 10501-BK
23. LA 2192
24. Lemont

Herbicide Treatments: Glufosinate 1 lb ai/A and 2 lb ai/A; Control

Harvest: Sept 29

Experimental Design: Randomized complete block with a split-plot arrangement of treatments; main plots, herbicide treatments; split plots, rice lines.

Results: Table 1 compares the performance of the 24 lines where no glufosinate was applied. These data show that there were significant differences for the variables days to 50% heading, plant height, and yield. There were also significant differences between untransformed Gulfmont and some of the transformed Gulfmont lines for each of these variables. In addition, when comparing the untransformed Koshihikari lines to the transformed lines, there were significant differences for all three variables. These data do suggest that these lines may have some agronomic differences in addition to herbicide resistance.

Table 2 displays plant height at maturity of transgenic rice lines as affected by glufosinate rate of application. For some of the lines, plant height was significantly reduced by glufosinate treatment.

The effect of glufosinate levels on grain yields of the transgenic lines are shown in Table 3. Several of the lines had significantly lower grain yields at one or both of the glufosinate levels while some did not.

These data suggest that the transformed lines, when displaying resistance to glufosinate application, may be adversely affected by these applications. This suggests the need for additional field testing of these transgenic lines.

Table 1. Agronomic performance of transgenic and non-transgenic rice lines. No glufosinate herbicide treatment. Crowley, LA. 1994.

Entry	Days to 50% heading	Plant height	Yield
		-(in)-	(lb/A @ 12%)
GFMT 517-1-R1	89	35	4726
GFMT 517-2-R1	92	36	4284
GFMT 517-3-R1	90	35	4854
GFMT 517-5-R1	90	34	3488
GFMT 517-7-R1	91	38	4802
GFMT 526-1	91	34	4198
KOSH 495-1-R1	82	37	4547
KOSH 495-1-R2	81	36	4299
KOSH 496-1-R1	78	35	4618
KOSH 496-1-R2	79	35	5054
KOSH 496-2-R1	79	35	4623
KOSH 496-3-R1	78	35	3914
KOSH 496-3-R2	79	38	4326
KOSH 496-4-R1	78	34	4441
KOSH 496-4-R2	78	35	4521
Gulfmont	87	34	5464
Koshihikari	80	39	5793
LA 10501-BK	85	32	5958
Bengal	85	33	5223
Cypress	87	35	6483
Lemont	90	34	5678
Jodon	83	32	5986
LA 2192	86	35	9006
Katy	89	43	5296
CV	1.8	4.3	11.9
LSD	2	2	848

Table 2. Plant height of transgenic rice lines as affected by glufosinate herbicide. Crowley, LA. 1994.

Entry	Herbicide treatment (lb/A) 0	1	2
	(in)		
GFMT 517-1-R1	35	34	34
GFMT 517-2-R1	36	35	36
GFMT 517-3-R1	35	33	35
GFMT 517-5-R1	34	32	33
GFMT 517-7-R1	38	36	35
GFMT 526-1	34	34	34
KOSH 495-1-R1	37	37	36
KOSH 495-1-R2	36	36	37
KOSH 496-1-R1	35	33	30
KOSH 496-1-R2	35	31	31
KOSH 496-2-R1	35	35	33
KOSH 496-3-R1	35	34	33
KOSH 496-3-R2	38	34	33
KOSH 496-4-R1	34	31	32
KOSH 496-4-R2	35	33	31
CV	4.7		
LSD (0.05) among genotypes	2		
among herbicides	2		

Table 3. Grain yields of transgenic rice lines as affected by glufosinate herbicide. Crowley, LA. 1994.

Entry	Herbicide treatment (lb/A) 0	1	2
	----------(lb/A)----------		
GFMT 517-1-R1	4726	3496	3896
GFMT 517-2-R1	4284	3469	3707
GFMT 517-3-R1	4854	4014	4826
GFMT 517-5-R1	3488	2766	3569
GFMT 517-7-R1	4802	3869	3897
GFMT 526-1	4198	3226	3337
KOSH 495-1-R1	4547	4706	4056
KOSH 495-1-R2	4299	5153	4357
KOSH 496-1-R1	4618	3462	2823
KOSH 496-1-R2	5054	2443	2274
KOSH 496-2-R1	4623	4968	4217
KOSH 496-3-R1	3914	2903	2642
KOSH 496-3-R2	4326	3560	2606
KOSH 496-4-R1	4441	3762	3373
KOSH 496-4-R2	4521	3817	2650
CV	16.9		
LSD (0.05) among entry	906		
among herbicide level	1059		

EVALUATION AND SELECTION OF BLAST RESISTANT RICE LINES AND CULTIVARS

Y. Liu, S.D. Linscombe, D.E. Groth, and F. Jodari

The experiment was conducted at the Rice Research Station at Crowley. There were 624 accessions in the test, including 10 cultivars and 614 breeding lines. The breeding lines were primarily selections from F_3 and F_4 populations involving crosses of blast resistant x resistant, resistant x susceptible, or susceptible x susceptible parents.

Separate evaluations were conducted under both flooded and upland conditions. M-201, an extremely blast susceptible cultivar, was used as a source of blast infection (spreader) in both tests.

One tier of M-201 was seeded adjacent to the upland nursery 1 week prior to seeding the test lines. This test was seeded on May 9. Rows were approximately 18 inches and were separated by 4 inches. Cultivars (checks) were seeded in every twentieth row. The entire seeded area was then surrounded by M-201 to insure sufficient inoculum during the growing season.

The flooded nursery was seeded on May 11. The rows were 6 feet long with 10 inches between rows. A check cultivar was seeded in every twentieth row. The test area was surrounded by M-201 to serve as an inoculum source.

High levels of nitrogen fertilizer (150 lb/A) were applied to facilitate blast development in both tests. Lines were rated for both leaf and rotten neck blast using a 0-9 scale where higher numbers indicate higher levels of blast susceptibility.

The leaf blast rating scale was as follows: 0 = no evidence of infection, immune; 1 = small pinpoint brown lesions (type-1 lesion); 2 = larger, pinhead brown lesions, few with necrotic ashen centers (type-2 lesions), mixed with type-1; 3 = small round to slightly elongated necrotic ashen lesions with brown margins, 1-2 mm diameter (type-3 lesions), mixed with type-1 and type-2; 4 = like 3, but with development of a few spindle-shaped eyespot lesions with brown margins, 0.5-1 cm long, among type-1, -2, and -3 lesions; 5 = about 10% of the lesions are ashen eyespots with brown margins, 0.5-2 cm long (type-4 lesions), mixed with type-1, -2, and -3; 6 = between 5 and 7; 7 = 25-50% of the lesions are type-4, some not completely delineated with brown margins, usually mixed with type -1, -2, and -3 lesions; 8 = more than 50% type -4 lesions, some larger than 2 cm, many without complete brown margins, appearing water-soaked at the base, lesions completely coalesce, usually some type -1, -2, and -3 lesions; 9 = plants are killed.

A 0-9 scale estimating incidence of disease and a 0-9 scale estimating the degree of yield loss were used to evaluate neck blast. The criterion were as follows:

Scale	Incidence of Disease	Yield Loss
0	0	0
1	below 10%	below 10%
2	below 20%	below 20%
3	below 30%	below 30%
4	below 40%	below 40%
5	below 50%	below 50%
6	below 60%	below 60%
7	below 70%	below 70%
8	below 80%	below 80%
9	above 81%	above 81%

Leaf blast ratings were made 43 days after seedling emergence and neck blast ratings 25 to 30 days after heading on the upland test. Leaf blast ratings were made 42 days after seedling emergence, and neck blast 30 to 35 days after heading on the flooded test.

Most of the lines showed the same trend of blast susceptibility in both tests. Lines evaluated as resistant to leaf blast in the upland nursery also rated as resistant in the flooded nursery. In addition, lines rated as susceptible in the flooded nursery were also rated as susceptible in the upland nursery. Also, response to neck blast was similar for most lines in both nurseries. When leaf blast ratings for the two nurseries are compared, 49.7% of accessions rated no more than one rating point different, and 91.4% rated no more than two rating points different. When neck blast ratings are compared for the two nurseries, 76.4% of the accessions rated identically. Estimation of yield loss is more difficult; however, 64.9% of the lines rated no more than one rating point different when the two tests were compared (Table 1).

Table 1. Comparison of blast ratings from upland and flooded tests.

Rating	Same Rating Point	Difference of 1 Rating Point	Difference of 2 Rating Points	Difference of 3 Rating Points
Leaf blast	297	247	48	3
Neck blast	452	44	32	64
Yield loss	167	217	108	100

These data indicate the resistant lines are usually more susceptible to neck blast in the unflooded nursery.

Relation Between Leaf Blast and Neck Blast

Lines that are susceptible to leaf blast are susceptible to neck blast, and lines resistant to leaf blast are usually resistant or tolerant to neck blast. Lines that rate above 5 on leaf blast are typically highly susceptible to neck blast and yield loss. Three situations exist among lines that rate 0 to 2 for leaf blast; most are resistant to neck blast, some are tolerant, and some are susceptible. Most of the lines rated as a 3 for leaf blast are highly susceptible to neck blast; however, a few are either resistant or moderately resistant.

Resistant and Tolerant Lines and Cultivars

Based on response to leaf blast and neck blast, as well as agronomic characteristics, 39 experimental lines were selected for yield trials. A few of the selected lines displayed a high incidence of neck blast but may possess some tolerance as yield loss was low. Some highly resistant lines were not selected because of poor agronomic suitability. The selected lines were from the following populations:

KATY//8303116/LMNT
20001-5/LMNT//KATY
GFMT/KATY
KATY//CI11048/LEAH
NWBT/TQNG
M202/DLLA

The cultivar Katy was highly resistant to both leaf blast and neck blast in both nurseries. Kaybonnet was equally resistant to leaf blast but displayed somewhat more susceptibility to neck blast, than did Katy. However, Kaybonnet had very little yield loss associated with disease incidence.

This work demonstrates that the upland nursery can be very useful in screening lines for blast susceptibility as these results coincide very closely with those from the flood nursery. Therefore, the upland nursery is effective in evaluating and selecting lines for blast resistance in a rice breeding program.

In addition, this work shows that lines rated as susceptible (4 and above rating) in the leaf blast evaluation should be considered for elimination since they will be susceptible to neck blast. Lines rated as resistant (0-2) for leaf blast must be further evaluated for neck blast before decisions on selection or elimination are reached. Neck blast is usually more serious in the upland nursery than in the flooded nursery (especially for lines rated as resistant to leaf blast). Therefore, criterion for elimination in the upland nursery should not be overly severe.

This study also demonstrates that it is important to have a sufficient number of seedlings of each line in blast evaluation in the upland nursery. It is suggested that at least 20 plants are required for each line. If fewer seedlings are present, the ratings may not be as meaningful because of the influence on the micro environment.

STUDIES ON PARTICLE BOMBARDMENT OF THE BAR GENE INTO IMMATURE PANICLE CALLUS

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Q.J. Xie, T.P. Croughan, and F. Jodari

ABSTRACT

This work was conducted to establish the procedures for developing rice immature panicle-derived calli via particle bombardment-mediated DNA transformation. Exogenous plasmid pBSL 21 DNA, carrying the hyp. and bar genes, was transferred into calli from immature panicles of three rice cultivars (Cypress, Bengal, and Taipei 309) by Biolistic PDS-1000/He. After several cycles of selection in the presence of 50 ppm hygromycin B, 156 Cypress plants, 38 Bengal plants, and 49 Taipei 309 plants have been regenerated from hygromycin-resistant calli. Plant regeneration rates among the rice varieties were 7.73, 6.73, and 9.3%, respectively. Regenerated rice plants were selected for their herbicide resistance by dipping leaves into 1.66% (v/v) Ignite herbicide. The results showed that all rice plants were susceptible to the herbicide.

INTRODUCTION

Rice has been one of the most important crops in the world. Today, this food helps sustain two-thirds of the world's population. Thus, initial research has been focused on the improvement of rice through breeding, improved cultural practices, and more recently, genetic transformation methods.

Weeds can reduce the yield and quality of rice. Red rice, which is the same species as commercial rice (Hoagland and Paul, 1978), is a major weed species problem in the United States rice producing areas (Dunand, 1988). It is estimated that rice grain yield, grade, and quality reductions in commercial rice due to red rice cost producers millions of dollars annually (Eastin, 1978). No herbicide has been available that will selectively kill red rice without damaging the commercial crop.

Glufosinate (trade names are Finale, Ignite, Basta, and Liberty) is a non-selective, broad spectrum herbicide for the control of emerged weeds in non-crop areas. The active ingredient of glufosinate is phosphinothricin (PPT, 2-amino-4-[hydroxymethyl-phosphinoyl]-butyric acid). PPT, released by the action of peptidases on bialaphos, is a powerful inhibitor of glutamine synthetase (Thompson et al., 1987). The inhibition of glutamine synthetase leads to ammonia accumulation resulting in death of the plants (Tachibana et al., 1986). The bar gene, isolated from *Streptomyces hygroscopicus*, encodes for phosphinothricin acetyltransferase (PAT) that acetylates the free NH_2 group of PPT rendering it nontoxic (Murakami et al., 1986). Thus, it disrupts PPT inhibitory activity making the plant herbicide-resistant (DeBlock et al., 1987).

Transgenic herbicide-resistant rice plants have been obtained using exogenous DNA transfer methods, including via PEG-mediated transformation of protoplasts (Rathore et al., 1993); via microprojectile-mediated transformation of suspension culture cells (Cao et al., 1992); and via particle bombardment of immature embryos (Christou et al., 1991, 1992). The bar gene has been incorporated into the rice varieties Gulfmont and Koshihikari. Several of these lines were evaluated for yield potential and other agronomic variables in the field (Braverman and Linscombe, 1993). The results have shown great promise as the lines withstood 2x rates of Ignite. That is more than two times the rate normally necessary to kill red rice (Linscombe et al., 1993). This work will report the procedures for transformation experiments, to induce calli from immature panicles, to transfer the exogenous DNA into rice callus, and to select hygromycin-resistant callus in order to get regenerated rice plants and select for herbicide-resistant plants.

MATERIALS AND METHODS

Rice Callus Culture

Rice plants (Cypress, Bengal, and Taipei 309) were grown in the field and greenhouse at the Rice Research Station.

Immature Panicle Callus Culture

Rice shoots were collected at the boot stage when the tip of the flag leaf was 3 to 5 cm above the penultimate leaf collar. The immature panicles are 1 to 3 cm in length at this stage. All leaves were removed from harvested panicles except the top two (Cao et al., 1990; Croughan and Chu, 1991). Shoots were surface sterilized by soaking in bleach:water (1:1) for 30 min. and rinsed with sterile water three times. Immature panicles were aseptically removed from the stem. Panicles were cut into several spikelet pieces and plated onto the modified MS medium (Murashige and Skoog, 1962), code as MSI (4.3 g/L MS salts, 1 mg/L B1, 0.5 mg/L B6, 0.5 mg/L nicotinic acid, 100 mg/L Inositol, 2 mg/L glycine, supplemented with 4 mg/L 2,4-D, 30 g/L sucrose and 8 g/L sigma agar, pH 5.8), in 10-cm Petri dishes. Dishes were sealed with parafilm and incubated at 26.5°C ± 1°C for 1 to 2 weeks in the dark incubator.

Plasmid Vectors DNA

Plasmid pBSL 21, carries the hygromycin B and bar genes, which are controlled by 35S promoter and nos polyadenylation region. pBSL 21 plasmid DNA was supplied by Dr. J. Oard, Agronomy Department, LSU Agricultural Center.

Particle Bombardment Treatment

The protocol for particle bombardment was a modification of Biolistic PDS-1000/He. The Particle Delivery System (Bio-Rad Lab.) was supplied and guided by Dr. J. Oard, Dr. M.C. Rush, and Dr. Q.J. Xie.

Calli Selection and Plant Regeneration

Following the particle bombardment treatment, the treated calli were transferred into new medium and further propagated in MSI medium for 3 days in the dark incubator at 26.5°C ± 1°C. The calli were then transferred into MSI supplemented with 50 ppm hygromycin B. After 2 weeks of selection, the hygromycin-resistant callus was moved into new MSI with 50 ppm hygromycin B medium for an additional 2 weeks of selection. Then, each hygromycin-resistant callus was split into two parts, one part was transferred to MSR medium, which is modified MS medium supplemented with 2.8 mM IAA, 4.4 mM 6-Bp, 500 mg/L CH, 30 g/L sucrose, 8 g/L agar, and pH 5.8. It was then maintained at 26°C under daily cycles of 16 hr. light and 8 hr darkness. Subculture was repeated every 2 weeks. The second part was continually selected with the same hygromycin. After selecting one to four times, respectively, plantlets were then regenerated from hygromycin resistant calli on MSR medium. Plants were grown 3 to 5 cm tall and transplanted to the potted soil in the greenhouse.

Selection for Herbicide Resistance

Regenerated plants were tested for their herbicide resistance by dipping the apical 5 to 7 cm portion of a leaf into 1.66% (v/v) Ignite herbicide. The leaves were monitored daily for signs of damage.

RESULTS AND DISCUSSIONS

Rice Calli via Particle Bombardment Transformation

The Biolistic PDS-1000/He, used in this work, delivers a macrocarrier loaded with millions of microscopic gold or tungstern particle microcarriers, which have been coated with plasmid pBSL 21 DNA toward the target cells at high pressure helium velocity. The macrocarrier is halted after a short distance by a stopping screen, while microcarriers continue toward the target. The velocity of the microcarriers is sufficient to penetrate the rice callus cells.

The plasmid DNA amount moved into cells was found to be the most important parameters in Biolistic transformation. Thus, increasing the exogenous plasmid DNA amount on the macrocarrier and making double shots on target dish containing rice calli could raise the transformation rate effectively (Q.J. Xie, unpublished data).

Selection for Hygromycin Resistance

After Biolistic transformation, calli were transferred to selection medium, which was MSI supplemented with 50 ppm hygromycin B. Following selection with hygromycin one to four times, most of the calli stayed at the initial size, then turned dark brown or died; while a few of the calli plated grew vigorously. These surviving calli exhibited hygromycin resistance. Resistant calli were transferred to MS regeneration medium (MSR) with hygromycin B.

Rice Plant Regeneration from Hygromycin-Resistant Calli

Rice plants were regenerated from hygromycin-resistant calli on MSR medium under daily cycles of 16 hr of light and 8 hr of darkness for 6 to 8 weeks.

Table 1 is a summary of the regenerated plants obtained from two US rice cultivars, Cypress (long grain) and Bengal (medium grain), and one japonica rice variety Taipei 309 (medium grain). One hundred and fifty-six Cypress plants have been regenerated from calli via hygromycin selection at a plant regeneration rate of 7.73%, 38 Bengal plants have been obtained at a regeneration rate of 6.73%, and 49 Taipei 309 plants have been regenerated at a regeneration rate of 9.30%.

The differences of plant regeneration rates were also found in different ages of calli derived from immature panicles, the younger calli, the more plantlets regenerated (Table 2).

Selection for Herbicide Resistance

Regenerated rice plants with at least three true leaves were transplanted in the greenhouse. Plants at the 5- to 6-leaf stage were used for evaluating their resistance to Ignite herbicide using the leaf test methods as described before. The results of herbicide selection showed that the treated portion of the rice plant leaf exhibited different degrees of damage, leaves rolled and the plants finally died. Thus, all regenerated rice plants were susceptible to the herbicide.

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Table 1. Rice regeneration of callus via particle bombardment. Rice Research Station, Crowley, LA. 1994.

Rice varieties treated[1]	No. of calli plated	No. of hyg. selected	Calli regeneration					
			Morphogensis [2]		Green plants		Albino plants	
			No.	%	No.	%	No.	%
Cypress$_{(PB)}$	1087	1	256	23.55	148	13.62	3	0.27
	614	2	23	3.75	5	0.81	1	0.16
	251	3	10	3.98	3	1.19	0	0.00
	65	4	2	3.07	0	0.00	0	0.00
	2017	1-4	291	14.43	156	7.73	4	0.19
Bengal$_{(PB)}$	255	1	68	26.67	24	9.41	0	0.00
	191	2	25	13.09	13	6.81	0	0.00
	119	3	5	4.20	1	0.84	0	0.00
	565	1-3	98	17.35	38	6.73	0	0.00
Taipei 309$_{(PB)}$	84	1	7	8.33	0	0.00	0	0.00
	129	2	28	21.71	5	3.88	0	0.00
	227	3	62	27.31	43	18.94	0	0.00
	87	4	12	13.79	1	1.15	0	0.00
	527	1-4	109	20.68	49	9.30	0	0.00

[1] PB plasmid pBSL 21 DNA carried hyp. and bar gene.
[2] Defined as any visible differentiation, including green plants and albino plants.

Table 2. Rice regeneration of different age calli via particle bombardment. Rice Research Station, Crowley, LA. 1994.

Rice varieties treated	Age of calli (days)[1]	No. of calli plated	No. of hyg. selected	Calli regeneration					
				Morphogensis		Green plants		Albino plants	
				No.	%	No.	%	No.	%
Cypress	<45	1520	1-4	278	18.29	152	10.0	4	0.26
	>45	497	1-4	13	2.61	4	0.8	0	0.00
Bengal	<45	335	1-3	87	25.97	32	9.55	0	0.00
	>45	230	1-3	11	4.78	6	2.61	0	0.00
Taipei 309	<45	386	1-4	101	26.16	47	12.18	0	0.00
	>45	141	1-4	8	5.67	2	1.42	0	0.00

[1] Days from the day of immature panicle culture to the day of transfer into regeneration medium

TOLERANCE OF RICE VARIETIES AND EXPERIMENTAL LINES TO RICE HERBICIDES

D.E. Sanders, S.D. Linscombe, F. Jodari, and K.F. Carriere

Some of the newer rice varieties have displayed susceptibility to damage from some labelled and developmental rice herbicides. These studies were designed to provide information on which rice line/herbicide combinations may display sufficient phytotoxicity, delay in maturity, and/or yield reduction to warrant non-recommendation.

Experiment: Herbicide Tolerance Study

Location: Rice Research Station

Seeding Rate/Date: 150 lb/A, Apr 27, 1994

Planting Method: Water seeded (pre-germinated seed)

Fertilization: 14-42-42 (lb/A N-P_2O_5-K_2O) preplant incorporated, Apr 26; 92 lb N/A, June 7

Plot Size: 4.66 x 12 ft (56 ft^2)

Water Management: Flooded, Apr 26; drained, Apr 30; reflood, June 7; harvest drainage, Aug 20

Rice Lines: Jodon, Cypress, Bengal, Dellrose, Kaybonnet, LaGrue, LA 2071, LA 2008, LA 2168, and Adair

Herbicide Treatments:

1. Propanil 4 lb ai/A post (preflood) (Stam 4 EC)
2. Propanil 2.25 lb ai/A + Molinate 2.25 lb ai/A post (preflood) (Arrosolo 6 EC)
3. Quinclorac .38 lb ai/A post (preflood) (Facet 50 WP)
4. Fenoxyprop .06 lb ai/A post (preflood) (Whip 360)

5. Propanil 4 lb ai/A + Triclopyr .38 lb ai/A post (preflood) (Stam 4 EC + Grandstand 3 L)

6. Propanil 4 lb ai/A + pendimethalin 1.0 lb ai/A post (preflood) (Stam 4 EC + Prowl 3.3 EC)

7. Propanil (4 lb ai/A + bensulfuron .037 lb ai/A post (preflood) (Stam 4 EC + Londax 60 DF)

8. Control (weed free)

Harvest: Sept 3

Experimental Design: Randomized complete block with a factorial arrangement of treatments (rice lines x herbicides), three replications

Results: Table 1

Table 1. Effect of herbicide treatments on grain yield of rice varieties. Rice Research Station, Crowley, LA. 1994.

Herbicide treatment	Jodon	Cypress	Bengal	Dellrose	Kaybonnet	LaGrue	LA 2071	LA 2008	LA 2168	Adair	Mean
Propanil	6412	6402	5565	5347	8512	6527	5650	6847	5347	6200	6281
Arrosolo	6324	7254	5291	5452	8810	6248	5983	7887	5642	6538	6543
Facet	6558	6776	5499	5432	8391	6446	6156	7797	5998	6806	6586
Whip	6178	6751	5742	5050	8364	6205	5691	7096	5623	6797	6350
Propanil + Grandstand	6189	6504	5326	5621	8242	6499	6277	8056	5749	6438	6490
Propanil + Prowl	6846	7555	5637	5782	8431	5949	6204	8320	6195	6518	6743
Propanil + Londax	7352	7037	5367	5548	8250	6449	6115	8433	5990	6802	6734
Control	6377	7106	5210	5650	8968	6577	6210	8577	6303	6523	6750
Mean	6529	6923	5455	5485	8495	6363	6036	7877	5856	6578	

CV = 6.15
LSD (.05) = 652

MULTIPLE GENERATION RICE BREEDING NURSERY[1,2]

S.D. Linscombe, F. Jodari, and L. Aviles

A winter nursery facility is an important feature of a rice breeding program. The nursery allows the production of additional generations of breeding material per year, thus, decreasing the amount of time required to develop new varieties.

The agricultural experiment stations of Arkansas, Louisiana, Texas, and Puerto Rico have a cooperative agreement to operate a year-round rice nursery on the University of Puerto Rico Experiment Station located at Lajas for the purpose of advancement, selection, and seed increase of breeding lines. This cooperative venture facilitates efficient utilization of the nursery area, equipment, and labor and is allowing these breeding programs to grow a large number of breeding lines to expedite the development and release of improved rice varieties for the southern U.S. rice growing area.

1994 Activities

A nursery planted in September 1993 was harvested in January 1994. This nursery contained 4,500 rows and included F_2 bulk populations, advanced panicle rows, and purification and increase rows. A January nursery was planted (4,500 rows) and included turnover material from the previous nursery and some additional lines from the Rice Research Station. The nursery was harvested in May and the seed returned to Crowley and planted in late May at the Rice Research Station.

The fall 1994 nursery was planted on September 14. The nursery contained 4,500 rows and included primarily F_2 populations. The nursery was harvested in early January 1995, and the spring nursery was planted on January 17.

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[1] Cooperative investigators, Louisiana Agricultural Experiment Station, Crowley, LA; University of Puerto Rico Agricultural Experiment Station, Lajas, PR; Texas Agricultural Experiment Station and USDA-ARS, Beaumont, TX; and Arkansas Agricultural Experiment Station, Stuttgart, AR.

[2] This research is supported in part by funding provided by rice producers through the Louisiana Rice Research Board.

DEVELOPMENT OF SHEATH BLIGHT RESISTANT GERMPLASM AND MALE STERILE LINES FOR WIDE CROSSES[1]

J.H. Oard, D.E. Groth, S.D. Linscombe, and M.C. Rush

The Rice Genetics project located at the LSU Agricultural Center, Department of Agronomy, is carried out under LAES Project 2971 and works in close cooperation with researchers at the Rice Research Station and the LSU Baton Rouge Campus. The objectives of this project are as follows:

1. Develop sheath blight resistant germplasm by introgression from the wild rice *Oryza rufipogon*.
2. Transfer and evaluate male sterile pollinator traits from California material to adapted Louisiana lines as tools for population development.
3. Develop protocols for efficient transfer of cloned genes of agronomic importance to Louisiana cultivars.

Objective 1: Sheath blight resistant germplasm

In 1994, 464 F_3 and 21 backcrossed lines developed from wide crosses (*Oryza rufipogon*) were evaluated for resistance to sheath blight (causal agent *Rhizoctonia solani*) in inoculated field plots at Crowley. Good inoculation of the plots were due to good canopy development and thick stands within each row. This was made possible primarily due to shortening of the row length to 3 feet, instead of the "standard" 6-foot length. In addition, the cultivar Cypress was used as the standard susceptible check in the plots instead of Lemont or Lacassine. In our plots, stand establishment of these last two cultivars is not consistent from year to year.

The genetic material was inoculated in the mid-tillering stage with a purified field isolate of *R. solani*. Approximately 45 days after inoculation and scoring of genetic material, over 95% of the material showed high infection levels to sheath blight or rotten neck or panicle blast. The high 1994 natural inoculum load of the blast fungus helped to eliminate unsuitable material for further advancement. Across all material, 11 lines were identified that exhibited "good" levels of resistance (i.e. 3 or 4 rating on 0-9 scale) against sheath blight with improved height and maturity characteristics. These lines carried the following 1994 designation: 94:5, 61, 95, 118, 119, 179, 185, 319, 341, 481, and 544. Several other lines showed a sheath blight rating of "5."

Selected individuals from the 11 resistant lines were crossed to Cypress and other material to maintain resistance levels and improve agronomic characteristics. This hybrid material, along with selected F_3 and F_4 lines, will be evaluated in 1995 inoculated plots at Crowley.

[1] Research supported in part by funds from the Louisiana Rice Research Board.

Objective 2: Transfer and evaluate male-sterile trait to Louisiana cultivars

For this research, 450 F_3 lines derived from five male sterile x male fertile crosses were evaluated for fertility levels. The goal for this study was to select individuals within lines that exhibited 100% pollen sterility. During anthesis, 67 individual F_3 plants across all families were identified that presumably showed complete sterility. These results must be confirmed in 1995 field trials at Crowley. The 67 male sterile lines were removed from the field in August 1994 and cut back for production of tillers in the greenhouse. Since the male sterile lines are photoperiod-sensitive, fertile seed from this material can be produced under short daylength conditions in the winter. Seed produced from the lines will be planted for evaluation in 1995 experiments.

One drawback to this material is susceptibility to panicle blast, which can inhibit proper scoring of the male sterile trait. Even after multiple applications of Beam fungicide from the boot stage on, many lines in 1994, but not all, were susceptible to blast infection. For this reason, initial crosses to blast resistant parents have been made. Progeny lines will be evaluated in 1995 Crowley field trials. The invaluable help of Mr. Liu in this work is acknowledged.

Objective 3: Develop efficient protocols for gene transfer to rice.

Research by other laboratories have evaluated the possibility of transferring certain cloned genes to rice for sheath blight resistance. Two public laboratories have transferred specific cloned genes to rice for sheath blight and blast resistance. In 1994, we contacted researchers from the labs who have agreed to cooperate in evaluating their material under field conditions. One group of transgenic lines has been evaluated in the greenhouse by a cooperator and inoculated with the sheath blight fungus. Results from these experiments indicate a reduction, but not total elimination, of sheath blight infection due to the transferred genes. If sufficient seed can be obtained in a timely manner from the cooperators in 1995, we will evaluate this transgenic material under inoculated field conditions. Greenhouse experiments will be conducted in 1995 if field trials are not possible.

Although not discussed in detail here, we have placed considerable effort in the improvement of tissue culture conditions as it relates to gene transfer in the cultivars Cypress and Bengal. Our early experiments in 1994 indicated that high transformation rates could be obtained (>1,000 GUS transformants/plate) when callus was cultured in liquid suspensions for 1 to 2 months. However, when treated in this manner, the liquid cultures invariably lost regeneration potential in a short period of time. Therefore, our current efforts have shifted to working with embryogenic callus grown on solid medium and extracting immature embryos as target sources for future gene transfer experiments. In collaboration with M.C. Rush, similar types of experiments are being conducted in the Department of Plant Pathology and Crop Physiology.

SPECIAL PURPOSE RICE BREEDING

F. Jodari, S.D. Linscombe, and K. Bett

Certain special purpose rice varieties continue to be in increasing demand as the consumption and market for these types in the U.S. continue to expand. Recent changes in the rice export market are also adding to this demand to a certain extent. Part of the objectives of the state project 2925 is to develop specialty rice varieties that are adapted to Louisiana's environment and possess superior agronomic, milling, cooking, and specific specialty qualities. The major emphasis is being placed on breeding for Jasmine, Della, Basmati, Kokuho, and waxy types.

A number of new specialty germplasm introductions were obtained in 1994 and used in the crossing program. In addition, 252 Basmati- and Jasmine-type lines were obtained from the breeding program of the International Rice Research Institute (IRRI). These lines are currently being processed in quarantine by Dr. Don Groth at the Rice Research Station, Crowley. A total of 96 crosses and backcrosses were made with specialty parents. The early generation specialty nursery in 1994 included 93 F_1 populations, 44 F_2 populations, 11,000 progeny rows, and 500 anther culture-derived breeding rows. Twenty-eight of the F_1 populations in 1994 are part of a genetic study designed to determine the inheritance of flavor components in aromatic rice.

The preliminary yield trials included 90 specialty selections. They included typical long- and medium-grain cook-type aromatics, soft cooking Jasmine, elongating Basmati, medium- and short-grain waxy, Kokuho, and red bran selections. An additional 116 selections were included in non-replicated standard size plots for observation and initial estimates of agronomic, milling, and quality performance. The agronomic practices used for these trials were similar to other drill-seeded trials explained earlier in the general breeding section. The results are reported in Tables 52-54, 56, and 58-59, pages 71-73, 76, 82-84, and 86-87.

The Uniform Regional Nursery in 1994 included eight specialty entries from Louisiana. These entries were selected based primarily on their cooking qualities followed by their agronomic, disease reaction, and milling characteristics. Among these lines were one Jasmine, four elongating Basmati, two Della, and one short-grain waxy-type lines (Tables 3, 4, and 11-14, pages 8, 17-18, and 20-21).

The unique flavor and cooking qualities of Thai Jasmine and India Basmati have been transferred to a large number of progeny of crosses with southern varieties. Since the two groups are of Indica subspecies and their agronomic characteristics are considerably different than southern varieties, an extensive selection and crossing process is needed to combine the desired specialty qualities with the superior agronomic qualities of the southern varieties. During 1994, four advanced experimental lines (one Jasmine, two Basmati, and one waxy) were tested in statewide advanced yield trials. These lines have shown good agronomic and specialty qualities.

A considerable number of anther culture-derived selections were also included in the 1994 yield trials. The anther culture procedure is specially advantageous when used among distant crosses. The Puerto Rico winter nursery has also been very effective in advancing some of the priority early generation material. A total of 2400 specialty rows were evaluated and selected during the spring and winter of 1994. Mutation breeding efforts also continued during 1994. One X_1 and seven X_2 populations were evaluated and selections made.

The evaluation and screening processes of breeding lines for specialty qualities are an integral part of specialty rice breeding. Clearly, preservation and enhancement of specialty and cooking qualities are primary objectives. The standardized cooking procedure developed in 1992 was used to evaluate 192 preliminary and advanced breeding lines from 1994 selections for various quality attributes, such as flavor, texture, aroma, flakiness, elongation, and color. Five hundred and eighty early generation lines were also screened for their grain and cooking characteristics using testtube milling and small sample cooking procedures.

Quantitative analysis for aroma content measurement (2-acetyl-l-pyroline compound) among 27 aromatic breeding lines were carried out by the Louisiana State University Agricultural Center's Food Science Department, Baton Rouge, and the USDA Rice Quality Laboratory in Beaumont. Modified procedures using gas chromatography have been developed by the rice quality laboratory that uses smaller rice samples for 2-AP measurement, therefore, allowing a larger number of lines to be analyzed. In 1994, 58 samples were submitted for analysis through this lab.

The experimental line 9102085 is currently in the process of being released as a Della-type aromatic rice variety. In 1991-1994 performance trials, this line has shown high first and second crop yield potentials and high milling yield. This line is early maturing and has a semidwarf plant type. The aroma and cooking qualities of 2085 is similar to the variety Della.

GRAIN FISSURING AND MILLING CHARACTERISTICS OF RICE GENOTYPES

F. Jodari and S.D. Linscombe

Milling quality directly influences the economic value of rice in many countries, especially in the United States. Obtaining a high milling quality is a major objective in rice variety development. As part of the objectives of state project 2925, newly released rice varieties and advanced experimental and breeding lines are being continuously evaluated at the Rice Research Station for their milling qualities.

Ten genotypes were tested in 1994. A randomized complete block design experiment with four replications was used. Varieties included 'Lemont,' 'Cypress,' 'Bengal,' 'Jodon,' 'Kaybonnet,' and 'LaGrue.' Experimental lines were '9102071,' '9302008,' '9302065,' and '9302062.' Entries were drill seeded at a 100 lb/A rate. Experimental plots were 5 feet wide and 25 feet long. All agronomic practices used were similar to preliminary yield trials described earlier.

Prior to maturity, a 3 x 4 square foot area of each plot was harvested for milling and fissuring measurements at time intervals. Sampling was initiated when grain moisture had reached 26% (260 g kg^{-1}). Subsequent samples were taken at 2- to 3-day intervals until grain moisture content decreased to about 13% (130 g kg^{-1}).

Samples were threshed in the field and taken to the lab for harvest moisture measurements. After slowly drying rough rice to 12% moisture, milling yields were determined using standard milling procedures. Sixty mature rough rice kernels were hand shelled at each harvest moisture to determine the percentage of fissured grain. Fissured grain counts after milling were also measured. Relative humidity and temperature were continuously monitored during the sampling period using a hygrothermograph located adjacent to the plots. Hourly rainfall data during the test period were also recorded. The completed results of this study will be reported in the 1995 annual report.

A new study was initiated in 1994 with the objective of evaluating grain moisture variability within and among rice panicles and among genotypes. Thirty-six rice cultivars and experimental lines were harvested at optimum harvest moisture. Grain moisture variability, fissuring, and maturity were evaluated at the upper, middle, and lower 1/3 of the panicles. Completed results of this study will also be reported in the 1995 annual report.

RICE FERTILIZATION AND CULTURAL MANAGEMENT[1]

EFFECT OF N RATE ON AGRONOMIC PERFORMANCE OF SELECTED RICE VARIETIES AND EXPERIMENTAL LINES IN LOUISIANA RICE PRODUCING AREAS

P.K. Bollich, G.A. Meche, R.P. Regan, G.R. Romero, and D.M. Walker

INTRODUCTION

Fertilizer nitrogen (N) is required on virtually all of the rice acreage in Louisiana for optimum production. Efficiency and uptake of applied N are influenced by factors such as placement, rate, and timing in relation to water management. Growing a suitable rice variety coupled with management practices that conserve applied N generally increase the chance of profitable rice production.

The placement and timing of fertilizer N are dependent upon the cultural system used. In Louisiana, rice is grown in water- and dry-seeded cultural systems. In the water-seeded, permanently flooded system, the optimum N rate should be placed 2 to 3 inches below the soil surface within 5 to 7 days of establishing the flood. In the dry-seeded system, the optimum N rate should be broadcast onto a dry soil surface prior to establishing the permanent flood. There is generally no advantage to applying multiple applications of fertilizer N in either cultural system provided there is precision in N application and placement and sound water management. Split applications may be desirable if the optimum N rate is not known, if the farmer is unfamiliar with a field, or if a variety is susceptible to lodging. When split applications are applied, it is important to apply an adequate amount of basal N to maintain the rice plant through tillering and into early reproductive growth. Generally, a split application consists of two-thirds of the estimated total N requirement applied preplant in water-seeded rice and preflood in dry-seeded rice, followed by a topdressing of the remaining one-third at either panicle initiation, panicle differentiation, or when deficiency symptoms appear.

Rice varieties may differ in their response to the amount and timing of applied N. Maximum or optimum yields of many varieties may occur over a wide range of N rates, depending on such factors as lodging, disease susceptibility, and inherent N utilization efficiency. Environmental influences, such as soil type, growing conditions, pest pressure, and weather, may affect varietal performance. Conducting field research in the major rice producing areas of Louisiana provides valuable information for developing fertilization and management strategies for new varieties.

[1] This research supported in part by funds provided by rice producers through the Louisiana Rice Research Board.

The objectives of these variety evaluations are to 1) determine yield potential and agronomic performance of new rice varieties and advanced experimental lines in different environments and 2) determine the optimum N rate for each variety.

MATERIALS AND METHODS

Fifteen rice varieties and/or advanced experimental lines were grouped by maturity for testing. Each entry is followed by a short agronomic description and its origination.

The very early entries were:

Maybelle (MBLE)- short statured, long-grain Texas variety with very good yield potential, good straw strength, excellent ratoon potential, moderately resistant to straighthead, matures 8 to 10 days earlier than Tebonnet.

Jackson (JKSN)- long-grain Texas variety very similar to Maybelle in yield potential, slightly taller and 7 to 10 days later in maturity than Maybelle, moderately resistant to lodging, moderately resistant to straighthead.

Jodon (JODN)- long-grain, semidwarf Louisiana line with excellent yield potential in the main and ratoon crop, resistant to lodging, very susceptible to straighthead.

Adair (ADAR)- tall, long-grain Arkansas variety with high yield potential in the main and ratoon crop, moderately susceptible to lodging and susceptible to straighthead.

The early entries were:

Lemont (LMNT)- long-grain, semidwarf Texas variety with very good main crop and average ratoon crop potential, poor seedling vigor, resistant to lodging, moderately susceptible to straighthead.

Cypress (CPRS)- long-grain, semidwarf Louisiana variety with excellent yield potential in the main and ratoon crop, good seedling vigor, resistant to lodging, moderately susceptible to straighthead.

Bengal (BNGL)- medium-grain, semidwarf Louisiana variety with excellent main crop and good ratoon crop potential, moderately resistant to lodging, susceptible to straighthead.

LaGrue (LGRU)- tall, long-grain Arkansas line, moderately susceptible to lodging, high main crop yield potential, good ratoon potential, moderately susceptible to straighthead.

Kaybonnet (KBNT)- tall, long-grain Arkansas entry in its second year of testing in variety by N trials, excellent main crop yield potential, good ratoon potential, moderately susceptible to lodging, moderately susceptible to straighthead.

2071- short, long-grain Louisiana entry in its second year of testing in variety by N trials, a somaclone possessing high levels of sheath blight resistance.

2192- conventional stature, intermediate-grain Louisiana entry in its second year of testing in variety by N trials, a selection from the RAX hybrids, very high yield potential.

2062- long-grain, semidwarf, Louisiana entry in its initial year of testing in a variety by N trial.

2008- medium-grain, semidwarf, Louisiana entry in its initial year of testing in a variety by N trial.

2065- long-grain, semidwarf, Louisiana entry in its initial year of testing in a variety by N trial.

1176- tall, long-grain, Arkansas entry in its initial year of testing in a variety by N trial.

Varieties and advanced experimental lines in the very early and early maturity groups were tested in five different locations. Line 1176 was evaluated at the Rice Research Station only. Line 2065 was evaluated at all locations except the Rice Research Station. Experiments at the Rice Research Station and in Vermilion Parish were water seeded in a pinpoint flood cultural system. The trials in Morehouse Parish were water seeded in a delayed flood cultural system. Evaluations in East Carroll and Rapides parishes were drill seeded. Entries were tested at four N rates, ranging from 60 to 150 lb/A in 30 lb/A increments, with N being applied as single applications at the Rice Research Station and in Vermilion and Morehouse parishes. In Rapides and East Carroll parishes, N rates ranged from 90 to 180 lb/A in 30 lb/A increments.

Fertilizer N as ammonium sulfate was banded approximately 2 inches deep 1 to 2 days prior to flooding in the water-seeded, pinpoint flood experiments. On soils requiring P and K, approximately 45 lb/A P_2O_5 and K_2O were also banded. In drill-seeded experiments and in the water-seeded, delayed flood experiment, basal N treatments (urea) were applied as a single broadcast application prior to establishment of the permanent flood.

Water-seeded experiments were seeded at the rate of 150 lb/A with presoaked seed. After 3 to 4 days, the experiments were drained briefly to promote seedling anchorage. A permanent flood was established 2 to 4 days after drainage, never allowing the soil to dry. In the water-seeded, delayed flood experiment, the entries were seeded

at a rate of 150 lb/A with presoaked seed, drained after 4 days, and flushed periodically until permanent flood establishment. In drill-seeded experiments, varieties were seeded at 100 lb/A and flushed periodically until the permanent flood was established (4 to 5 weeks after planting).

Pest control (weeds, insects, disease) was practiced when necessary. Individual whole plots were combine-harvested at field maturity. Days to 50% heading, plant height, lodging, and grain yield were measured.

Second crop data were generated in the Vermilion Parish and Rice Research Station variety evaluations. Following main crop harvest, 75 (Vermilion) and 90 (Rice Research Station) lb N/A were broadcast into the dry stubble, and a shallow flood was established within 2 to 3 days after N application. Individual whole plots were combine-harvested at field maturity. Grain yield was determined.

Sixty entries were screened in 1994 for reaction to arsenic (As)-induced straighthead. Included in the nursery were 39 commercial varieties, both public and private, and 20 and 1 advanced experimental lines from the rice varietal development programs of Louisiana and Arkansas, respectively.

The nursery was established on a Crowley silt loam soil. Approximately 120 lb N/A and 60 lb/A P_2O_5 and K_2O were banded 2 inches deep prior to planting. Arsenic as MSMA (monosodium salt of methylarsonic acid) was surface applied at the rate of 4 lb As/A, and the test area was flooded. The test was water seeded in a pinpoint flood cultural system. Evaluation for straighthead reaction was made at maturity, with each entry being rated on a scale of 0 to 9, based on the estimated percentage of normal grain yield. A rating of 0 indicated that there was no damage or apparent symptoms present and was considered to be highly resistant. A rating of 9 indicated that no grain was produced due to severe damage and was considered to be highly susceptible. Results of the evaluation are shown in Table 15.

Plant growth stages were determined for all varieties at each location for use in updating or establishing predictions in the DD50 Rice Management Program (Tables 16-20).

Experiment: Very early variety x nitrogen

Location: Rice Research Station

Soil Type/Analysis: Crowley silt loam; pH: 5.8; O.M.: 1.14%; extractable nutrients (mg/kg): P-22, Na-74, K-78, Ca-1206, Mg-241, Zn-1.67, S-15.20, As-1.67, Fe-77.40

Variety/Seeding Rate: MBLE, JKSN, JDON, ADAR, 150 lb/A

Planting Method/Date: Water-seeded, Mar 25

Fertilization: 45 lb/A P_2O_5 and K_2O PPI; N source, ammonium sulfate; second crop, 90 lb N/A; 0.54 lb/A zinc (foliar), Apr 20

Plot Size: 7 x 25 ft (175 ft^2)

Emergence Date: MBLE, ADAR, Apr 1; JKSN, Apr 2; JDON, Apr 3

Water Management: Flooded, Mar 24; drained, Apr 1; reflooded, Apr 5; harvest drainage, July 15; second crop flooded, Aug 1; harvest drainage, Oct 11

Herbicides: 1.0 oz ai/A Londax (bensulfuron), Apr 18

Insecticides: 0.5 lb ai/A Furadan (carbofuran), Apr 28

Fungicides: 0.75 lb ai/A Benlate (benomyl), June 17

Harvest: Main crop, July 29; ratoon crop, Oct 26

Experimental Design: Split plot in a randomized complete block with four replications, N assigned to main plots and varieties to subplots

Comments: All entries emerged over a 3-day period. Maybelle headed 6 to 9 days earlier than the other entries (Table 1). Adair and Maybelle lodged severely at the higher N rates. Main crop grain yields were good to excellent with all entries yielding in excess of 8000 lb/A except Maybelle. Jodon yield was significantly higher than the other entries. Approximately 90 to 120 lb N/A was required for optimum yield. Ratoon yields were fair to excellent, with Adair yielding over 3000 lb/A (Table 2). Ratoon yield of Maybelle was significantly lower. Total grain yields of Adair and Jodon exceeded 11,000 lb/A.

Table 1. Effect of N rete on agronomic performance of water-seeded very early rice varieties. Rice Research Station, Crowley, LA. 1994.

	N rate (lb/A)																			
	Days to 50% heading					Plant height					% Lodging/type[1]				Grain yield at 12% moisture					
Variety	60	90	120	150	Mean	60	90	120	150	Mean	60	90	120	150	60	90	120	150	Mean	
						----------(cm)----------									----------(lb/A)----------					
Maybelle	76	77	76	77	77	86	91	91	93	90	0/0	22/1	52/3	72/5	7254	7661	7441	7213	7392	
Jackson	82	83	83	84	83	91	96	98	100	96	0/0	0/0	0/0	17/1	7966	8050	8434	8130	8145	
Jodon	85	86	86	86	86	85	86	88	88	87	0/0	0/0	0/0	0/0	8399	8890	8790	8994	8768	
Adair	82	83	83	83	83	96	108	103	102	102	0/0	5/1	22/2	80/4	8227	8616	8151	7544	8135	
N																				
Mean	82	82	82	83		90	95	95	96						7962	8304	8204	7970		
C.V., %			1.07					3.16									3.51			
LSD (0.01):																				
Nitrogen			ns					ns									ns			
Variety			1					3									273			
N x V			ns					ns									*			

[1] Lodging rate in percent/lodging type on a scale of 1 to 5, where 1 = leaning and 5 = complete.

Table 2. Effect of N rate in main crop on grain yields of water-seeded very early rice varieties. Rice Research Station, Crowley, LA. 1994.

Variety	Main crop grain yield at 12% moisture					Ratoon crop grain yield at 12% moisture					Total grain yield at 12% moisture				
	60	90	120	150	Mean	60	90	120	150	Mean	60	90	120	150	Mean
	(lb/A)														
Maybelle	7254	7661	7441	7213	7392	1879	1790	1809	1959	1859	9132	9452	9250	9172	9251
Jackson	7966	8050	8434	8130	8145	2337	2550	2479	2123	2372	10304	10600	10913	10253	10517
Jodon	8399	8890	8790	8994	8768	2814	2760	2833	2612	2755	11213	11650	11623	11606	11523
Adair	8227	8616	8151	7544	8135	3344	3756	3651	3155	3477	11571	12373	11802	10700	11611
N															
Mean	7962	8304	8204	7970		2593	2714	2693	2462		10555	11018	10897	10433	
C.V., %			3.51					8.63					3.38		
LSD (0.01):															
Nitrogen			ns					ns					ns		
Variety			273					217					349		
N x V			*					ns					*		

Experiment: Early variety x nitrogen

Location: Rice Research Station

Soil Type/Analysis: Crowley silt loam; pH: 5.8; O.M.: 1.08%; extractable nutrients (mg/kg): P-21, Na-74, K-42, Ca-1217, Mg-241, Zn-3.97, S-12.43, As-2.19, Fe-93.06

Variety/Seeding Rate: LMNT, CPRS, BNGL, LGRU, KBNT, 2071, 2192, 2062, 2008, 1176, 150 lb/A

Planting Method/Date: Water-seeded, Mar 25

Fertilization: 45 lb/A P_2O_5 and K_2O PPI; N source, ammonium sulfate; second crop, 90 lb N/A; 0.54 lb/A zinc (foliar), Apr 20

Plot Size: 7 x 25 ft (175 ft^2)

Emergence Date: KBNT, Apr 1; CPRS, 2008, 2071, Apr 2; BNGL, 1176, Apr 3; LMNT, 2062, 2192, LGRU, Apr 4

Water Management: Flooded, Mar 24; drained, Apr 1; reflooded, Apr 5; harvest drainage, July 18; second crop flooded, Aug 1; harvest drainage, Oct 11

Herbicides: 1.0 oz ai/A Londax (bensulfuron), Apr 18

Insecticides: 0.5 lb ai/A Furadan (carbofuran), Apr 28

Fungicides: 0.75 lb ai/A Benlate (benomyl), June 17

Harvest: Main crop, Aug 1; ratoon crop, Oct 26

Experimental Design: Split plot in a randomized complete block with four replications, N assigned to main plots and varieties to subplots

Comments: Entries emerged over a 4-day period. Differences in 50% heading across entries were significant (Table 3). 2008 and 2071 were much earlier than the other entries. 2008 lodged severely. Main crop grain yields were excellent, with all entries yielding over 8000 lb/A except 2062 and 2071. Average yield of 2192 was over 10,000 lb/A. Most entries required 120 to 150 lb N/A for optimum yield. Excellent ratoon yields were produced by Cypress, Kaybonnet, Bengal, LaGrue, and 2192, 2062, and AR1192 (Table 4). Ratoon yields of Lemont, 2071, and 2008 were significantly lower. All entries except Lemont, 2071, and 2008 produced total grain yields in excess of 11,000 lb/A. Total grain yield of 2192 exceeded 13,000 lb/A.

Table 3. Effect of N rate on agronomic performance of water-seeded early rice varieties and advanced experimental lines. Rice Research Station, Crowley, LA. 1994.

	N rate (lb/A)																			
	Days to 50% heading					Plant height					% Lodging/type[1]				Grain yield at 12% moisture				
Variety	60	90	120	150	Mean	60	90	120	150	Mean	60	90	120	150	60	90	120	150	Mean
						(cm)									(lb/A)				
Lemont	91	90	91	92	91	77	80	79	82	80	0/0	0/0	0/0	0/0	7786	8087	8360	8162	8099
Cypress	84	84	88	87	86	80	81	87	86	84	0/0	0/0	0/0	0/0	7604	8096	8705	8878	8321
Bengal	87	88	87	89	88	76	83	83	83	81	0/0	0/0	0/0	0/0	7540	8265	8752	8757	8328
LaGrue	84	85	86	87	85	92	101	104	104	100	0/0	0/0	5/1	0/0	7710	8132	8371	8512	8181
Kaybonnet	84	84	85	86	85	92	94	98	101	96	0/0	0/0	10/1	0/0	7829	8151	8492	8180	8163
2071	78	78	78	78	78	75	77	78	82	78	0/0	0/0	0/0	0/0	7169	7630	8024	8165	7747
2192	88	87	88	89	88	79	82	83	82	81	0/0	0/0	0/0	0/0	9716	10384	10715	10750	10391
2062	82	83	83	85	83	76	81	82	84	81	0/0	0/0	0/0	0/0	6967	7816	8453	8281	7879
2008	79	79	78	79	79	80	83	86	85	83	32/2	7/2	25/1	65/4	7271	8148	8731	8376	8132
1176	85	84	85	85	85	98	101	105	105	103	0/0	0/0	0/0	0/0	7771	7885	8543	8690	8222
N																			
Mean	84	84	85	86		83	86	89	89						7736	8259	8715	8675	
C.V., %			1.44					2.89									3.67		
LSD (0.01):																			
Nitrogen			1					ns									219		
Variety			1					2									284		
N x V			*					ns									ns		

[1] Lodging rate in percent/lodging type on a scale of 1 to 5, where 1 = leaning and 5 = complete.

Table 4. Effect of N rate in main crop on grain yields of water-seeded early rice varieties and advanced experimental lines. Rice Research Station, Crowley, LA. 1994.

Variety	Main crop grain yield at 12% moisture					Ratoon crop grain yield at 12% moisture					Total grain yield at 12% moisture				
	60	90	120	150	Mean	60	90	120	150	Mean	60	90	120	150	Mean
	(lb/A)														
Lemont	7786	8087	8360	8162	8099	2662	2768	2675	2281	2597	10448	10855	11034	10443	10695
Cypress	7604	8096	8705	8878	8321	3115	2913	3086	3327	3110	10719	11009	11791	12206	11431
Bengal	7540	8265	8752	8757	8328	2787	2785	3129	3306	3002	10327	11050	11881	12063	11330
LaGrue	7710	8132	8371	8512	8181	3363	3273	3711	3555	3475	11073	11405	12082	12067	11657
Kaybonnet	7829	8151	8492	8180	8163	3311	3255	3163	3006	3184	11140	11406	11655	11187	11347
2071	7169	7630	8024	8165	7747	2496	2522	2689	2805	2628	9666	10152	10714	10970	10375
2192	9716	10384	10715	10750	10391	2403	2993	3246	3815	3114	12120	13376	13961	14566	13506
2062	6967	7816	8453	8281	7879	3568	3508	3258	3443	3444	10535	11324	11711	11724	11324
2008	7271	8148	8731	8376	8132	2420	2219	2582	2664	2471	9691	10367	11313	11040	10603
1176	7771	7885	8543	8690	8222	2930	2924	2874	3017	2936	10701	10810	11417	11708	11159
N															
Mean	7736	8259	8715	8675		2906	2916	3041	3122		10642	11176	11756	11797	
C.V., %			3.67					10.36					4.24		
LSD (0.01):															
Nitrogen			219					ns					372		
Variety			284					288					446		
N x V			ns					*					*		

Experiment: Very early variety x nitrogen

Location: East Carroll Parish, Buford Perry Farm

Soil Type/Analysis: Sharkey clay; pH: 6.7; O.M.: 2.42%; extractable nutrients (mg/kg): P-146, Na-83, K-455, Ca-6830, Mg-1547, Zn-8.13, S-7.59, As-5.95, Fe-272.3

Variety/Seeding Rate: MBLE, JKSN, JDON, ADAR, 100 lb/A

Planting Method/Date: Drill-seeded, May 9

Fertilization: N source, urea

Plot Size: 7 x 25 ft (175 ft^2)

Emergence Date: May 22

Water Management: Flushed, May 15, May 20, May 25; flooded, June 20; harvest drainage, Sept 6

Herbicides: 3.0 lb ai/A Stam (propanil) + .375 lb ai/A Facet (quinclorac), June 1; 3.5 lb ai/A Ordram (molinate), June 28; 1.0 oz ai/A Londax (bensulfuron), July 1

Insecticides: 0.5 lb ai/A Furadan (carbofuran), July 9

Fungicides: 0.5 lb ai/A Benlate (benomyl), July 28 and Aug 12

Harvest: Sept 26

Experimental Design: Split plot in a randomized complete block with four replications, N assigned to main plots and varieties to subplots

Comments: All entries emerged 7 days after the first flush. Maybelle headed 7 to 10 days earlier than the other entries (Table 5). Adair lodged severely at 150 and 180 lb N/A. Grain yields of all entries except Maybelle exceeded 8000 lb/A. Yield of Jodon was over 9000 lb/A.

Table 5. Effect of N rate on agronomic performance of drill-seeded very early rice varieties. Buford Perry Farm, East Carroll Parish, LA. 1994.

	N rate (lb/A)																			
	Days to 50% heading					Plant height					% Lodging/type[1]				Grain yield at 12% moisture				
Variety	90	120	150	180	Mean	90	120	150	180	Mean	90	120	150	180	90	120	150	180	Mean
						(cm)									(lb/A)				
Maybelle	78	79	80	80	79	94	97	100	102	98	0/0	0/0	0/0	0/0	6742	7223	7303	7982	7312
Jackson	85	87	89	90	88	102	105	107	114	107	0/0	0/0	0/0	0/0	7756	8415	9189	9204	8641
Jodon	87	89	90	91	89	93	95	98	100	97	0/0	0/0	0/0	0/0	8963	9256	9724	10040	9496
Adair	84	85	88	87	86	115	118	122	125	120	0/0	2/1	66/5	82/5	8330	9011	8498	8980	8705
N																			
Mean	83	85	87	87		101	104	107	110						7948	8476	8679	9051	
C.V., %			0.79					2.53									5.60		
LSD (0.01):																			
Nitrogen			1					3									654		
Variety			1					3									460		
N x V			*					ns									ns		

[1] Lodging rate in percent/lodging type on a scale of 1 to 5, where 1 = leaning and 5 = complete.

Experiment: Early variety x nitrogen

Location: East Carroll Parish, Buford Perry Farm

Soil Type/Analysis: Sharkey clay; pH: 6.3; O.M.: 2.68%; extractable nutrients (mg/kg): P-157, Na-73, K-437, Ca-6247, Mg-1427, Zn-8.41, S-8.24, As-5.42, Fe-298.9

Variety/Seeding Rate: LMNT, CPRS, BNGL, LGRU, KBNT, 2071, 2192, 2062, 2008, 1176, 100 lb/A

Planting Method/Date: Drill-seeded, May 9

Fertilization: N source, urea

Plot Size: 7 x 25 ft (175 ft^2)

Emergence Date: KBNT, CPRS, 2192, 2071, BNGL, 2065, May 22; LMNT, 2062, 2008, LGRU, May 23

Water Management: Flushed, May 15, May 20, May 25; flooded, June 20; harvest drainage, Sept 6

Herbicides: 3.0 lb ai/A Stam (propanil) + .375 lb ai/A Facet (quinclorac), June 1; 3.5 lb ai/A Ordram (molinate), June 28; 1.0 oz ai/A Londax (bensulfuron), July 1

Insecticides: 0.5 lb ai/A Furadan (carbofuran), July 9

Fungicides: 0.5 lb ai/A Benlate (benomyl), July 28 and Aug 12

Harvest: Sept 26

Experimental Design: Split plot in a randomized complete block with four replications, N assigned to main plots and varieties to subplots

Comments: All entries emerged 7 to 8 days after the first flush. 2071 headed 7 to 14 days earlier than the other entries (Table 6). Grain yields of all entries except 2062 and 2065 exceeded 8000 lb/A. Bengal and 2192 yielded over 10,000 and 11,000 lb/A, respectively. Most entries required 120 to 180 lb N/A. Optimum yield of Kaybonnet occurred with 90 lb N/A.

Table 6. Effect of N rate on agronomic performance of drill-seeded early rice varieties and advanced experimental lines. Buford Perry Farm, East Carroll Parish, LA. 1994.

	N rate (lb/A)																			
	Days to 50% heading					Plant height					% Lodging/type[1]				Grain yield at 12% moisture					
Variety	90	120	150	180	Mean	90	120	150	180	Mean	90	120	150	180	90	120	150	180	Mean	
						(cm)									(lb/A)					
Lemont	92	94	96	97	95	91	90	93	95	92	0/0	0/0	0/0	0/0	7954	8413	8813	8325	8376	
Cypress	91	94	95	96	94	93	96	95	99	96	0/0	0/0	0/0	0/0	8027	8590	8498	8728	8461	
Bengal	85	87	89	91	88	95	96	98	102	98	0/0	0/0	0/0	0/0	10157	10686	11244	11368	10864	
LaGrue	89	90	92	94	91	111	116	119	122	117	0/0	0/0	0/0	12/1	9040	9990	10078	10082	9797	
Kaybonnet	88	90	92	92	91	106	106	112	114	110	0/0	0/0	0/0	9/1	8850	8878	8970	8805	8876	
2071	79	80	82	82	81	87	87	89	91	88	0/0	0/0	0/0	0/0	7889	8104	8485	8428	8226	
2192	86	87	88	89	88	91	92	95	98	94	0/0	0/0	0/0	0/0	11271	12221	12103	12216	11953	
2062	87	89	90	91	89	89	87	87	93	89	0/0	0/0	0/0	0/0	6724	7205	7476	8137	7385	
2008	82	84	84	86	84	97	100	100	105	100	0/0	0/0	0/0	0/0	8524	8778	9408	9633	9086	
2065	92	93	96	98	95	89	88	92	95	91	0/0	0/0	0/0	0/0	7355	7908	8109	8203	7894	
N																				
Mean	87	89	90	92		95	96	98	101						8579	9077	9318	9392		
C.V., %			0.75					2.17									3.87			
LSD (0.01):																				
Nitrogen			1					4									434			
Variety			1					2									326			
N x V			*					*									*			

[1] Lodging rate in percent/lodging type on a scale of 1 to 5, where 1 = leaning and 5 = complete.

Experiment: Very early variety x nitrogen

Location: Vermilion Parish, Errol Lounsberry Farm

Soil Type/Analysis: Crowley silt loam; pH: 4.9; O.M.: 1.35%; extractable nutrients (mg/kg): P-45, Na-41, K-71, Ca-708, Mg-139, Zn-5.77, S-27.00, As-1.39, Fe-139.1

Variety/Seeding Rate: MBLE, JKSN, JDON, ADAR, 150 lb/A

Planting Method/Date: Water-seeded, Mar 29

Fertilization: 45 lb/A P_2O_5 and K_2O PPI, Fall 1993; N source, ammonium sulfate; 0.54 lb/A zinc (foliar), Apr 21; ratoon crop, 75 lb N/A

Plot Size: 7 x 25 ft (175 ft^2)

Emergence Date: MBLE, ADAR, Apr 7; JDON, JKSN, Apr 8

Water Management: Flooded, Mar 26; drained, Apr 3; reflooded, Apr 8; harvest drainage, July 11; ratoon crop flooded, July 29; harvest drainage, Oct 5

Herbicides: 1.0 oz ai/A Londax (bensulfuron), Apr 28

Insecticides: 0.5 lb ai/A Furadan (carbofuran), May 11

Fungicides: 0.75 lb ai/A Benlate (benomyl), June 19

Harvest: Main crop, July 28; ratoon crop, Oct 31

Experimental Design: Split plot in a randomized complete block with four replications, N assigned to main plots and varieties to subplots

Comments: Entries emerged over a 2-day period. Maybelle reached 50% heading 6 to 7 days earlier than the other entries (Table 7). Grain yields were fair, with Adair yield significantly higher. All entries required 60 to 90 lb N/A for optimum yields. Ratoon yields were low, especially for Maybelle (Table 8). Total grain yield was highest for Adair and lowest for Maybelle.

Table 7. Effect of N rate on agronomic performance of water-seeded very early rice varieties. Errol Lounsberry Farm, Vermilion Parish, LA. 1994.

	N rate (lb/A)																			
	Days to 50% heading					Plant height					% Lodging/type[1]				Grain yield at 12% moisture					
Variety	60	90	120	150	Mean	60	90	120	150	Mean	60	90	120	150	60	90	120	150	Mean	
						(cm)									(lb/A)					
Maybelle	74	74	74	75	74	83	91	89	88	88	2/1	0/0	0/0	0/0	5827	6324	5928	5825	5976	
Jackson	79	80	80	81	80	85	93	91	93	91	0/0	0/0	0/0	0/0	5787	6460	6349	6286	6221	
Jodon	80	80	81	81	81	81	84	84	84	83	0/0	2/1	0/0	2/1	5961	6188	6041	5999	6047	
Adair	79	79	81	81	80	92	100	98	97	97	0/0	2/1	0/0	0/0	6328	6886	6541	6388	6536	
N																				
Mean	78	79	79	80		85	92	91	91						5978	6465	6215	6125		
C.V., %			.81					2.59									4.31			
LSD (0.01):																				
Nitrogen			1					5									425			
Variety			1					2									257			
N x V			ns					ns									ns			

[1] Lodging rate in percent/lodging type on a scale of 1 to 5, where 1 = leaning and 5 = complete.

Table 8. Effect of N rate in main crop on grain yields of water-seeded very early rice varieties. Errol Lounsberry Farm, Vermilion Parish, LA. 1994.

Variety	Main crop grain yield at 12% moisture					Ratoon crop grain yield at 12% moisture					Total grain yield at 12% moisture				
	60	90	120	150	Mean	60	90	120	150	Mean	60	90	120	150	Mean
	(lb/A)														
Maybelle	5827	6324	5928	5825	5976	1333	1381	1329	1448	1373	7160	7704	7258	7273	7349
Jackson	5787	6460	6349	6286	6221	1892	1967	1995	1935	1947	7679	8427	8344	8221	8168
Jodon	5961	6188	6041	5999	6047	2423	2267	2279	2236	2301	8384	8455	8320	8235	8348
Adair	6328	6886	6541	6388	6536	2633	2952	2890	2767	2810	8961	9838	9431	9155	9346
N															
Mean	5976	6465	6215	6125		2070	2142	2123	2096		8046	8606	8338	8221	
C.V., %			4.31					10.72					4.26		
LSD (0.01):															
Nitrogen			425					ns					401		
Variety			257					217					340		
N x V			ns					ns					ns		

Experiment: Early variety x nitrogen

Location: Vermilion Parish, Errol Lounsberry Farm

Soil Type/Analysis: Crowley silt loam; pH: 4.9; O.M.: 1.29%; extractable nutrients (mg/kg): P-34, Na-45, K-67, Ca-689, Mg-137, Zn-5.49, S-24.35, As-2.07, Fe-135.7

Variety/Seeding Rate: LMNT, CPRS, BNGL, LGRU, KBNT, 2071, 2192, 2062, 2008, 2065, 150 lb/A

Planting Method/Date: Water-seeded, Mar 28

Fertilization: 45 lb/A P_2O_5 and K_2O PPI, Fall 1993; N source, ammonium sulfate; 0.54 lb/A zinc (foliar), Apr 21; ratoon crop, 75 lb N/A

Plot Size: 7 x 25 ft (175 ft^2)

Emergence Date: CPRS, Apr 8; BNGL, 2008, Apr 9; 2192, 2071, 2065, Apr 10; LMNT, KBNT, 2062, LGRU, Apr 11

Water Management: Flooded, Mar 26; drained, Apr 3; reflooded, Apr 8; harvest drainage, July 11; ratoon crop flooded, July 29; harvest drainage, Oct 5

Herbicides: 1.0 oz ai/A Londax (bensulfuron), Apr 28

Insecticides: 0.5 lb ai/A Furadan (carbofuran), May 11

Fungicides: 0.75 lb ai/A Benlate (benomyl), June 19

Harvest: Main crop, July 28; ratoon crop, Oct 31

Experimental Design: Split plot in a randomized complete block with four replications, N assigned to main plots and varieties to subplots

Comments: Entries emerged over a 4-day period. Differences in 50% heading across entries were significant (Table 9). 2008 and 2071 were much earlier than the other entries. Lemont, Bengal, and 2192 were the last to reach 50% heading. Main crop grain yields were fair to good, with all entries yielding between 6000 and 7000 lb/A, except 2008 and 2192 which yielded significantly higher. Most entries required 90 to 120 lb N/A for optimum yield. Excellent ratoon yields were produced by Cypress, Lemont, Kaybonnet, Bengal, LaGrue, 2192, 2062, and 2065 (Table 10). Ratoon yields of 2071 and 2008 were significantly lower. All entries except 2071 produced total grain yields in excess of 9,000 lb/A. Total grain yields of Bengal and 2008 exceeded 10,000 lb/A, and yield of 2192 was over 13,000 lb/A.

Table 9. Effect of N rate on agronomic performance of water-seeded early rice varieties and advanced experimental lines. Errol Lounsberry Farm, Vermilion Parish, LA. 1994.

	N rate (lb/A)																			
	Days to 50% heading					Plant height					% Lodging/type[1]				Grain yield at 12% moisture					
Variety	60	90	120	150	Mean	60	90	120	150	Mean	60	90	120	150	60	90	120	150	Mean	
						----------(cm)----------									----------(lb/A)----------					
Lemont	88	89	90	91	89	74	77	83	85	80	0/0	0/0	0/0	0/0	6465	6562	6204	6072	6326	
Cypress	83	85	86	86	85	77	78	82	86	80	0/0	0/0	0/0	0/0	6509	6547	6269	6479	6455	
Bengal	90	90	90	91	90	78	80	82	86	82	0/0	0/0	0/0	0/0	6002	6306	6423	6118	6212	
LaGrue	84	84	85	85	85	92	98	101	103	99	0/0	0/0	0/0	0/0	5947	6514	6336	6637	6358	
Kaybonnet	83	82	84	85	84	88	94	96	101	95	0/0	0/0	0/0	0/0	6683	6933	7285	6839	6929	
2071	76	76	76	77	76	71	73	77	81	75	0/0	0/0	0/0	0/0	6161	6593	6232	6306	6323	
2192	90	90	91	90	90	83	86	86	89	86	0/0	0/0	0/0	0/0	8640	9402	9708	9155	9226	
2062	81	82	82	83	82	73	77	81	84	79	0/0	0/0	0/0	0/0	6183	6805	7286	6708	6745	
2008	78	79	79	80	79	80	84	87	87	84	0/0	0/0	0/0	0/0	6945	7584	7616	7702	7462	
2065	84	85	86	89	86	73	78	79	82	78	0/0	0/0	0/0	0/0	6090	6631	6616	6208	6386	
N																				
Mean	84	84	85	86		79	82	85	89						6562	6978	6997	6831		
C.V., %			1.41					2.92									5.40			
LSD (0.01):																				
Nitrogen			1					3									419			
Variety			1					2									342			
N x V			ns					ns									*			

[1] Lodging rate in percent/lodging type on a scale of 1 to 5, where 1 = leaning and 5 = complete.

Table 10. Effect of N rate in main crop on grain yields of water-seeded early rice varieties and advanced experimental lines. Errol Lounsberry Farm, Vermilion Parish, LA. 1994.

Variety	Main crop grain yield at 12% moisture					Ratoon crop grain yield at 12% moisture					Total grain yield at 12% moisture				
	60	90	120	150	Mean	60	90	120	150	Mean	60	90	120	150	Mean
	(lb/A)														
Lemont	6465	6562	6204	6072	6326	3684	3228	3253	3250	3354	10150	9790	9456	9322	9680
Cypress	6509	6547	6269	6479	6455	3142	2997	3040	3365	3113	9651	9544	9310	9844	9568
Bengal	6002	6306	6423	6118	6212	3949	3477	3854	3915	3799	9951	9783	10277	10034	10011
LaGrue	5947	6514	6336	6637	6358	3500	3488	3369	3787	3536	9447	10001	9705	10424	9894
Kaybonnet	6683	6933	7285	6839	6929	3064	3008	2899	2751	2915	9747	9941	10184	9591	9844
2071	6161	6593	6232	6306	6323	2394	2355	2118	2356	2306	8555	8948	8350	8663	8629
2192	8640	9402	9708	9155	9226	4073	4038	4187	4120	4104	12713	13439	13896	13275	13331
2062	6183	6805	7286	6708	6745	3435	3171	3215	3033	3213	9618	9975	10501	9741	9959
2008	6945	7584	7616	7702	7462	2592	2791	2617	2749	2687	9537	10374	10233	10451	10149
2065	6090	6631	6616	6208	6386	3300	3117	3102	3234	3188	9390	9748	9718	9442	9574
N															
Mean	6562	6978	6997	6831		3313	3167	3165	3241		9876	10144	10163	10072	
C.V., %			5.40					7.10					4.68		
LSD (0.01):															
Nitrogen			419					ns					ns		
Variety			342					212					437		
N x V			*					*					*		

Experiment: Very early variety x nitrogen

Location: Rapides Parish, Will Bollich Farm

Soil Type/Analysis: Moreland clay; pH: 6.7; O.M.: 2.57%; extractable nutrients (mg/kg): P-188, Na-43, K-433, Ca-5006, Mg-1402, Zn-9.89, S-12.77, As-6.68, Fe-273.8

Variety/Seeding Rate: MBLE, JKSN, JDON, ADAR, 100 lb/A

Planting Method/Date: Drill-seeded, June 10

Fertilization: N source, urea

Plot Size: 7 x 25 ft (175 ft^2)

Emergence Date: Data not taken

Water Management: Flushed, June 13, June 21, June 28; flooded, July 6; harvest drainage, Sept 21

Herbicides: Arrosolo (3.0 lb ai/A molinate + 3.0 lb ai/A propanil), July 2; 1.0 oz ai/A Londax (bensulfuron), July 16; 3.0 lb ai/A Ordram (molinate), July 16

Insecticides: 0.5 lb ai/A Furadan (carbofuran), July 20; 0.25 lb ai/A methyl parathion, Aug 30, Sept 10

Fungicides: 0.5 lb ai/A Rovral (iprodione), Aug 30

Harvest: Oct 27

Experimental Design: Split plot in a randomized complete block with four replications, N assigned to main plots and varieties to subplots

Comments: Maybelle reached 50% heading 7 to 9 days earlier than the other entries (Table 11). Jodon lodged severely at all rates of N and was due to harvest being delayed well past maturity and inclement weather. Grain yield of Maybelle was poor. Yields of the other entries were similar. There was no response to increasing rate of N. Yields were possibly reduced due to a severe infestation of the sugarcane borer and rice stalk borer.

Table 11. Effect of N rate on agronomic performance of drill-seeded very early rice varieties. Will Bollich Farm, Rapides Parish, LA. 1994.

	N rate (lb/A)																			
	Days to 50% heading					Plant height					% Lodging/type[1]				Grain yield at 12% moisture					
Variety	90	120	150	180	Mean	90	120	150	180	Mean	90	120	150	180	90	120	150	180	Mean	
						(cm)									(lb/A)					
Maybelle	68	69	70	70	69	85	88	88	89	88	0/0	0/0	0/0	0/0	4437	4709	4466	4548	4540	
Jackson	77	77	78	79	78	92	93	96	96	94	0/0	0/0	0/0	0/0	5971	6299	6304	6555	6282	
Jodon	77	77	78	78	78	91	92	93	92	92	87/5	90/5	90/5	67/4	5977	6234	6067	6036	6079	
Adair	75	76	77	77	76	97	97	102	99	99	7/1	0/0	12/1	30/2	6350	6355	6625	6609	6485	
N																				
Mean	74	75	76	76		91	92	95	94						5684	5900	5865	5937		
C.V., %			0.83					2.26									8.36			
LSD (0.01):																				
Nitrogen			1					ns									ns			
Variety			1					2									470			
N x V			ns					ns									ns			

[1] Lodging rate in percent/lodging type on a scale of 1 to 5, where 1 = leaning and 5 = complete.

Experiment: Early variety x nitrogen

Location: Rapides Parish, Will Bollich Farm

Soil Type/Analysis: Moreland clay; pH: 6.6; O.M.: 2.88%; extractable nutrients (mg/kg): P-181, Na-44, K-417, Ca-4871, Mg-1376, Zn-14.83, S-13.26, As-6.06, Fe-285.7

Variety/Seeding Rate: LMNT, CPRS, BNGL, LGRU, KBNT, 2071, 2192, 2062, 2008, 2065, 100 lb/A

Planting Method/Date: Drill-seeded, June 10

Fertilization: N source, urea

Plot Size: 7 x 25 ft (175 ft^2)

Emergence Date: Data not taken

Water Management: Flushed, June 13, 21, and 28; flooded, July 6; harvest drainage, Sept 21

Herbicides: Arrosolo (3.0 lb ai/A molinate + 3.0 lb ai/A propanil), July 2; 1.0 oz ai/A Londax (bensulfuron), July 16; 3.0 lb ai/A Ordram (molinate), July 16

Insecticides: 0.5 lb ai/A Furadan (carbofuran), July 20; 0.25 lb ai/A methyl parathion, Aug 30, Sept 10

Fungicides: 0.5 lb ai/A Rovral (iprodione), Aug 30

Harvest: Oct 27

Experimental Design: Split plot in a randomized complete block with four replications, N assigned to main plots and varieties to subplots

Comments: 2071 and 2008 reached 50% heading 10 to 14 days earlier than the other entries (Table 12). Lodging was severe in many entries and was due to harvest being delayed well past maturity and inclement weather. Increasing N did not appear to influence lodging severity. Grain yields were fair to poor. Lemont, 2071, and 2062 yielded less than 6000 lb/A. 2192 yielded over 7000 lb/A. There was no response to rate of N. Yields were possibly reduced due to a severe infestation of the sugarcane borer and rice stalk borer.

Table 12. Effect of N rate on agronomic performance of drill-seeded early rice varieties and advanced experimental lines. Will Bollich Farm, Rapides Parish, LA. 1994.

	N rate (lb/A)																			
	Days to 50% heading					Plant height					% Lodging/type[1]				Grain yield at 12% moisture					
Variety	90	120	150	180	Mean	90	120	150	180	Mean	90	120	150	180	90	120	150	180	Mean	
						(cm)									(lb/A)					
Lemont	83	84	84	84	84	84	84	83	85	84	0/0	17/1	0/0	0/0	5950	5930	6028	5394	5828	
Cypress	81	81	81	81	81	93	92	93	91	92	72/5	67/4	82/5	87/4	6009	6372	6402	6069	6213	
Bengal	77	78	78	79	78	83	85	84	82	84	17/1	25/1	27/2	50/3	6036	6145	6394	6091	6166	
LaGrue	78	79	80	81	79	98	100	101	100	100	55/3	55/3	47/3	67/4	6540	6316	6370	6398	6406	
Kaybonnet	79	79	80	79	79	99	100	101	103	101	70/4	67/4	90/5	90/5	6537	6400	6288	6800	6507	
2071	70	70	70	70	70	80	81	79	81	80	0/0	0/0	7/1	0/0	5482	5532	5238	5486	5434	
2192	80	80	81	81	80	87	85	86	84	86	87/4	85/5	90/5	90/5	7363	7678	7508	7218	7442	
2062	77	77	78	78	78	85	86	84	85	85	0/0	0/0	0/0	0/0	5715	5603	5784	5935	5759	
2008	71	72	72	72	72	83	83	87	88	86	80/3	72/3	85/4	80/4	6095	5881	6180	6234	6098	
2065	80	81	81	81	81	83	84	84	85	84	0/0	0/0	0/0	0/0	6342	6144	6533	6630	6412	
N																				
Mean	78	78	78	79		88	88	88	89						6207	6200	6273	6226		
C.V., %			.88					2.83									6.73			
LSD (0.01):																				
Nitrogen			1					ns									ns			
Variety			1					2									388			
N x V			ns					ns									ns			

[1] Lodging rate in percent/lodging type on a scale of 1 to 5, where 1 = leaning and 5 = complete.

Experiment: Very early variety x nitrogen

Location: Morehouse Parish, Zaunbrecher Farm

Soil Type/Analysis: Hebert silty clay; pH: 5.8; O.M.: 2.47%; extractable nutrients (mg/kg): P-135, Na-141, K-257, Ca-2883, Mg-764, Zn-9.70, S-13.34, As-5.61, Fe-576.7

Variety/Seeding Rate: MBLE, JKSN, JDON, ADAR, 150 lb/A

Planting Method/Date: Water-seeded delayed flood, May 11

Fertilization: N source, urea

Plot Size: 7 x 25 ft (175 ft^2)

Emergence Date: May 16

Water Management: Flooded, May 11; drained, May 15; flushed, May 19, May 26, June 3; flooded, June 10; harvest drainage, Aug 30

Herbicides: 4.0 lb ai/A Stam (propanil) + .75 lb ai/A Basagran (bentazon), June 7; 1.0 oz ai/A Londax (bensulfuron), June 21

Insecticides: 0.5 lb ai/A Furadan (carbofuran), June 23

Fungicides: 0.5 lb ai/A Benlate (benomyl), June 23, Aug 8

Harvest: Sept 13

Experimental Design: Split plot in a randomized complete block with four replications, N assigned to main plots and varieties to subplots

Comments: All entries emerged 5 days after water seeding. Maybelle headed 5 to 8 days earlier than the other entries (Table 13). Adair lodged severely at N rates above 90 lb/A. Grain yields were good to excellent, with Jodon and Adair yielding over 9000 lb/A. Maybelle yield was significantly lower than the other entries.

Table 13. Effect of N rate on agronomic performance of water-seeded very early rice varieties. Zaumbrecher Farm, Morehouse Parish, LA. 1994.

	N rate (lb/A)																			
	Days to 50% heading					Plant height					% Lodging/type[1]				Grain yield at 12% moisture				
Variety	60	90	120	150	Mean	60	90	120	150	Mean	60	90	120	150	60	90	120	150	Mean
						(cm)									(lb/A)				
Maybelle	75	76	77	77	76	75	79	81	85	80	0/0	0/0	0/0	0/0	7076	7223	7942	8148	7597
Jackson	82	83	85	86	84	80	83	84	92	85	0/0	0/0	0/0	0/0	7710	8033	8620	8936	8325
Jodon	82	83	85	86	84	78	81	80	87	82	0/0	0/0	0/0	0/0	8904	9277	9841	10298	9580
Adair	79	80	81	82	81	88	94	96	105	96	0/0	42/3	49/3	60/4	8838	9869	10370	10780	9964
N																			
Mean	80	80	82	83		80	84	85	92						8132	8601	9193	9540	
C.V., %			0.86					2.78									4.88		
LSD (0.01):																			
Nitrogen			1					5									538		
Variety			1					2									416		
N x V			ns					ns									ns		

[1] Lodging rate in percent/lodging type on a scale of 1 to 5, where 1 = leaning and 5 = complete.

Experiment: Early variety x nitrogen

Location: Morehouse Parish, Zaunbrecher Farm

Soil Type/Analysis: Hebert silty clay; pH: 5.7; O.M.: 2.50%; extractable nutrients (mg/kg): P-148, Na-126, K-290, Ca-2863, Mg-755, Zn-12.94, S-14.87, As-5.75, Fe-610.1

Variety/Seeding Rate: LMNT, CPRS, BNGL, LGRU, KBNT, 2071, 2192, 2062, 2008, 2065, 150 lb/A

Planting Method/Date: Water-seeded delayed flood, May 12

Fertilization: N source, urea

Plot Size: 7 x 25 ft (175 ft^2)

Emergence Date: May 16

Water Management: Flooded, May 11; drained, May 15; flushed, May 19, May 26, June 3; flooded, June 10; harvest drainage, Aug 30

Herbicides: 4.0 lb ai/A Stam (propanil) + .75 lb ai/A Basagran (bentazon), June 7; 1.0 oz ai/A Londax (bensulfuron), June 21

Insecticides: 0.5 lb ai/A Furadan (carbofuran), June 23

Fungicides: 0.5 lb ai/A Benlate (benomyl), June 23, Aug 8

Harvest: Sep 14

Experimental Design: Split plot in a randomized complete block with four replications, N assigned to main plots and varieties to subplots

Comments: All entries emerged 3 to 4 days after water seeding. 2071 and 2008 headed much earlier than the other entries (Table 14). Grain yields were exceptional with all entries except Lemont, 2071, 2065, and 2062 yielding over 9000 lb/A. Kaybonnet and LaGrue yielded over 10,000, Bengal over 11,000, and 2192 over 12,000 lb/A.

Table 14. Effect of N rate on agronomic performance of water-seeded early rice varieties and advanced experimental lines. Zaunbrecher Farm, Morehouse Parish, LA. 1994.

	N rate (lb/A)																			
	Days to 50% heading					Plant height					% Lodging/type[1]				Grain yield at 12% moisture					
Variety	60	90	120	150	Mean	60	90	120	150	Mean	60	90	120	150	60	90	120	150	Mean	
						(cm)									(lb/A)					
Lemont	88	89	89	90	89	76	77	80	79	78	0/0	0/0	0/0	0/0	8846	8528	9082	9229	8921	
Cypress	84	85	86	88	86	81	83	84	86	84	0/0	0/0	0/0	0/0	9336	10190	9794	10187	9877	
Bengal	80	81	81	83	81	82	83	86	87	84	0/0	0/0	0/0	0/0	10780	10926	11648	11594	11237	
LaGrue	82	83	85	87	84	96	99	101	104	100	0/0	0/0	0/0	0/0	10255	9969	10538	10831	10398	
Kaybonnet	81	83	84	85	83	92	98	101	103	98	0/0	0/0	0/0	0/0	9924	9879	10350	11259	10353	
2071	71	72	73	74	73	73	74	75	77	75	0/0	0/0	0/0	0/0	7627	7760	8348	8844	8145	
2192	84	84	84	85	84	84	85	85	88	85	0/0	0/0	0/0	0/0	11689	11914	12428	12923	12239	
2062	80	81	81	83	81	80	78	82	82	81	0/0	0/0	0/0	0/0	8373	8511	9280	9079	8811	
2008	76	77	78	80	78	84	88	89	91	88	0/0	0/0	0/0	0/0	8831	8764	9447	9457	9124	
2065	84	85	87	89	86	73	73	77	80	76	0/0	0/0	0/0	0/0	8548	8293	8762	9154	8689	
N																				
Mean	81	82	83	84		82	84	86	88						9421	9473	9968	10256		
C.V., %			0.75					2.57									3.66			
LSD (0.01):																				
Nitrogen			1					5									828			
Variety			1					2									334			
N x V			*					ns									*			

[1] Lodging rate in percent/lodging type on a scale of 1 to 5, where 1 = leaning and 5 = complete.

Table 15. Straighthead evaluation for commercial rice varieties and advanced experimental lines. Rice Research Station, Crowley, LA. 1994.

Entry	Grain type[1]	Rating[2]
Jodon	L	7.3
Toro 2	L	7.3
L203	L	7.3
Millie	L	7.0
V4716	M	7.0
9302152	L	6.7
8902192	M	6.7
9402128	M	6.7
A301	L	6.3
LA BK 93	L	5.7
9402134	M	5.7
M201	M	5.7
Tebonnet	L	5.7
Adair	L	5.7
Bengal	M	5.7
Kaybonnet	L	5.3
9302008	M	5.3
Mercury	M	5.0
Mars	M	5.0
9202168	L	5.0
Orion	M	4.7
Akitakomachi	M	4.7
9302165	L	4.3
RT7015	L	4.3
9402048	L	4.3
9302062	L	4.0
Lemont	L	4.0
LaGrue	L	4.0
Alan	L	4.0
L202	L	4.0
9202071	L	4.0
9402074	L	4.0
CM101	S	4.0
9302106	M	4.0
Katy	L	4.0
9402068	L	3.7
9402005	L	3.7
Carolina Gold	L	3.7
AB869	M	3.7
Cypress	L	3.3
9402042	L	3.3
9402028	M	3.0
Lacassine	L	3.0

Continued.

Table 15. Continued.

Entry	Grain type[1]	Rating[2]
Zenith	L	3.0
Gulfmont	L	3.0
AB647	M	3.0
9402045	L	3.0
Saturn	M	2.7
9402002	L	2.7
Jackson	L	2.7
9402137	M	2.7
Dellmont	L	2.3
Newbonnet	L	2.3
9302065	L	2.3
Della	L	2.3
9202149	L	1.7
Magnolia	M	1.7
9201176	L	1.3
Maybelle	L	1.3
Rico	M	1.0

[1] L = long grain, M = medium grain, S = short grain.
[2] Rating based on a scale from 0 to 9, where 0 = resistant and 9 = highly susceptible.

Table 16. Growth stage information for the DD-50 Rice Management Program. Water-seeded rice varieties and advanced experimental lines. Rice Research Station, Crowley, LA. 1994.

Variety	Emergence date	First[1] tiller	Green ring	Panicle 2 mm	Date of 50% heading
Very Early					
Maybelle	4-01	--	5-15	5-23	6-10
Jackson	4-02	--	5-17	5-27	6-16
Jodon	4-02	--	5-17	5-27	6-19
Adair	4-01	--	5-17	5-26	6-16
Early					
Lemont	4-04	--	5-22	6-02	6-24
Cypress	4-02	--	5-17	5-28	6-19
Bengal	4-03	--	5-23	6-02	6-21
LaGrue	4-04	--	5-17	5-27	6-18
Kaybonnet	4-01	--	5-17	6-02	6-18
2071	4-02	--	5-14	5-23	6-11
2192	4-04	--	5-22	5-30	6-21
2062	4-04	--	5-18	6-02	6-16
2008	4-02	--	5-17	5-28	6-12
1176	4-03	--	5-21	5-30	6-18

[1] Data not taken.

Table 17. Growth stage information for the DD-50 Rice Management Program. Drill-seeded rice varieties and advanced experimental lines. Buford Perry Farm, East Carroll Parish, LA. 1994.

Variety	Emergence date	First tiller	Green ring	Panicle 2 mm	Date of 50% heading
Very Early					
Maybelle	5-22	6-08	7-04	7-13	8-02
Jackson	5-22	6-07	7-07	7-20	8-11
Jodon	5-22	6-08	7-07	7-18	8-12
Adair	5-22	6-07	7-08	7-17	8-09
Early					
Lemont	5-23	6-07	7-10	7-25	8-18
Cypress	5-22	6-07	7-08	7-21	8-17
Bengal	5-22	6-07	7-10	7-25	8-11
LaGrue	5-23	6-08	7-09	7-21	8-14
Kaybonnet	5-22	6-06	7-10	7-23	8-14
2071	5-22	6-08	7-07	7-16	8-04
2192	5-22	6-06	7-10	7-19	8-11
2062	5-23	6-07	7-11	7-20	8-12
2008	5-23	6-07	7-11	7-20	8-07
2065	5-22	6-07	7-09	7-23	8-18

Table 18. Growth stage information for the DD-50 Rice Management Program. Water-seeded rice varieties and advanced experimental lines. Errol Lounsberry Farm, Vermilion Parish, LA. 1994.

Variety	Emergence date	First[1] tiller	Green ring	Panicle 2 mm	Date of 50% heading
Very Early					
Maybelle	4-07	--	5-18	5-27	6-11
Jackson	4-08	--	5-18	5-28	6-17
Jodon	4-08	--	5-18	5-28	6-18
Adair	4-07	--	5-18	5-27	6-17
Early					
Lemont	4-11	--	5-21	6-04	6-15
Cypress	4-08	--	5-18	6-01	6-11
Bengal	4-09	--	5-23	6-04	6-16
LaGrue	4-11	--	5-18	5-29	6-11
Kaybonnet	4-11	--	5-20	5-30	6-10
2071	4-10	--	5-15	5-25	6-02
2192	4-10	--	5-21	6-04	6-16
2062	4-11	--	5-21	5-29	6-08
2008	4-09	--	5-22	5-29	6-05
2065	4-10	--	5-20	6-04	6-12

[1] Data not taken.

Table 19. Growth stage information for the DD-50 Rice Management Program. Drill-seeded rice varieties and advanced experimental lines. Will Bollich Farm, Rapides Parish, LA. 1994.

Variety	Emergence[1] date	First tiller	Green ring	Panicle 2 mm	Date of 50% heading
Very Early					
Maybelle	--	7-06	7-25	8-05	8-21
Jackson	--	7-07	7-28	8-10	8-30
Jodon	--	7-05	7-25	8-05	8-30
Adair	--	7-03	7-28	8-05	8-28
Early					
Lemont	--	7-06	7-29	8-10	9-05
Cypress	--	7-07	7-30	8-09	9-02
Bengal	--	7-06	8-01	8-08	8-30
LaGrue	--	7-06	7-30	8-08	8-31
Kaybonnet	--	7-05	7-27	8-07	8-31
2071	--	7-07	7-27	8-02	8-22
2192	--	7-07	8-01	8-13	9-01
2062	--	7-07	7-29	8-08	8-30
2008	--	7-07	7-31	8-07	8-24
2065	--	7-05	7-30	8-11	9-02

[1] Data not taken.

Table 20. Growth stage information for the DD-50 Rice Management Program. Water-seeded rice varieties and advanced experimental lines. Zaunbrecher Farm, Morehouse Parish, LA. 1994.

Variety	Emergence date	First tiller	Green ring	Panicle 2 mm	Date of 50% heading
Very Early					
Maybelle	5-16	6-09	6-27	7-07	7-26
Jackson	5-16	6-09	7-01	7-14	8-03
Jodon	5-16	6-08	6-27	7-14	8-03
Adair	5-16	6-09	6-30	7-07	7-31
Early					
Lemont	5-16	6-08	6-28	7-18	8-09
Cypress	5-15	6-05	6-25	7-15	8-06
Bengal	5-16	6-08	6-28	7-12	8-01
LaGrue	5-15	6-07	6-28	7-13	8-04
Kaybonnet	5-15	6-10	6-28	7-12	8-03
2071	5-15	6-09	6-25	7-05	7-23
2192	5-15	6-04	6-30	7-13	8-04
2062	5-16	6-08	6-29	7-12	8-01
2008	5-15	6-06	6-27	7-09	7-28
2065	5-15	6-07	6-30	7-12	8-06

RICE NUTRITION STUDIES

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A series of studies was conducted to evaluate various aspects of rice plant nutrition in both drill- and water-seeded rice. Most of the studies concerned fertilizer N management, with emphasis on N source, time of N application in relation to water management, and midseason N applications. The response of rice to variable rates of P and K and to time of application of P was determined on a reclaimed marsh soil in Vermilion Parish. A calcium silicate rate was also initiated at this location. Various Zn formulations were evaluated in both a soil and foliar application study.

A study was continued from 1991 to evaluate the effectiveness of a controlled-release urea fertilizer when applied preplant (PP) in drill-seeded rice. Meister urea was developed by the Chisso Corporation and is currently used in a number of crops grown in Japan. Various timed-release formulations of Meister were applied as a single PP application in drill-seeded Cypress rice. These formulations were compared with urea applied in split applications according to currently recommended practices. All sources of N were applied at rates of 40, 80, 120, 160, and 200 lb/A. Meister formulations were applied as single PP applications with minimal incorporation. The urea fertilizer was applied in split applications with the exception of the 40 and 80 lb/A rate, which were applied as single preflood (PF) applications. The 120, 160, and 200 lb/A rates were split 80-40, 120-40, and 160-40, respectively, with the initial amount being applied PF and the remainder at PI. Plant samples were taken at 50% heading and at maturity to determine N uptake. A Meister formulation was also evaluated for its effectiveness when applied as a midseason topdress application. Cypress was fertilized with PF N rates of 0, 45, and 90 lb/A. At PI, Meister and conventional urea were applied at rates of 30 and 60 lb N/A.

In studies where fertilizer N uptake and recovery were determined, 2 atom% ^{15}N pelletized fertilizer (either urea or ammonium sulfate) was applied to microplots ranging in size from 3 to 6.25 ft^2. Plant samples were collected at 50% heading in the ^{15}N studies for N recovery. Additional samples were taken at maturity to determine total N uptake, partitioning them into two components (grain and stems and leaves), to determine N uptake.

Sources of N and application timings were evaluated at the Rice Research Station and in East Carroll and Morehouse parishes. Single PF 2- and 5-way N applications at total rates of 150 and 200 lb N/A were compared in a drill-seeded system at the Rice Research Station. In East Carroll and Morehouse parishes, studies were drill-seeded and water-seeded with a delayed flood, respectively. Urea and ammonium sulfate were applied to deliver 150 lb N/A in either a single PF or 2-way application. These treatments were also applied postflush to a wet soil prior to permanent flood establishment. In Vermilion Parish, each source of N was applied as a single preplant, single preflood, or single postflood application in a water-seeded, pinpoint flood system. Each source was also applied as a 2-way split, with the initial application being either preplant or preflood and the second postflood.

The use of early-season N as a starter was evaluated at the Rice Research Station and in East Carroll, Rapides, and Morehouse parishes. Approximately 30 lb N/A was applied at four timings and included preplant, 1, 2, and 3 weeks after planting. All treatments received 135 lb N/A PF. A single PF application of 165 lb N/A was also included.

A midseason N time of application study was conducted at the Rice Research Station. A PF N rate of either 60 or 120 lb/A was applied to drill-seeded Cypress. Midseason N was applied at a rate of 45 lb/A beginning at panicle initiation and every 7 days for 35 days.

Various sources of Zn fertilizer were evaluated in a soil and foliar application study conducted on a Crowley silt loam previously limed to a pH of 7.9. Inorganic formulations were applied at rates of 0, 5, and 10 lb Zn/A. Chelated formulations were applied at 0, 0.5, and 1.0 lb Zn/A.

A foliar nutrient study was conducted to evaluate the influence of a Huma Gro nutrient formulation (0-5-0) on drill-seeded rice. This formulation was applied alone and in combination with Benlate as either a single boot or a boot plus heading application to Cypress previously inoculated with sheath blight. Yield response and disease evaluation were determined.

Experiment: Controlled-release urea

Location: Rice Research Station

Soil Type/Analysis: Crowley silt loam; pH: 6.1; O.M.: 1.10%; extractable nutrients (mg/kg): P-21, Na-76, K-54, Ca-1216, Mg-235; Zn-3.26, S-11.74, As-2.25, Fe-75.20

Variety/Seeding Rate: CPRS, 100 lb/A

Planting Method/Date: Drill-seeded, Mar 23

Fertilization: 45 lb/A P-K, Mar 23; Meister treatments, Mar 23; PF urea treatments, Apr 27; MS split, May 23

Plot Size: 7 x 25 ft (175 ft^2)

Emergence Date: Apr 10

Water Management: Flushed, Mar 25, Apr 4; permanent flood, Apr 28; harvest drainage, July 20; ratoon flooded, Aug 3; harvest drainage, Oct 11

Herbicides: 3.0 lb ai/A Stam (propanil), Apr 20; 0.6 oz ai/A Londax (bensulfuron), May 16

Insecticides: 0.6 lb ai/A Furadan (carbofuran), June 3

Fungicides: 0.5 lb ai/A Benlate (benomyl), June 17

Harvest: Aug 2, Oct 26

Experimental Design: Randomized complete block with four replications, N rate assigned to main plot and source to subplot

Comments: A visual response to the preplant Meister treatments was observed 2 weeks after emergence. Visual response to PF urea occurred within 5 days. During later tillering stages, N deficiency was first observed where only 40 lb urea-N/A were applied PF. The Meister formulations also displayed mild N deficiency at the lower rates of application. Overall growth and color were obviously better at higher rates of N for all sources. The Meister formulations did not influence heading, regardless of rate (Table 1). Plant height was influenced by source and rate of N. Height was significantly reduced with the S15 formulation. Plant height was greatest with the M15 formulation. Biomass increased as rate of N increased for all sources except S15. Urea and M15 produced significantly more biomass than did the other formulations.

A significant source by N rate interaction occurred for main crop and total grain yield (Table 2). The response to rate of N was variable with respect to source. Optimum grain yield occurred at a N rate of 160 lb/A for M15 and urea. Yields were significantly lower with M+S and S15 urea. The M15 formulation outyielded all other sources at all rates of application. An application of 160 lb M15 was comparable with 200 lb urea-N/A.

Ratoon yields were influenced by rate of main crop N. Source of main crop N also affected grain yield. Yields were significantly lower when the S15 and M+S formulations were used in the main crop.

Total yield was affected by source of N with most of the contribution in yield resulting from the main crop. The low total yield of the S15 treatment was a combination of yield reductions in both crops. This formulation was very inefficient in supplying adequate N to the rice crop.

Total N in the mature straw and grain increased as the fertilizer rate increased for all sources except S15 (Table 3). N accumulation was much higher for M15 in both straw and grain. Accumulation of N with urea as the source was also superior to the other formulations.

Table 1. Effect of N source and rate on agronomic performance of drill-seeded Cypress rice. Rice Research Station, Crowley, LA. 1994.

	N source																								
	Harvest maturity																								
	Days to 50% heading					Plant height					Straw weight					Grain weight					Whole plant weight				
N rate	M+S	S15	M15	Urea	N Mean	M+S	S15	M15	Urea	N Mean	M+S	S15	M15	Urea	N Mean	M+S	S15	M15	Urea	N Mean	M+S	S15	M15	Urea	Mean
(lb/A)						--------(cm)---------					----------(g/3 ft²)----------														
40	91	94	91	92	92	66	63	70	69	67	144	115	190	177	156	137	116	178	157	147	281	231	368	334	303
80	91	94	90	92	92	67	61	71	70	67	151	116	219	198	171	141	105	216	185	162	292	222	435	382	333
120	90	93	89	91	91	67	62	75	73	69	177	115	254	254	200	166	110	244	200	180	343	224	498	454	380
160	91	93	89	92	91	72	62	79	74	72	203	116	277	287	221	187	116	265	239	202	390	232	542	525	422
200	90	94	90	92	91	71	61	80	78	73	216	117	290	303	231	204	111	252	250	204	420	227	542	553	436
Source Mean	91	94	90	92		69	62	75	73		178	116	246	244		167	111	231	206		345	227	477	450	
C.V., %			1.13					3.53					12.10					9.93					10.06		
LSD (0.05):[1]																									
Nitrogen			ns					2					21					16					34		
Source			1					2					15					11					24		
Nitrogen x Source			ns					ns					*					*					*		

[1] ns = nonsignificant; * denotes significance at P = 0.05.

Table 2. Effect of main crop N source and rate on grain yields of drill-seeded Cypress rice. Rice Research Station, Crowley, LA. 1994.

	N source														
	Main crop grain yield at 12% moisture					Ratoon crop grain yield at 12% moisture					Total grain yield at 12% moisture				
N rate	M+S	S15	M15	Urea	N Mean	M+S	S15	M15	Urea	N Mean	M+S	S15	M15	Urea	N Mean
(lb/A)	(lb/A)														
40	4311	3697	5626	5091	4681	1357	1287	1483	1454	1395	5667	4984	7109	6545	6077
80	4931	3472	6948	6297	5412	1314	1206	1520	1534	1393	6245	4678	8468	7831	6806
120	5626	3917	7890	6797	6058	1531	1367	1778	1669	1587	7158	5284	9668	8467	7644
160	6323	3751	8879	8188	6785	1586	1271	1845	1784	1622	7909	5022	10725	9972	8407
200	6762	3921	8812	8381	6969	1639	1396	1902	1707	1661	8401	5317	10714	10088	8630
Source															
Mean	5591	3752	7631	6951		1485	1305	1706	1630		7076	5057	9337	8581	
C.V., %			5.87					8.79					5.37		
LSD (0.05):[1]															
Nitrogen			272					138					348		
Source			224					86					257		
Nitrogen x Source			*					ns					*		

[1] ns = nonsignificant; * denotes significance at P = 0.05.

Table 3. Effect of N source and rate on N efficiency of drill-seeded Cypress rice. Rice Research Station, Crowley, LA. 1994.

	N source																			
	Straw at maturity										Grain at maturity									
	N Concentration					Total N uptake					N Concentration					Total N uptake				
N rate	M+S	S15	M15	Urea	N Mean	M+S	S15	M15	Urea	N Mean	M+S	S15	M15	Urea	N Mean	M+S	S15	M15	Urea	N Mean
	(%)					(lb/A)					(%)					(lb/A)				
40	.66	.65	.63	.62	.64	31	24	38	36	32	1.12	1.12	1.17	1.16	1.14	49	41	67	58	54
80	.63	.67	.62	.62	.63	31	25	43	39	34	1.08	1.09	1.14	1.14	1.11	49	36	79	67	58
120	.64	.71	.61	.61	.64	36	26	50	49	40	1.14	1.13	1.23	1.17	1.17	61	40	96	75	68
160	.59	.62	.71	.65	.65	39	23	64	60	46	1.17	1.09	1.29	1.18	1.19	71	41	110	90	78
200	.60	.65	.92	.77	.74	42	24	86	75	57	1.15	1.12	1.35	1.29	1.23	75	40	109	103	82
Source																				
Mean	.63	.66	.70	.65		36	24	56	52		1.13	1.11	1.24	1.19		61	40	92	79	
C.V., %			9.82					19.15					3.45					0.90		
LSD (0.05)[1]																				
Nitrogen			.05					6.3					.04					7.1		
Source			.04					5.1					.03					4.7		
Nitrogen x source			*					*					*					*		

[1] ns = nonsignificant; * denotes significance at P = 0.05.

Experiment: Midseason controlled-release urea

Location: Rice Research Station

Soil Type/Analysis: Crowley silt loam; pH: 5.8; O.M.: 1.26%; extractable nutrients (mg/kg): P-24, Na-70, K-57, Ca-1065, Mg-173, Zn-2.24, S-16.37, As-11.51 Fe-122.0

Variety/Seeding Rate: CPRS, 100 lb/A

Planting Method/Date: Drill seeded, Apr 29

Fertilization: 45 lb/A P-K, Apr 29; PF urea May 20; MS splits, June 3

Plot Size: 7 x 25 ft (175 ft^2)

Emergence Date: May 5

Water Management: Flushed, May 9; flooded, May 20; harvest drainage, Aug 8

Herbicides: 3.0 lb ai/A Stam (propanil) + .5 lb ai/A Basagran (bentazon), May 17; 0.6 oz ai/A Londax (bensulfuron), June 7

Insecticides: 0.5 lb ai/A Furadan (carbofuran), June 7

Fungicides: None

Harvest: Aug 19

Experimental Design: Randomized complete block with four replications, PF N assigned to main plot and MS splits to subplot

Comments: Plant height was significantly reduced at low rates of PF N (Table 1). PF N had a significant influence on grain yield. A 30 lb/A application of Meister A compared favorably with 60 lb urea/A. There was no significant difference between the two sources of urea when compared at equivalent rates.

Table 1. Influence of midseeson N source and rate on agronomic performance of drill-seeded Cypress rice. Rice Research Station, Crowley, LA. 1994.

Preflood N	Midseason Source-Rate	Days to 50% heading	Plant height	Grain yield at 12% moisture
(lb/A)			(cm)	(lb/A)
0	0	79	74	5042
0	Meister A-30	79	77	5460
0	Meister A-60	79	80	6070
0	Urea 30	79	75	5398
0	Urea 60	79	75	5295
45	0	78	81	6565
45	Meister A-30	79	84	6955
45	Meister A-60	78	85	7255
45	Urea 30	78	79	6805
45	Urea 60	78	82	7166
90	0	80	86	7370
90	Meister A-30	79	88	7733
90	Meister A-60	80	89	7692
90	Urea 30	79	87	7536
90	Urea 60	79	88	7640
C.V., %		0.91	2.51	6.17
			Main effects	
Preflood N:				
0		79	76	5453
45		78	82	6949
90		80	88	7594
LSD (0.05)[1]		ns	4	1148
Midseason N:				
0		79	80	6326
Meister A-30		79	83	6716
Meister A-60		79	85	7006
Urea 30		79	80	6580
Urea 60		79	82	6700
LSD (0.05)		ns	2	341
PF N x MS N		ns	ns	ns

Experiment: Single vs 2- and 3-way N splits

Location: Rice Research Station

Soil Type/Analysis: Crowley silt loam; pH: 6.1; O.M.: 1.12%; extractable nutrients (mg/kg): P-22, Na-59, K-51, Ca-1151, Mg-196, Zn-2.98, S-6.45, As-1.34, Fe-83.48

Variety/Seeding Rate: CPRS, BNGL, 100 lb/A

Planting Method/Date: Drill-seeded, Apr 20

Fertilization: 45 lb/A P-K, Apr 20; 135 lb N/A PF, May 13

Plot Size: 7 x 25 ft (175 ft^2)

Emergence Date: Apr 25

Water Management: Flushed, Apr 29; permanent flood, May 13; harvest drainage, July 28; ratoon flooded, Aug 12; harvest drainage, Oct 11

Herbicides: 3.0 lb ai/A Stam (propanil), May 10; 0.9 oz ai/A Londax (bensulfuron), June 1

Insecticides: 0.5 lb ai/A Furadan (carbofuran), May 31

Fungicides: None

Harvest: Aug 11, Oct 26

Experimental Design: Randomized complete block with four replications

Comments: Main crop grain yield of Bengal was significantly lower than Cypress and was probably due to blast (Table 1). Ratoon yields of Bengal and Cypress were similar. Yield of Cypress was significantly reduced with a 3-way split. Yield of Bengal was not affected. With the exception of Bengal and the 3-way split, there was no difference in yield when time of midseason applications were based on visual observation rather than specific growth stage. Whole plant weight was also not affected by N timing. Uptake and recovery of ^{15}N were similar for all treatments except Bengal with a visual 3-way split (Table 2). Incidence of blast probably affected plant response to N. Total N in the grain and in the whole plant was generally higher for Bengal.

Table 1. Influence of N rate and timing on agronomic performance of drill-seeded Cypress and Bengal rice. Rice Research Station, Crowley, LA. 1994.

Variety	Method of application	Time and rate[1]	Days to 50% heading	Plant height	Grain yield at 12% moisture			Whole plant weight
					Main crop	Ratoon crop	Total	
		(lb/A)		(cm)	----------(lb/A)---------			(g/3 ft²)
Cypress	Growth stage	150 PF	78	94	8077	1322	9399	1005
Bengal	Growth stage	150 PF	79	87	6966	1413	8379	1020
Cypress	Growth stage	100PF|50PI	77	90	7845	1409	9254	1019
Bengal	Growth stage	100PF|50PI	77	84	7228	1464	8691	1063
Cypress	Growth stage	50PF|50PI|50PD	76	81	6681	1389	8072	1055
Bengal	Growth stage	50PF|50PI|50PD	76	82	6820	1276	8096	1057
Cypress	Visual	100PF|50	78	89	7753	1359	9112	1008
Bengal	Visual	100PF|50	77	87	7214	1499	8714	1075
Cypress	Visual	50PF|50|50	77	85	6710	1467	8177	1045
Bengal	Visual	50PF|50|50	77	82	6155	1256	7411	1045
C.V., %			1.20	3.34	3.70	8.95	3.76	4.68
LSD (0.05)			1	4	383	ns	465	ns

[1] PF = preflood, PI = panicle initiation, PD = panicle differentiation.

Table 2. Influence of midseason N timing on N recovery of drill-seeded Cypress and Bengal rice. Rice Research Station, Crowley, LA. 1994.

Variety	Method of application	Time and rate[1]	^{15}N uptake	^{15}N recovery	Total N	Grain N	Straw N
		(lb/A)	-(lb/A)-	-(%)-	--------(lb/A)--------		
Cypress	Growth stage	150 PF	77	51	137	76	61
Bengal	Growth stage	150 PF	72	48	128	58	70
Cypress	Growth stage	100PF|50PI	78	52	137	76	61
Bengal	Growth stage	100PF|50PI	70	46	125	64	61
Cypress	Growth stage	50PF|50PI|50PD	77	52	134	80	54
Bengal	Growth stage	50PF|50PI|50PD	75	50	127	69	58
Cypress	Visual	100PF|50	77	52	138	74	64
Bengal	Visual	100PF|50	72	48	127	64	63
Cypress	Visual	50PF|50|50	74	49	129	77	51
Bengal	Visual	50PF|50|50	63	43	115	64	51
C.V., %			7.57	7.64	5.87	6.43	10.21
LSD (0.05)			8	5	11	7	9

[1] PF = preflood, PI = panicle initiation, PD = panicle differentiation.

Experiment: Single, 2-, and 5-way N splits

Location: Rice Research Station

Soil Type/Analysis: Crowley silt loam; pH: 5.3; O.M.: 1.37%; extractable nutrients (mg/kg): P-21, Na-75, K-74, Ca-985, Mg-193, Zn-3.13, S-17.34, As-1.81, Fe-128.2

Variety/Seeding Rate: CPRS, 100 lb/A

Planting Method/Date: Drill seeded, Apr 29

Fertilization: 45 lb/A P-K, Apr 29; PF N, May 20; MS splits according to timing schedule; N source, urea

Plot Size: 7 x 25 ft (175 ft^2)

Emergence Date: May 5

Water Management: Flushed, May 9; flooded, May 20; harvest drainage, Aug 8

Herbicides: 3.0 lb ai/A Stam (propanil) + .5 lb ai/A Basagran (bentazon), May 17; 0.6 oz ai/A Londax (bensulfuron), June 7

Insecticides: 0.5 lb ai/A Furadan (carbofuran), June 7

Fungicides: 0.5 lb ai/A Benlate (benomyl), July 1

Harvest: Aug 19

Experimental Design: Randomized complete block with four replications

Comments: Plant height was generally reduced at low rates of PF N (Table 1). Optimum grain yield occurred when the PF N rate was at least 100 lb/A. A single application of 150 lb N/A prior to permanently flooding was the most efficient method of application. Grain yields were significantly reduced when PF N was 50 lb/A or less. Multiple applications of N at midseason offered no yield advantage over a single PF application of the proper amount.

Table 1. Influence of rate and time of application of fertilizer N on agronomic performance of drill-seeded Cypress rice. Rice Research Station, Crowley, LA. 1994.

Preflood N	Mid-season[1] N	Days to 50% heading	Plant height	Grain yield at 12% moisture
----(lb/A)------			-(cm)-	--(lb/A)--
150	-	80	90	8215
30	4 x 30	78	86	7458
100	50	78	89	7983
50	4 x 25	78	88	7686
200	-	80	95	8039
40	4 x 40	78	87	7874
150	50	80	91	8310
100	4 x 25	79	90	8038
C.V., %		0.58	3.16	3.48
LSD (0.05)		1	4	407

[1] Single midseason applications were applied at panicle initiation. Multiple applications were applied in four equal splits as needed.

Experiment: Midseason N timing

Location: Rice Research Station

Soil Type/Analysis: Crowley silt loam; pH: 6.0; O.M.: 1.04%; extractable nutrients (mg/kg): P-20, Na-63, K-49, Ca-1028, Mg-188, Zn-3.74, S-6.53, As-1.31, Fe-89.80

Variety/Seeding Rate: CPRS, 100 lb/A

Planting Method/Date: Drill-seeded, Apr 20

Fertilization: 45 lb/A P-K, Apr 20; PF urea treatments, May 13; MS splits according to timing schedule

Plot Size: 7 x 25 ft (175 ft^2)

Emergence Date: Apr 25

Water Management: Flushed, Apr 29; permanent flood, May 13; harvest drainage, July 28; ratoon flooded, Aug 12; harvest drainage, Oct 11

Herbicides: 3.0 lb ai/A Stam (propanil), May 10; 0.9 oz ai/A Londax (bensulfuron), June 1

Insecticides: 0.6 lb ai/A Furadan (carbofuran), May 31

Fungicides: 0.5 lb ai/A Benlate (benomyl), July 1

Harvest: Aug 11, Oct 26

Experimental Design: Randomized complete block with four replications, factorial arrangement of PF N and MS N

Comments: Main crop and total grain yields were significantly greater with higher total N (Table 1). A significant yield reduction occurred when MS N was applied later than 21 days after PI. Total grain yields were affected in a similar manner.

Table 1. Influence of midseason N timing on agronomic performance of drill-seeded Cypress rice. Rice Research Station, Crowley, LA. 1994.

Preflood N	Midseason[1] N timing	Days to 50% heading	Plant height	Grain yield at 12% moisture: Main crop	Second crop	Total
(lb/A)			(cm)	(lb/A)		
60	PI	76	81	7486	1498	8985
60	PI + 7	75	81	7378	1336	8714
60	PI + 14	76	80	7506	1579	9086
60	PI + 21	75	80	7682	1470	9151
60	PI + 28	75	79	6981	1421	8403
60	PI + 35	75	79	7050	1444	8494
120	PI	78	88	8265	1614	9878
120	PI + 7	78	88	8004	1183	9187
120	PI + 14	78	89	8395	1373	9768
120	PI + 21	78	87	8439	1381	9820
120	PI + 28	77	88	8206	1452	9658
120	PI + 35	77	88	7967	1357	9323
C.V., %		.76	2.65	3.37	9.96	3.12
			Main effects			
Preflood N:						
60		76	80	7347	1458	8805
120		78	88	8213	1393	9606
LSD (0.05)		1	1	154	ns	169
Midseason N:						
PI		77	85	7875	1556	9432
PI + 7		77	84	7691	1259	8951
PI + 14		77	85	7951	1476	9427
PI + 21		77	84	8060	1425	9486
PI + 28		76	83	7594	1437	9030
PI + 35		76	84	7508	1400	8909
LSD (0.05)		ns	ns	266	144	292
PF N x MS N		ns	ns	ns	ns	ns

[1] PI = panicle initiation with 45 lb N/A applied beginning at PI and continuing at 7-day intervals for 35 days.

Experiment: Urea vs ammonium sulfate

Location: Rice Research Station

Soil Type/Analysis: Crowley silt loam; pH: 5.8; O.M.: 1.38%; extractable nutrients (mg/kg): P-26, Na-77, K-75, Ca-1171, Mg-205, Zn-2.97, S-10.75, As-1.23, Fe-103.2

Variety/Seeding Rate: CPRS, 100 lb/A

Planting Method/Date: Drill seeded, Apr 29

Fertilization: 45 lb/A P-K, Apr 29; PF N, May 20; MS splits at PI; N source, urea and ammonium sulfate

Plot Size: 7 x 25 ft (175 ft^2)

Emergence Date: May 5

Water Management: Flushed, May 9; flooded, May 20; harvest drainage, Aug 8

Herbicides: 3.0 lb ai/A Stam (propanil) + .5 lb ai/A Basagran (bentazon), May 17; 0.6 oz ai/A Londax (bensulfuron), June 7

Insecticides: 0.5 lb ai/A Furadan (carbofuran), June 7

Fungicides: 0.5 lb ai/A Benlate (benomyl), July 1

Harvest: Aug 19

Experimental Design: Randomized complete block with four replications

Comments: Source of N had no influence on grain yield (Table 1). Differences in ^{15}N uptake and recovery simply reflected the difference in the amount of ^{15}N applied PF and at MS. Total N in the grain, straw, and whole plant was not affected by source.

Table 1. Influence of N source on agronomic performance, N uptake, and N recovery of drill-seeded Cypress rice. Rice Research Station, Crowley, LA. 1994.

Source[1]	Time and rate[2]	Days to 50% heading	Plant height	Main crop grain yield at 12% moisture	50% heading			Maturity		
					Whole plant weight	^{15}N uptake	^{15}N recovery	Total N	Grain N	Straw N
	(lb/A)		(cm)	-(lb/A)-	(g/3 ft²)	-(lb/A)-	-(%)-	----------(lb/A)---------		
A.S.	90 ^{15}N PF|45 N PI	77	84	6974	492	31	34	122	82	40
A.S.	90 N PF|45 ^{15}N PI	78	84	7226	477	21	47	117	82	34
Urea	90 ^{15}N PF|45 N PI	78	85	7178	505	33	36	124	82	41
Urea	90 N PF|45 ^{15}N PI	79	84	7302	479	21	47	117	80	37
U + S	90 ^{15}N PF|45 N PI	79	85	7549	511	30	33	124	82	42
U + S	90 N PF|45 ^{15}N PI	80	86	7297	548	19	42	137	89	48
C.V., %		1.18	2.04	4.15	9.50	18.48	22.98	11.76	11.27	14.86
LSD (0.05)		1	ns	ns	ns	7	ns	ns	ns	ns

[1] A.S. = ammonium sulfate; U + S = urea + a rate of sulfur equivalent to that applied when ammonium sulfate is the N source.
[2] ^{15}N was applied as either a preflood (PF) or panicle initiation (PI) application in each N source.

Experiment: N source x time of application

Location: East Carroll Parish, Buford Perry Farm

Soil Type/Analysis: Sharkey clay; pH: 6.6; O.M.: 2.43%; extractable nutrients (mg/kg): P-144, Na-75, K-454, Ca-6848, Mg-1530, Zn-9.32, S-8.60, As-4.93, Fe-284.5

Variety/Seeding Rate: CPRS, 100 lb/A

Planting Method/Date: Drill-seeded, May 9

Fertilization: N source, urea and ammonium sulfate

Plot Size: 7 x 25 ft (175 ft^2)

Emergence Date: May 22

Water Management: Flushed, May 15, May 20, May 25; flooded, June 20; harvest drainage, Sept 6

Herbicides: 3.0 lb ai/A Stam (propanil) + .375 lb ai/A Facet (quinclorac), June 1; 3.5 lb ai/A Ordram (molinate), June 28; 1.0 oz ai/A Londax (bensulfuron), July 1

Insecticides: 0.5 lb ai/A Furadan (carbofuran), July 9

Fungicides: 0.5 lb ai/A Benlate (benomyl), July 28, Aug 12

Harvest: Sept 26

Experimental Design: Randomized complete block with four replications

Comments: With the exception of minimal influence on days to 50% heading, source or time of N application had no effect on performance of Cypress (Table 1). Grain yields were similar when N was applied to a dry or wet soil prior to permanently flooding.

Table 1. Influence of N source and time of application on agronomic performance of drill-seeded Cypress rice. Buford Perry Farm, East Carroll Perish, LA. 1994.

N[1] Source	N[2] Time	Days to 50% heading	Plant height	Grain yield at 12% moisture
(%)	(lb/A)		(cm)	(lb/A)
46	150 PF	93	95	8689
46	100 PF+50 PI	93	97	8835
46	150 Post	93	99	8555
46	100 Post+50 PI	92	100	8570
21	150 PF	95	96	8981
21	100 PF+50 PI	92	93	9072
21	150 Post	93	95	8422
21	100 Post+50 PI	92	97	8265
C.V., %		0.92	3.67	3.95
LSD (0.05)		1	ns	ns

[1] 46 = urea; 21 = ammonium sulfate.
[2] PF = preflood; PI = panicle initiation; Post = postflush.

Experiment: N source x time of application

Location: Vermilion Parish, Errol Lounsberry Farm

Soil Type/Analysis: Crowley silt loam; pH: 4.8; O.M.: 1.36%; extractable nutrients (mg/kg): P-39, Na-33, K-67, Ca-650, Mg-123, Zn-9.77, S-25.61, As-2.60, Fe-142.7

Variety/Seeding Rate: CPRS, 150 lb/A

Planting Method/Date: Water-seeded, Mar 29

Fertilization: 45 lb/A P-K PPI, fall 1993; N source, urea and ammonium sulfate; 0.54 lb/A zinc (foliar), Apr 21

Plot Size: 7 x 25 ft (175 ft^2)

Emergence Date: Apr 9

Water Management: Flooded, Mar 26; drained, Apr 3; reflooded, Apr 8; harvest drainage, July 11

Herbicides: 1.0 oz ai/A Londax (bensulfuron), Apr 28

Insecticides: 0.5 lb ai/A Furadan (carbofuran), May 11

Fungicides: 0.75 lb ai/A Benlate (benomyl), June 19

Harvest: July 28

Experimental Design: Randomized complete block with four replications

Comments: Plant height was increased when N was applied either PP or PF (Table 2). N source had no influence on grain yields when either half or all of the N was applied PP. A post application of 90 lb N/A as either ammonium sulfate or urea was very inefficient when compared with 90 lb/A PP. Single PP applications of N resulted in significantly higher grain yields than PF applications. Overall yields were higher with ammonium sulfate as the N source, and overall PP applications of either source were more effective than PF applications (includes an average of both single and split applications).

Table 2. Influence of N source and time of application on agronomic performance of water-seeded, Cypress rice. Errol Lounsberry Farm, Vermilion Parish, LA. 1994.

N[1] Source	N[2] Time	Days to 50% heading	Plant height	Grain yield at 12% moisture
(%)	(lb/A)		(cm)	(lb/A)
21	90 PP	80	82	6371
21	90 PF	81	80	5824
21	90 Post	78	71	5531
21	45 PP+45 Post	79	77	6379
21	45 PF+45 Post	79	73	5334
46	90 PP	80	77	6271
46	90 PF	79	75	5436
46	90 Post	79	70	5038
46	45 PP+45 Post	79	74	6231
46	45 PF+45 Post	79	74	5314
C.V., %		0.81	2.78	5.50
LSD (0.05)		1	3	461
Contrasts:[3]				
21% vs 46%		ns	*	*
PP vs PF		ns	*	*

[1] 46 = urea; 21 = ammonium sulfate.
[2] PP = preplant; PF = preflood; Post = postflood.
[3] * denotes significance at P = 0.05; ns = nonsignificant.

Experiment: N source x time of application

Location: Morehouse Parish, Zaunbrecher Farm

Soil Type/Analysis: Hebert silty clay; pH: 5.6; O.M.: 2.22%; extractable nutrients (mg/kg): P-142, Na-160, K-286, Ca-3103, Mg-840, Zn-9.30, S-14.15, As-5.40, Fe-588.8

Variety/Seeding Rate: CPRS, 150 lb/A

Planting Method/Date: Water-seeded delayed flood, May 11

Fertilization: N source, urea and ammonium sulfate

Plot Size: 7 x 25 ft (175 ft^2)

Emergence Date: May 15

Water Management: Flooded, May 11; drained, May 15; flushed, May 19, May 26, June 3; flooded, June 10; harvest drainage, Aug 30

Herbicides: 4.0 lb ai/A Stam (propanil) + .75 lb ai/A Basagran (bentazon), June 7; 1.0 oz ai/A Londax (bensulfuron), June 21

Insecticides: 0.5 lb ai/A Furadan (carbofuran), June 23

Fungicides: 0.5 lb ai/A Benlate (benomyl), June 23, Aug 8

Harvest: Sept 13

Experimental Design: Randomized complete block with four replications

Comments: With the exception of minimal influence on days to 50% heading, source or time of N application had no effect on performance of Cypress (Table 3). Grain yields were similar when N was applied to a dry or wet soil prior to permanently flooding.

Table 3. Influence of N source and time of application on agronomic performance of water-seeded, delayed flood Cypress rice. Zaunbrecher Farm, Morehouse Parish, LA. 1994.

N[1] Source	N[2] Time	Days to 50% heading	Plant height	Grain yield at 12% moisture
(%)	(lb/A)		(cm)	(lb/A)
46	150 PF	91	82	9045
46	100 PF+50 PI	90	81	9147
46	150 Post	89	78	8713
46	100 Post+50 PI	86	78	8922
21	150 PF	90	81	9378
21	100 PF+50 PI	90	80	9204
21	150 Post	90	81	9503
21	100 Post+50 PI	89	77	9026
C.V., %		1.08	3.69	4.61
LSD (0.05)		1	ns	ns

[1] 46 = urea; 21 = ammonium sulfate.
[2] PF = preflood; PI = panicle initiation; Post = postflush.

Experiment: Starter nitrogen

Location: Rice Research Station

Soil Type/Analysis: Crowley silt loam; pH: 5.6; O.M.: 1.36%; extractable nutrients (mg/kg): P-21, Na-79, K-58, Ca-1078, Mg-204, Zn-3.25, S-13.48, As-1.86, Fe-111.4

Variety/Seeding Rate: CPRS, 100 lb/A

Planting Method/Date: Drill seeded, Apr 29

Fertiiization: N source, urea

Plot Size: 7 x 25 ft (175 ft^2)

Emergence Date: May 5

Water Management: Flushed, May 9; flooded, May 20; harvest drainage, Aug 8

Herbicides: 3.0 lb ai/A Stam (propanil) + .5 lb ai/A Basagran (bentazon), May 17; 0.6 oz ai/A Londax (bensulfuron), June 7

Insecticides: 0.5 lb ai/A Furadan (carbofuran), June 7

Fungicides: 0.5 lb ai/A Benlate (benomyl), July 1

Harvest: Aug 19

Experimental Design: Randomized complete block with four replications

Comments: With the exception of minimal influence on days to 50% heading, starter N had no significant effect on performance of Cypress (Table 1).

Table 1. Influence of starter nitrogen on agronomic performance of drill-seeded Cypress rice. Rice Research Station, Crowley, LA. 1994.

Starter N rate	Preflood N rate	Days to 50% heading	Plant height	Grain yield at 12% moisture
---------(lb/A)---------			-(cm)-	----(lb/A)----
30 pre	135	77	91	8034
30 1 wk post	135	77	90	8103
30 2 wk post	135	78	92	8032
30 3 wk post	135	80	91	7925
-	135	80	91	7829
-	165	80	92	7899
C.V., %		0.83	2.33	2.97
LSD (0.05)		1	ns	ns

Experiment: Starter nitrogen

Location: East Carroll Parish, Buford Perry Farm

Soil Type/Analysis: Sharkey clay; pH: 6.6; O.M.: 2.39%; extractable nutrients (mg/kg): P-141, Na-76, K-425, Ca-6779, Mg-1496, Zn-8.80, S-7.63, As-5.84, Fe-293.1

Variety/Seeding Rate: CPRS, 100 lb/A

Planting Method/Date: Drill-seeded, May 9

Fertilization: N source, urea

Plot Size: 7 x 25 ft (175 ft^2)

Emergence Date: May 22

Water Management: Flushed, May 15, May 20, May 25; flooded, June 20; harvest drainage, Sept 6

Herbicides: 3.0 lb ai/A Stam (propanil) + .375 lb ai/A Facet (quinclorac), June 1; 3.5 lb ai/A Ordram (molinate), June 28; 1.0 oz ai/A Londax (bensulfuron), July 1

Insecticides: 0.5 lb ai/A Furadan (carbofuran), July 9

Fungicides: 0.5 lb ai/A Benlate (benomyl), July 28, Aug 12

Harvest: Sept 27

Experimental Design: Randomized complete block with four replications

Comments: With the exception of minimal influence on days to 50% heading, starter N had no significant influence on performance of Cypress (Table 2).

Table 2. Influence of starter nitrogen on agronomic performance of drill-seeded Cypress rice. Buford Perry Farm, East Carroll Parish, LA. 1994.

Starter N rate	Preflood N rate	Days to 50% heading	Plant height	Grain yield at 12% moisture
---------(lb/A)---------			-(cm)-	----(lb/A)----
30 pre	135	93	95	8770
30 1 wk post	135	92	95	8950
30 2 wk post	135	94	96	8655
30 3 wk post	135	94	95	9114
-	135	93	99	8885
-	165	95	98	9241
C.V., %		0.77	4.51	4.55
LSD (0.05)		1	ns	ns

Experiment: Starter nitrogen

Location: Rapides Parish, Will Bollich Farm

Soil Type/Analysis: Moreland clay; pH: 6.8; O.M.: 2.87%; extractable nutrients (mg/kg): P-205, Na-46, K-435, Ca-5102, Mg-1393, Zn-10.67, S-13.07, As-7.25, Fe-283.2

Variety/Seeding Rate: CPRS, 100 lb/A

Planting Method/Date: Drill-seeded, June 10

Fertilization: N source, urea

Plot Size: 7 x 25 ft (175 ft^2)

Emergence Date: Data not taken

Water Management: Flushed, June 13, June 21, June 28; flooded, July 6; harvest drainage, Sept 21

Herbicides: Arrosolo (3.0 lb ai/A molinate + 3.0 lb ai/A propanil), July 2; 1.0 oz ai/A Londax (bensulfuron), July 16; 3.0 lb ai/A Ordram (molinate), July 16

Insecticides: 0.5 lb ai/A Furadan (carbofuran), July 20; 0.25 lb ai/A methyl parathion, Aug 30, Sept 10

Fungicides: 0.5 lb ai/A Rovral (iprodione), Aug 30

Harvest: Oct 27

Experimental Design: Randomized complete block with four replications

Comments: With the exception of minimal influence on days to 50% heading, starter N had no significant effect on performance of Cypress (Table 3).

Table 3. Influence of starter nitrogen on agronomic performance of drill-seeded Cypress rice. Will Bollich Farm, Rapides Parish, LA. 1994.

Starter N rate	Preflood N rate	Days to 50% heading	Plant height	Grain yield at 12% moisture
---------(lb/A)---------			-(cm)-	----(lb/A)----
30 pre	135	80	93	6327
30 1 wk post	135	80	93	6181
30 2 wk post	135	81	93	6113
30 3 wk post	135	81	91	6476
-	135	81	92	6185
-	165	81	93	6519
C.V., %		0.47	2.67	9.05
LSD (0.05)		1	ns	ns

Experiment: Starter nitrogen

Location: Morehouse Parish, Zaunbrecher Farm

Soil Type/Analysis: Hebert silty clay; pH: 5.7; O.M.: 2.24%; extractable nutrients (mg/kg): P-119, Na-148, K-255, Ca-2959, Mg-807, Zn-10.15, S-12.88, As-5.52, Fe-543.0

Variety/Seeding Rate: CPRS, 150 lb/A

Planting Method/Date: Water-seeded delayed flood, May 11

Fertilization: N source, urea

Plot Size: 7 x 25 ft (175 ft^2)

Emergence Date: May 15

Water Management: Flooded, May 11; drained, May 15; flushed, May 19, May 26, June 3; flooded, June 10; harvest drainage, Aug 30

Herbicides: 4.0 lb ai/A Stam (propanil) + .75 lb ai/A Basagran (bentazon), June 7; 1.0 oz ai/A Londax (bensulfuron), June 21

Insecticides: 0.5 lb ai/A Furadan (carbofuran), June 23

Fungicides: 0.5 lb ai/A Benlate (benomyl), July 23, Aug 8

Harvest: Sept 13

Experimental Design: Randomized complete block with four replications

Comments: With the exception of minimal influence on days to 50% heading, starter N had no significant effect on performance of Cypress (Table 4).

Table 4. Influence of starter nitrogen on agronomic performance of water-seeded, delayed flood Cypress rice. Zaunbrecher Farm, Morehouse Parish, LA. 1994.

Starter N rate	Preflood N rate	Days to 50% heading	Plant height	Grain yield at 12% moisture
---------(lb/A)---------			-(cm)-	----(lb/A)----
30 pre	135	89	81	9619
30 1 wk post	135	89	84	9488
30 2 wk post	135	89	81	9526
30 3 wk post	135	89	81	9776
-	135	90	82	9549
-	165	91	83	9905
C.V., %		0.62	3.20	3.64
LSD (0.05)		1	ns	ns

Experiment: P and K fertilizer rate

Location: Vermilion Parish, Bobby Trahan Farm

Soil Type/Analysis: Reclaimed marsh; pH: 5.2; O.M.: 6.46%; extractable nutrients (mg/kg): P-38, Na-80, K-182, Ca-1863, Mg-562, Zn-4.29, S-., As-12.83, Fe-554.3

Variety/Seeding Rate: RICO, 100 lb/A

Planting Method/Date: Drill-seeded, Mar 30

Fertilization: Variable P and K fertilizer combinations PF; 60 lb N/A PF

Plot Size: 5 x 16 ft (80 ft^2)

Emergence Date: Data not taken

Water Management: Flushed, Apr 8; flooded, May 5; harvest drainage, July 20

Herbicides: Arrosolo (3.0 lb ai/A molinate + 3.0 lb ai/A propanil), May 3

Insecticides: 0.5 lb ai/A Furadan (carbofuran), May 15

Fungicides: None

Harvest: Aug 11

Experimental Design: Completely randomized design with three replications of 10 fertilizer combinations

Comments: Severe P deficiency occurred immediately after permanent flood establishment when little or no P was applied and grain yields were significantly reduced (Table 1). Maturity was also delayed with no P. P content in the Y-leaf was very low when no P was applied. There was no response to K.

Table 1. Influence of P and K rate on performance of drill-seeded Rico rice. Bobby Trahan Farm, Vermilion Parish. 1994.

Treatment combination		Days to 50% heading	Plant height	Grain yield at 12% moisture	Y-leaf content[1]	
P	K				P	K
(lb/A)			(cm)	(lb/A)	(%)	
60	0	94	88	4296	0.17	2.1
60	20	94	88	4436	0.18	2.2
60	40	94	86	4348	0.16	2.2
60	60	94	85	4266	0.20	2.3
60	80	94	86	4240	0.19	2.2
0	60	99	85	2690	0.10	1.9
20	60	95	85	3869	0.16	2.2
40	60	95	85	3793	0.15	2.1
60	60	95	87	4058	0.18	2.3
80	60	94	87	4328	0.19	2.3
C.V.%		1.00	2.37	11.44	13.08	4.3
LSD (0.05)		2	ns	791	0.04	0.2

[1] Leaf sample collected at panicle initiation.

Experiment: P time of application

Location: Vermilion Parish, Bobby Trahan Farm

Soil Type/Analysis: Reclaimed marsh; pH: 5.0; O.M.: 7.11%; extractable nutrients (mg/kg): P-43, Na-81, K-235, Ca-1977, Mg-543, Zn-7.40, S-., As-16.56, Fe-635.8

Variety/Seeding Rate: RICO, 100 lb/A

Planting Method/Date: Drill-seeded, Mar 30

Fertilization: 60 lb P/A at 7-day intervals; 60 lb N/A PF

Plot Size: 5 x 16 ft (80 ft^2)

Emergence Date: Data not taken

Water Management: Flushed, Apr 8; flooded, May 5; harvest drainage, July 20

Herbicides: Arrosolo (3.0 lb ai/A molinate + 3.0 lb ai/A propanil), May 3

Insecticides: 0.5 lb ai/A Furadan (carbofuran), May 15

Fungicides: None

Harvest: Aug 11

Experimental Design: Completely randomized design with three replications of 10 application timings

Comments: Severe P deficiency occurred immediately after permanent flood establishment when no P was applied and grain yields were significantly reduced (Table 2). Maturity was also delayed with no P. The most effective times of application were between 7 and 28 days after planting. Grain yield decreased with later applications.

Table 2. Influence of P timing on performance of drill-seeded Rico rice. Bobby Trahan Farm, Vermilion Parish. 1994.

Time of Application[1]	Days to 50% heading	Plant height	Grain yield at 12% moisture	Y-leaf content[2]
		(cm)	(lb/A)	(%)
0	101	86	2491	0.13
Preplant	97	86	3451	0.20
7 DAP	94	85	4067	0.19
14 DAP	95	87	3978	0.17
21 DAP	94	84	4366	0.26
28 DAP	94	86	4378	0.20
35 DAP	95	86	3992	0.17
42 DAP	96	86	3803	0.19
49 DAP	98	87	3517	0.17
56 DAP	97	86	3783	0.19
C.V.%	1.74	2.04	14.86	25.83
LSD (0.05)	3	ns	964	ns

[1] 60 lb P/A were applied at each timing. 0 level is no P.
[2] Leaf sample collected at panicle initiation.

Experiment: Silica rate

Location: Vermilion Parish, Bobby Trahan Farm

Soil Type/Analysis: Reclaimed marsh; pH: 5.0; O.M.: 6.39%; extractable nutrients (mg/kg): P-45, Na-84, K-221, Ca-1929, Mg-585, Zn-4.44, S-., As-13.61, Fe-571.3

Variety/Seeding Rate: RICO, 100 lb/A

Planting Method/Date: Drill-seeded, Mar 30

Fertilization: Variable Silica (Si) rates PF; 60 lb N/A PF

Plot Size: 5 x 16 ft (80 ft^2)

Emergence Date: Data not taken

Water Management: Flushed, Apr 8; flooded, May 5; harvest drainage, July 20

Herbicides: Arrosolo (3.0 lb ai/A molinate + 3.0 lb ai/A propanil), May 3

Insecticides: 0.5 lb ai/A Furadan (carbofuran), May 15

Fungicides: None

Harvest: Aug 11

Experimental Design: Completely randomized design with three replications of four Si rates

Comments: Plant height, days to 50% heading, and Si content were not affected by Si application (Table 1). Grain yield increased slightly as rate of Si increased.

Table 1. Influence of silica on performance of drill-seeded Rico rice. Bobby Trahan Farm, Vermilion Parish. 1994.

Rate	Days to 50% heading	Plant height	Grain yield at 12% moisture	Mature straw Si content
(lb/A)		(cm)	(lb/A)	(%)
0	96	86	3552	0.9
500	96	86	3621	1.2
1000	95	88	3795	1.2
1500	95	88	4016	1.1
C.V.%	0.68	1.92	5.05	10.08
LSD (0.05)	ns	ns	ns	ns

Experiment: Soil applied Zn

Location: Rice Research Station

Soil Type/Analysis: Crowley silt loam; pH: 7.8; O.M.: 0.84%; extractable nutrients (mg/kg): P-29, Na-88, K-97, Ca-2184, Mg-286, Zn-4.58, S-5.63, As-3.83, Fe-190.0

Variety/Seeding Rate: LCSN, 150 lb/A

Planting Method/Date: Water-seeded, Mar 28

Fertilization: 135 lb/A N, Mar 24; Zn treatments, Mar 24; 0-60-60 (N-P-K), May 13

Plot Size: 7 x 20 ft (140 ft^2)

Emergence Date: Apr 10

Water Management: Flooded, Mar 25; drained, Apr 1; flooded, Apr 5; drained, May 2; flooded, May 5; harvest drainage, July 29

Herbicides: 0.6 oz ai/A Londax (bensulfuron), May 16

Insecticides: 0.5 lb ai/A Furadan (carbofuran), May 16

Fungicides: None

Harvest: Aug 12

Experimental Design: Randomized complete block with three replications, treatment combinations consisting of Zn source and rate

Comments: Zinc source and rate had no effect on heading, plant height, grain yield, or Zn content (Table 1). Bronzing was observed in all treatments. Severe P deficiency at mid-tillering may have compromised the results of this study. According to a summary of plant tissue analyses for rice, a Zn content of >20 mg/kg at the PI growth stage is considered sufficient. Therefore, a response to applied Zn would not be expected.

Table 1. Effect of soil applied Zn sources and rates on agronomic performance of water-seeded Lacassine rice. Rice Research Station, Crowley, LA. 1994.

Source	Formulation	Zn rate (lb/A)[1]												Zn content			
		Days to 50% heading				Plant height				Grain yield at 12% moisture				Panicle initiation			
		5	10	15	Mean	5	10	15	Mean	5	10	15	Mean	5	10	15	Mean
	-(%)-					-------(cm)-------				----------(lb/A)----------				------(mg/kg)------			
Zinc Gro	35.5	101	100	102	101	87	87	89	88	6678	6871	6458	6669	26	27	28	27
Frit	31.0	101	100	101	101	88	88	88	88	6560	6960	6607	6709	27	28	28	28
Frit*	12.0	101	100	100	100	87	88	89	88	6604	7043	6501	6716	27	26	26	26
Ruffin*	10.0	102	102	99	101	90	87	87	88	6701	6627	6645	6658	25	27	27	26
Traylor*	36.0	102	101	100	101	88	88	87	87	6723	6537	7027	6762	26	27	26	26
Check	-	100	102	100	101	86	86	88	86	6727	6786	6868	6794	26	27	26	26
Zn Mean		101	101	100		87	87	88		6666	6804	6684		26	27	27	
C.V., %				1.13				3.60				4.53				6.69	
LSD (0.05):																	
Zn source				ns				ns				ns				ns	
Zn rate				ns				ns				ns				ns	

[1] Non-chelated sources applied at 5, 10, and 15 lb/A. Chelated sources applied at 0.5, 1.0, and 1.5 lb/A.
* = chelated sources.

Experiment: Foliar applied Zn

Location: Rice Research Station

Soil Type/Analysis: Crowley silt loam; pH: 7.8; O.M.: 0.75%; extractable nutrients (mg/kg): P-27, Na-94, K-103, Ca-2193, Mg-319, Zn-3.30, S-5.24, As-4.07, Fe-157.8

Variety/Seeding Rate: LCSN, 150 lb/A

Planting Method/Date: Water-seeded, Mar 28

Fertilization: 135 lb/A N, Mar 24; foliar Zn, May 4; 0-60-60 (N-P-K), May 13

Plot Size: 7 x 20 ft (140 ft^2)

Emergence Date: Apr 10

Water Management: Flooded, Mar 25; drained, Apr 1; flooded, Apr 5; drained, May 2; flooded, May 5; harvest drainage, July 29

Herbicides: 0.6 oz ai/A Londax (bensulfuron), May 16

Insecticides: 0.5 lb ai/A Furadan (carbofuran), May 16

Fungicides: None

Harvest: Aug 12

Experimental Design: Randomized complete block with three replications, treatment combinations consisting of Zn source and rate

Comments: Zinc source and rate had no significant effect on heading or plant height (Table 2). Leaf Zn content at midseason was not influenced by Zn source or rate. According to a summary of plant tissue analyses for rice, a Zn content of >20 mg/kg at the PI growth stage is considered sufficient. Therefore, a response to applied Zn would not be expected. Since grain yield was affected by both source and rate of Zn, the early-season deficiency may have been detected with a tissue sample at mid-tillering. Severe P deficiency also compromised the results of this study.

Table 2. Effect of foliar applied Zn sources and rates on agronomic performance of water-seeded Lacassine rice. Rice Research Station, Crowley, LA. 1994.

		Zn rate (lb/A)															
		Days to 50% heading				Plant height				Grain yield at 12% moisture				Zn content at panicle initiation			
Source	Formulation	0.5	1.0	1.5	Mean	0.5	1.0	1.5	Mean	0.5	1.0	1.5	Mean	0.5	1.0	1.5	Mean
	-(%)-					--------(cm)-------				----------(lb/A)----------				------(mg/kg)------			
Super Tel	35.5	102	100	101	101	85	85	84	85	6409	6593	6769	6590	24	24	23	24
ADM	8.0	102	101	102	102	84	83	86	84	6124	6450	6053	6209	25	27	25	25
Huma Gro	9.0	100	102	100	101	86	85	84	85	6120	6172	6502	6265	24	24	25	24
Traylor	7.0	101	100	101	101	86	84	84	85	6404	6787	6782	6658	24	24	24	24
Pro Sol	25.0	103	101	99	101	86	84	82	84	5810	6618	6675	6368	26	24	25	25
Check	-	101	100	100	100	83	86	85	85	6700	6744	6684	6709	26	25	24	25
Zn																	
Mean		101	101	100		85	85	84		6261	6561	6578		25	25	24	
C.V., %				1.51				2.84				6.26				5.36	
LSD (0.05):																	
Zn source				ns				ns				388				ns	
Zn rate				ns				ns				274				ns	

Experiment: Foliar nutrient x fungicide

Location: Rice Research Station

Soil Type/Analysis: Crowley silt loam; pH: 5.2; O.M.: 1.40%; extractable nutrients (mg/kg): P-26, Na-75, K-63, Ca-984, Mg-170, Zn-3.92, S-20.11, As-2.17, Fe-131.0

Variety/Seeding Rate: CPRS, 100 lb/A

Planting Method/Date: Drill-seeded, Apr 29

Fertilization: 0-45-45 (N-P-K), Apr 29; 135 lb N/A PF, May 20; 30 lb N/A, May 30

Plot Size: 7 x 25 ft (175 ft^2)

Emergence Date: May 5

Water Management: Flushed, May 9; flooded, May 20; harvest drainage, Aug 8

Herbicides: 3.0 lb ai/A Stam (propanil) + 0.5 lb ai/A Basagran (bentazon), May 17; 0.6 oz ai/A Londax (bensulfuron), June 7

Insecticides: 0.5 lb ai/A Furadan (carbofuran), June 7

Fungicides: Applied according to treatment

Harvest: Aug 19

Experimental Design: Randomized complete block with four replications

Comments: The test area was inoculated with a sheath blight (Rhizoctonia solani) culture on June 29. The Halt and Benlate treatments were applied on July 6 at the booting plant growth stage. The heading application of Halt and Benlate was applied on July 18. Days to 50% heading and plant height were not affected by any treatment (Table 1). A boot plus heading application of Halt and Benlate yielded significantly higher than the other treatments. Halt plus Benlate applied at boot also increased yield above the untreated control.

Table 1. Influence of a foliar nutrient formulation (0-5-0) and fungicide on disease development, plant growth, and grain yield of drill-seeded Cypress rice. Rice Research Station, Crowley, LA. 1994.

Treatment	Rate	Time of application	Days to 50% heading	Plant height	Grain yield at 12% moisture	Sheath Blight[1]	
						Rating	Infection
				-(cm)-	-(lb/A)-		-(%)-
Halt	16 oz	boot	80	89	6936	6.7	63
Benlate	0.5 lb	boot	79	88	7048	7.2	73
Halt + Benlate	16 oz + 0.5 lb	boot + heading	80	89	7629	6.0	62
Halt + Benlate	16 oz + 0.5 lb	boot	80	91	7244	6.7	79
Check	-	-	81	88	6800	7.2	80
C.V., %			1.22	2.66	3.30	6.30	24.37
LSD (0.05)			ns	ns	362	0.7	ns

[1] Rating based on a 0-9 scale where 0 = none (immune) and 9 = maximum (very susceptible); % infection based on number of tillers infected.

CULTURAL MANAGEMENT STUDIES

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G.R. Romero, D.M. Walker, M.J. Frey, and J. Nugent

A row spacing and arrangement study was conducted to evaluate the influence of row arrangement on plant growth, disease development, grain yields, and yield components of Cypress and Bengal. The study was drill-seeded at 75 and 100 lb seed/A for each row arrangement and variety. Rice was seeded at a constant 7-inch spacing or in a three-row arrangement alternating with a 7-inch skip. One-half of the treatment combinations was also inoculated with sheath blight.

A variety x N x water management study was conducted at the Rice Research Station to determine the influence of these factors on ratoon production. Cypress, Bengal, Jodon, and Jackson were water seeded at a rate of 150 lb/A and grown in a pinpoint flood system. Variable rates of N ranging from 0 to 120 lb/A were applied after main crop harvest prior to flooding. Water management strategies included floodup immediately after harvest (3 days) and a delayed flood establishment (12 days). Days to 50% heading in the ratoon, tiller production, grain yield, and yield components were determined.

A study was conducted in Acadia Parish to determine the influence of main crop harvest method on ratoon production of several rice varieties. The main crop was harvested by either a conventional cutter bar header or a stripper header. Ratoon crop grain yield and yield components were determined.

Two studies were conducted at the Rice Research Station to evaluate interactions among Bolero, fresh plant residue, and a fungal organism. The 10G and 8EC formulations were evaluated in separate tests. Plant residue was incorporated at a rate of 5 tons/A. Each Bolero formulation was applied at a rate of 4 lb ai/A. Cypress was water seeded at a rate of 150 lb/A and grown in a pinpoint flood system. An additional study evaluated the influence of a compacted vs fluffed seedbed on rice growth when preplant Bolero was applied.

Experiment: Row spacing and arrangement

Location: Rice Research Station

Soil Type/Analysis: Crowley silt loam; pH: 6.5; O.M.: 1.03%; extractable nutrients (mg/kg): P-19, Na-74, K-56, Ca-1263, Mg-210, Zn-3.37, S-5.89, As-1.92, Fe-99.67

Variety/Seeding Rate: CPRS, BNGL, 100 lb/A

Planting Method/Date: Drill-seeded, Apr 20

Fertilization: 45 lb/A P-K, Apr 20; 135 lb N/A PF, May 13; 90 lb/A ratoon crop N

Plot Size: 7 x 25 ft (175 ft^2)

Emergence Date: Apr 25

Water Management: Flushed, Apr 29; permanent flood, May 13; harvest drainage, July 28; ratoon flooded, Aug 12; harvest drainage, Oct 11

Herbicides: 3.0 lb ai/A Stam (propanil), May 10; 0.9 oz ai/A Londax (bensulfuron), June 1

Insecticides: 0.5 lb ai/A Furadan (carbofuran), May 31

Fungicides: None

Harvest: Aug 11, Oct 26

Experimental Design: Randomized complete block with four replications, factorial arrangement of variety, row arrangement, seeding rate, and inoculation

Comments: Main crop grain yield of Bengal was significantly lower than Cypress and was probably due to blast (Table 1). Ratoon yield of Bengal was significantly higher, and total yields were similar. An interaction occurred between variety and row arrangement for main crop and total yields. Yield reduction was much greater for Cypress than Bengal with a 7" x 3 rows + 7" skip. An interaction also occurred between varieties and inoculation. Cypress yields were significantly reduced by sheath blight and Bengal yields were not affected. Sheath blight rating and % infection followed a similar pattern. Straw weight of Cypress was affected by seeding rate to a greater extent than was Bengal (Table 2). Reductions in whole plant weight, grain weight, and grain number due to inoculation were greater for Cypress. Grains per panicle and grain weight per panicle were reduced in a similar manner.

Table 1. Influence of seeding rate, row spacing and arrangement, and sheath blight on agronomic performance of drill-seeded Cypress and Bengal rice. Rice Research Station, Crowley, LA. 1994.

Variety	Row arrangement	Seeding rate	Inoculation	Days to 50% heading	Plant height	Grain yield at 12% moisture: Main crop	Grain yield at 12% moisture: Ratoon crop	Grain yield at 12% moisture: Total	Sheath blight[1]: Rating	Sheath blight[1]: Infection
		(lb/A)			(cm)	--------(lb/A)--------				(%)
Cypress	7" ||||	100	+	79	93	7239	1610	8849	7.7	52
Cypress	7" x 3 rows + 7" skip ||| |||	100	+	79	91	6470	1448	7918	4.7	44
Cypress	7" ||||	75	+	80	94	7502	1643	9145	7.7	90
Cypress	7" x 3 rows + 7" skip ||| |||	75	+	80	93	6540	1373	7914	5.0	51
Bengal	7" ||||	100	+	79	89	7035	2416	9451	7.2	83
Bengal	7" x 3 rows + 7" skip ||| |||	100	+	79	91	6590	2248	8838	4.2	36
Bengal	7" ||||	75	+	80	89	7010	2398	9409	7.5	77
Bengal	7" x 3 rows + 7" skip ||| |||	75	+	80	89	6384	2324	8707	4.0	28
Cypress	7" ||||	100	-	79	94	8273	2128	10402	4.5	35
Cypress	7" x 3 rows + 7" skip ||| |||	100	-	79	92	7445	1992	9437	3.7	16
Cypress	7" ||||	75	-	79	94	8468	2240	10708	5.5	21
Cypress	7" x 3 rows + 7" skip ||| |||	75	-	81	94	7312	1937	9249	3.0	11
Bengal	7" ||||	100	-	79	90	6977	2320	9297	5.2	17
Bengal	7" x 3 rows + 7" skip ||| |||	100	-	78	89	6635	2221	8856	3.2	16
Bengal	7" ||||	75	-	79	90	6866	2422	9288	4.2	19
Bengal	7" x 3 rows + 7" skip ||| |||	75	-	79	89	6625	2347	8972	3.5	13
C.V., %				1.37	1.99	3.65	10.63	4.25	15.8	33.9
						Main effects				
Seeding rate:										
100				79	91	7083	2048	9131	5.2	40.1
75				80	92	7088	2086	9174	4.9	36.3
LSD (0.05)[2]				1	ns	ns	ns	ns	ns	ns

Continued.

Table 1. Continued.

	Days to 50% heading	Plant height	Grain yield at 12% moisture			Sheath blight[1]	
			Main crop	Ratoon crop	Total	Rating	Infection
		(cm)	--------(lb/A)--------				(%)
Variety:							
Cypress	80	93	7406	1797	9203	6.0	57.9
Bengal	79	89	6765	2337	9102	4.1	18.6
LSD (0.05)	ns	1	130	111	ns	0.4	6.5
Row:							
7"	79	92	7421	2147	9569	5.1	37.5
7" x 3 rows + 7" skip	80	91	6750	1986	8736	5.1	39.0
LSD (0.05)	ns	ns	130	111	196	ns	ns
Inoculation:							
+	80	91	6846	1933	8779	6.2	49.5
-	79	92	7325	2201	9526	3.9	27.0
LSD (0.05)	ns	ns	130	111	196	0.4	6.5
Variety x Seeding rate	ns	ns	ns	ns	ns	ns	ns
Variety x Row	ns	ns	*	ns	*	ns	ns
Seeding rate x Row	ns	ns	ns	ns	ns	ns	ns
Variety x Seeding rate x Row	ns	ns	ns	ns	ns	ns	*
Variety x Inoculation	ns	ns	*	*	*	*	*
Seeding rate x Inoculation	ns	ns	ns	ns	ns	ns	ns
Variety x Seeding rate x Inoculation	ns	ns	ns	ns	ns	ns	*
Row x Inoculation	ns	ns	ns	ns	ns	ns	ns
Variety x Row x Inoculation	ns	ns	ns	ns	ns	ns	ns
Seeding rate x Row x Inoculation	ns	ns	ns	ns	ns	ns	ns
Variety x Seeding rate x Row x Inoculation	ns	ns	ns	ns	ns	ns	ns

[1] Rating based on 0-9 scale where 0 = none (immune) and 9 = maximum (very susceptible). Infection based on % tillers infected.
[2] ns = nonsignificant; * denotes significance at P = 0.05.

Table 2. Influence of row spacing and arrangement on yield components of drill-seeded Cypress and Bengal rice. Rice Research Station, Crowley, LA. 1994.

Variety	Row arrangement	Seeding rate	Inoculation	Whole plant weight	Straw weight	Grain weight	Grain number	Panicle number	Grains per panicle	Grain weight per panicle	1000-grain weight
		(lb/A)		----------(g/7 ft²)----------				(7 ft²)		----------(g)----------	
Cypress	7"	100	+	1128	625	503	23235	391	59	1.28	21.64
Cypress	7" x 3 rows + 7" skip	100	+	1008	589	419	19364	362	54	1.16	21.63
Cypress	7"	75	+	1152	677	475	22003	396	55	1.20	21.65
Cypress	7" x 3 rows + 7" skip	75	+	1078	637	441	21066	354	60	1.25	20.94
Bengal	7"	100	+	1225	753	472	20525	309	66	1.52	23.01
Bengal	7" x 3 rows + 7" skip	100	+	1093	672	421	18757	283	67	1.50	22.46
Bengal	7"	75	+	1158	704	454	19960	290	70	1.58	22.74
Bengal	7" x 3 rows + 7" skip	75	+	1057	628	429	19579	250	80	1.75	21.94
Cypress	7"	100	-	1221	663	558	25656	395	65	1.41	21.74
Cypress	7" x 3 rows + 7" skip	100	-	1103	613	490	23048	373	62	1.31	21.29
Cypress	7"	75	-	1211	651	561	26065	390	67	1.44	21.52
Cypress	7" x 3 rows + 7" skip	75	-	1157	639	518	25411	329	80	1.61	20.40
Bengal	7"	100	-	1162	712	450	20203	293	69	1.54	22.32
Bengal	7" x 3 rows + 7" skip	100	-	1139	710	429	19178	289	66	1.49	22.36
Bengal	7"	75	-	1170	703	466	20646	286	72	1.63	22.62
Bengal	7" x 3 rows + 7" skip	75	-	1095	677	418	18946	266	71	1.58	22.09
C.V., %				6.13	8.04	7.09	7.29	8.88	11.94	10.87	2.91
						Main effects					
Seeding rate:											
100				1135	667	468	21246	337	64	1.40	22.1
75				1135	664	470	21710	320	69	1.51	21.7
LSD (0.05)[1]				ns	ns	ns	ns	15	4	.08	ns
Variety:											
Cypress				1132	637	496	23231	374	63	1.33	21.3
Bengal				1137	695	442	19724	283	70	1.57	22.4
LSD (0.05)				ns	27	17	788	15	4	0.08	0.3

Continued.

Table 2. Continued.

	Whole plant weight	Straw weight	Grain weight	Grain number	Panicle number	Grains per panicle	Grain weight per panicle	1000-grain weight
	----------(g/7 ft²)----------				(7 ft²)		----------(g)----------	
Row:								
7"	1178	686	492	22287	344	65	1.45	22.1
7" x 3 rows + 7" skip	1091	646	446	20669	313	67	1.46	21.7
LSD (0.05)	35	27	17	788	15	ns	ns	0.3
Inoculation:								
+	1112	661	452	20561	330	64	1.41	22.0
-	1157	671	486	22394	328	69	1.50	21.8
LSD (0.05)	35	ns	17	788	ns	4	0.8	ns
Variety x Seeding rate	ns	*	ns	ns	ns	ns	ns	ns
Variety x Row	ns	ns	ns	ns	ns	ns	ns	ns
Seeding rate x Row	ns	ns	ns	ns	ns	*	*	ns
Variety x Seeding rate x Row	ns	ns	ns	ns	ns	ns	ns	ns
Variety x Inoculation	*	ns	*	*	ns	*	*	ns
Seeding rate x Inoculation	ns	ns	ns	ns	ns	ns	ns	ns
Variety x Seeding rate x Inoculation	ns	ns	ns	ns	ns	ns	ns	ns
Row x Inoculation	ns	ns	ns	ns	ns	ns	ns	ns
Variety x Row x Inoculation	ns	ns	ns	ns	ns	ns	ns	ns
Seeding rate x Row x Inoculation	ns	ns	ns	ns	ns	ns	ns	ns
Variety x Seeding rate x Row x Inoculation	ns	ns	ns	ns	ns	ns	ns	ns

[1] ns = nonsignificant; * denotes significance at P = 0.05.

Experiment: Ratoon variety x N rate x water management

Location: Rice Research Station

Soil Type/Analysis: Crowley silt loam; pH: 5.7; O.M.: 1.25%; extractable nutrients (mg/kg): P-29, Na-61, K-68, Ca-1148, Mg-217, Zn-7.83, S-10.80, As-1.73, Fe-152.1

Variety/Seeding Rate: CPRS, BNGL, JDON, JKSN, 150 lb/A

Planting Method/Date: Water-seeded, Mar 25

Fertilization: 135-45-45 (N-P-K) lb/A ppi; N source, ammonium sulfate; 0.54 lb/A zinc (foliar), Apr 20; ratoon crop, variable N rates

Plot Size: 7 x 25 ft (175 ft^2)

Emergence Date: CPRS, Apr 1; BNGL, JKSN, Apr 2; JDON, Apr 3

Water Management: Flooded, Mar 24; drained, Apr 1; reflooded, Apr 5; harvest drainage, July 15; ratoon crop flooded, Aug 1 (early) and Aug 9 (delayed); harvest drainage, Oct 17

Herbicides: 0.6 oz ai/A Londax (bensulfuron), Apr 18

Insecticides: 0.5 lb ai/A Furadan (carbofuran), Apr 28

Fungicides: 0.75 lb ai/A Benlate (benomyl), June 17

Harvest: Main crop, July 29; ratoon crop, Nov 1

Experimental Design: Split plot in a randomized complete block with four replications, water management assigned to main plots and a factorial arrangement of varieties and N rates to subplots

Comments: Differences in ratoon heading due to variety or N were slight (Table 1), and water management had no effect. N rate influenced tiller and panicle production and grain yields. Bengal produced the highest ratoon yield, Cypress and Jodon were similar, and yield of Jackson was significantly decreased. Whole plant and straw weight increased with delayed flood (Table 2), but 1000-grain weight decreased. N increased whole plant, straw, and grain weight. Whole plant, straw, and 1000-grain weight of Bengal were significantly higher than the other varieties. Grain weight of Jackson was much lower.

Table 1. Influence of water management (WM) and N rate on ratoon performance of water-seeded rice varieties. Rice Research Station, Crowley, LA. 1994.

Variety	N rate	Days to 50% heading		Tillers		Panicles		Grain yield at 12% moisture	
		Early	Delayed	Early	Delayed	Early	Delayed	Early	Delayed
	(lb/A)			(no/3 ft²)				(lb/A)	
Cypress	0	47	48	39	32	130	123	2069	2022
Cypress	30	47	48	45	31	130	123	2218	2547
Cypress	60	47	48	44	49	132	152	2472	2945
Cypress	90	47	48	49	37	158	133	2761	2973
Cypress	120	48	48	47	42	144	132	2664	2947
Bengal	0	45	47	24	25	105	103	1856	2158
Bengal	30	46	47	32	34	117	127	2586	2707
Bengal	60	46	47	36	34	117	127	3005	3063
Bengal	90	46	47	35	29	116	127	2761	3154
Bengal	120	46	48	43	32	140	146	2817	3154
Jodon	0	46	48	46	39	153	124	2016	2044
Jodon	30	46	48	41	36	104	156	2330	2453
Jodon	60	46	48	44	48	146	148	2475	2842
Jodon	90	47	48	44	41	134	138	2445	3055
Jodon	120	46	48	45	44	153	141	2474	2740
Jackson	0	48	47	30	32	90	99	1690	1618
Jackson	30	50	49	29	37	87	112	1854	2111
Jackson	60	49	50	35	37	99	122	1920	2410
Jackson	90	50	49	35	39	99	121	2133	2463
Jackson	120	50	51	35	39	109	119	2064	2308
WM mean		47	48	39	37	123	129	2330	2586
C.V., %		2.18		21.45		15.12		11.51	
LSD (0.05):[1]		ns		ns		ns		ns	
Nitrogen (N) mean									
0		47		34		116		1934	
30		48		36		120		2351	
60		48		41		130		2641	
90		48		39		128		2718	
120		48		41		135		2646	
LSD (0.05):		1		4		6		140	
Variety (V) mean									
Cypress		48		42		136		2562	
Bengal		47		32		123		2726	
Jodon		47		43		140		2488	
Jackson		49		35		106		2057	
LSD (0.05):		1		4		5		125	
Main effect interactions									
V x N		ns		ns		ns		ns	
V x WM		*		*		ns		ns	
N x WM		ns		ns		*		ns	
V x N x WM		ns		ns		ns		ns	

[1] ns = nonsignificant; * denotes significance at P = 0.05.

Table 2. Influence of water management (WM) and N rate on ratoon yield components of water-seeded rice varieties. Rice Research Station, Crowley, LA. 1994.

Variety	N rate	Whole plant weight		Straw weight		Grain weight		1000-grain weight	
		Early	Delayed	Early	Delayed	Early	Delayed	Early	Delayed
	(lb/A)	(g/3 ft²)						(g)	
Cypress	0	196	186	124	121	71	65	22	22
Cypress	30	217	232	142	153	75	79	22	22
Cypress	60	240	295	152	195	88	99	22	21
Cypress	90	267	283	171	193	96	90	21	21
Cypress	120	278	258	181	176	97	82	21	21
Bengal	0	237	233	174	165	63	69	26	26
Bengal	30	254	316	172	222	82	94	26	25
Bengal	60	280	327	185	226	94	101	25	25
Bengal	90	285	331	206	235	79	96	24	23
Bengal	120	322	384	234	214	88	96	24	24
Jodon	0	224	185	149	115	75	70	24	23
Jodon	30	200	233	133	149	67	84	23	22
Jodon	60	239	260	159	174	80	86	22	22
Jodon	90	237	267	153	188	84	79	22	21
Jodon	120	283	281	184	203	99	77	22	21
Jackson	0	188	180	119	127	69	54	22	22
Jackson	30	184	260	122	188	62	72	21	21
Jackson	60	218	285	147	205	71	80	22	20
Jackson	90	239	296	163	219	76	77	21	20
Jackson	120	265	335	188	263	77	71	21	20
WM mean		243	271	163	187	80	81	23	22
C.V., %		12.62		19.10		14.35		2.87	
LSD (0.05):[1]		ns		ns		ns		1	
Nitrogen (N) mean									
0		204		137		67		23	
30		237		160		77		23	
60		268		180		87		22	
90		276		191		85		22	
120		301		205		86		22	
LSD (0.05):		16		16		6		1	
Variety (V) mean									
Cypress		245		161		84		22	
Bengal		297		203		86		25	
Jodon		241		161		80		22	
Jackson		245		174		71		21	
LSD (0.05):		14		15		5		1	
Main effect interactions									
V x N		ns		ns		ns		ns	
V x WM		*		*		ns		ns	
N x WM		*		*		*		*	
V x N x WM		ns		ns		ns		ns	

[1] ns = nonsignificant; * denotes significance at P = 0.05.

Experiment: Stripper header effects on ratoon performance

Location: Acadia Parish, Fred Zaunbrecher Farm

Variety: JKSN, CPRS, MARS

Planting Method: Water-seeded

Fertilization: Ratoon crop, 75 lb N/A

Plot Size: 10 x 25 ft (250 ft^2)

Experimental Design: Paired plots (stripper vs conventional main crop harvest) with 10 replications for yield determinations and 15 replications for yield components

Comments: Grain yield of Cypress was significantly higher when the main crop was harvested with a conventional header (Table 1). Grain weight, number, and grains per panicle were higher with the conventional header. Yield components of Cypress in a different field responded similarly. Yield of Jackson was unaffected by harvest method even though most yield components were significantly higher with the stripper. Grain weight, grain number, and grains per panicle were significantly higher in Mars when the main crop was stripped.

Table 1. Influence of main crop harvest method on ratoon crop production. Fred Zaunbrecher Farm, Acadia Parish, LA. 1994.

Harvest	Grain yield at 12% moisture	Panicle number	Grain weight	Grain number	Grains per panicle
	-(lb/A)-	---------(3 ft^2)--------			
Jackson:					
Conventional	2313	90	56	2505	28
Stripped	2275	99	71	3295	33
C.V., %	7.91	18.32	24.68	22.94	18.68
LSD (0.05)	ns	ns	12	498	4
Cypress:					
Conventional	2637	127	70	3354	26
Stripped	2090	121	54	2745	23
C.V., %	6.45	11.90	18.32	17.44	15.39
LSD (0.05)	143	ns	8	398	3
Cypress:[1]					
Conventional	--	168	112	5412	32
Stripped	--	173	88	4493	26
C.V., %		11.63	11.02	10.58	11.99
LSD (0.05)		ns	8	392	3
Mars:[1]					
Conventional	--	56	38	1600	30
Stripped	--	55	47	2059	37
C.V., %		19.22	28.38	28.01	27.52
LSD (0.05)		ns	9	383	7

[1] Grain yield was not determined.

Experiment: Bolero 10G x plant residue x fungus interaction

Location: Rice Research Station, South Unit

Soil Type/Analysis: Crowley silt loam; pH: 6.2; O.M.: 1.46%; extractable nutrients (mg/kg): P-50, Na-86, K-59, Ca-1326, Mg-327, Zn-6.50, S-7.16, As-2.77, Fe-175.0

Variety/Seeding Rate: CPRS, 150 lb/A

Planting Method/Date: Water-seeded, May 30

Fertilization: 40 lb/A P_2O_5 and K_2O, 135 lb N/A (urea) PPI, May 24; 69 lb N/A, July 7

Plot Size: 7 x 25 ft (175 ft^2)

Emergence Date: Data not taken

Water Management: Flooded, May 26; drained, June 2; permanent flood, June 5; harvest drainage, Aug 28

Herbicides: Bolero 10G applied May 27

Insecticides: 0.5 lb ai/A Furadan (carbofuran), June 27

Fungicides: None

Harvest: Sep 12

Experimental Design: Randomized complete block with four replications

Comments: The test area was prepared on May 24. Fresh plant residue (5 tons/A) and a fungal culture were incorporated with a power mulcher. Visual differences in stand density were first observed at the 4-leaf stage. Physiological symptoms consistent with previous documentation began to appear, although, overall injury was minor. Maturity was delayed 3 to 4 days in all treatments containing Bolero 10G (Table 2). The Bolero x plant residue combination significantly decreased grain yield when compared with all other treatments. The Bolero x plant residue x fungus combination reduced yield to a lesser extent.

Table 2. Influence of Bolero 10G, plant residue, and fungi on water-seeded Cypress rice. Rice Research Station, South Unit, Crowley, LA. 1994.

Treatment combination[1]			Days to 50% heading	Plant height	Grain yield at 12% moisture
Bolero	Plant residue	Fungus			
				(cm)	(lb/A)
+	-	-	75	81	4431
+	-	+	75	84	4809
+	+	-	75	75	2965
+	+	+	76	78	3760
-	-	-	72	78	4710
-	-	+	71	77	4836
-	+	-	72	74	4270
-	+	+	72	76	4402
C.V.%			0.80	5.71	13.29
LSD (0.05)			1	ns	835

[1] Treatments consist of all possible combinations of Bolero (4.0 lb ai/A), plant residue, and fungus.

Experiment: Bolero 8EC x plant residue x fungus interaction

Location: Rice Research Station, South Unit

Soil Type/Analysis: Crowley silt loam; pH: 6.2; O.M.: 1.46%; extractable nutrients (mg/kg): P-50, Na-86, K-59, Ca-1326, Mg-327, Zn-6.50, S-7.16, As-2.77, Fe-175.0

Variety/Seeding Rate: CPRS, 150 lb/A

Planting Method/Date: Water-seeded, May 30

Fertilization: 40 lb/A P_2O_5 and K_2O, 135 lb N/A (urea) PPI, May 24; 69 lb N/A, July 7

Plot Size: 7 x 25 ft (175 ft^2)

Emergence Date: Data not taken

Water Management: Flooded, May 26; drained, June 2; permanent flood, June 5; harvest drainage, Aug 28

Herbicides: PPS Bolero 8EC applied May 25

Insecticides: 0.5 lb ai/A Furadan (carbofuran), June 27

Fungicides: None

Harvest: Sep 12

Experimental Design: Randomized complete block with four replications

Comments: The test area was prepared on May 24. Fresh plant residue (5 tons/A) and a fungal culture were incorporated with a power mulcher. Visual differences in stand density were first observed at the 4-leaf stage. Physiological symptoms consistent with previous documentation began to appear, although, overall injury was minor. Maturity was delayed 2 days in all treatments containing Bolero 8EC (Table 3). The Bolero x plant residue combination significantly decreased grain yield when compared with treatments without Bolero and plant residue. Yields were generally lower in all treatments containing Bolero. These yield reductions were not significant due to the high CV in this study.

Table 3. Influence of Bolero 8EC, plant residue, and fungi on water-seeded Cypress rice. Rice Research Station, South Unit, Crowley, LA. 1994.

Treatment combination[1]			Days to	Plant	Grain yield at
Bolero	Plant residue	Fungus	50% heading	height	12% moisture
				(cm)	(lb/A)
+	-	-	75	81	4046
+	-	+	75	80	3828
+	+	-	76	75	2458
+	+	+	76	76	3199
-	-	-	74	79	4932
-	-	+	74	80	5332
-	+	-	73	80	4783
-	+	+	73	79	4505
C.V.%			1.61	5.99	30.50
LSD (0.05)			2	ns	1855

[1] Treatments consist of all possible combinations of Bolero (4.0 lb ai/A), plant residue, and fungus.

Experiment: Seedbed compaction x Bolero

Location: Rice Research Station, South Unit

Soil Type/Analysis: Crowley silt loam; pH: 6.2; O.M.: 1.46%; extractable nutrients (mg/kg): P-50, Na-86, K-59, Ca-1326, Mg-327, Zn-6.50, S-7.16, As-2.77, Fe-175.0

Variety/Seeding Rate: CPRS, 150 lb/A

Planting Method/Date: Water-seeded, May 30

Fertilization: 40 lb/A P_2O_5 and K_2O, 135 lb N/A (urea) PPI, May 24; 69 lb N/A, July 7

Plot Size: 7 x 25 ft (175 ft^2)

Emergence Date: Data not taken

Water Management: Flooded, May 26; drained, June 2; permanent flood, June 5; harvest drainage, Aug 28

Herbicides: Bolero EC applied May 25; Bolero 10G applied June 13

Insecticides: 0.5 lb ai/A Furadan (carbofuran), June 27

Fungicides: None

Harvest: Sept 12

Experimental Design: Randomized complete block with four replications

Comments: The test area was prepared on May 24. Compacted seedbeds were formed by rolling with a water-filled roller after the seedbed was prepared. Fluffed seedbeds were formed with a power mulcher after final seedbed preparation. Seedbed preparation had no effect on phytotoxicity of the Bolero treatments. Maturity was only delayed 1 to 2 days in the Bolero treatments when compared with the untreated control (Table 4). Plant height and grain yield were not affected by Bolero application or seedbed preparation.

Table 4. Influence of seedbed preparation and Bolero application on water-seeded Cypress rice. Rice Research Station, South Unit, Crowley, LA. 1994.

Treatment combination[1]		Days to	Plant	Grain yield at
Seedbed	Bolero application	50% heading	height	12% moisture
	-(lb ai/A)-		(cm)	(lb/A)
Compacted	2 EC	76	87	5501
Compacted	3 EC	76	85	5396
Compacted	4 EC	76	82	4711
Compacted	2 EC + 2 10G	76	85	5367
Compacted	-	74	84	5133
Fluffed	2 EC	76	85	5659
Fluffed	3 EC	77	82	4770
Fluffed	4 EC	76	85	5665
Fluffed	2 EC + 2 10G	76	88	5725
Fluffed	-	75	84	5471
C.V.%		1.27	3.40	14.92
LSD (0.05)		1	ns	ns
Contrast:				
Compacted vs fluffed		ns	ns	ns

[1] Compacted seedbeds were rolled to compress soil after final preparation. Fluffed seedbeds were formed with a power mulcher. Bolero EC treatments were applied after seedbed preparation and before flooding. Bolero 10G sequential treatments were applied 13 days after planting.

CONSERVATION TILLAGE STUDIES

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Studies relating to conservation tillage conducted in 1994 included a (1) preplant herbicide burndown evaluation, (2) variety by N by tillage study, (3) no-till stand establishment study, and (4) land preparation by weed management study.

In the no-till, preplant burndown study, Roundup D-Pak (glyphosate), Gramoxone Extra (paraquat), and Ignite (glufosinate) were evaluated alone and in combination with Facet (quinclorac), Bolero (thiobencarb), and Harmony Extra (thifensulfuron + tribenuron). All treatments were applied with 1/2% Triton AG98 surfactant. Treatment combinations and rates of application are shown in Table 1. Treatments were rated for percent weed control 12 days after planting. Days to 50% heading, plant height, and grain yield were determined.

The varieties Lacassine, Cypress, Bengal, and Jodon were evaluated in a variety by N by tillage study. Roundup plus 1/2% surfactant were applied 21 days prior to drill seeding. Nitrogen was applied as single applications at rates including 90, 120, 150, and 180 lb/A PF. The 150 lb N/A rate was also applied as a two-way split (100 PF + 50 PI). Days to 50% heading, plant height, lodging, and grain yield were determined.

Preplant vegetation management, water management, and varieties were evaluated in the no-till stand establishment study. Three methods of preplant vegetation management included no herbicide termination of preplant vegetation, herbicide termination of preplant vegetation (Roundup plus 2,4-D), and herbicide termination of preplant vegetation followed by grooving. Three water management practices included a pinpoint flood (flood established 4 days after initial drain), delayed pinpoint flood (flood established 10 days after initial drain), and a delayed flood (flood established 20 days after initial drain). The delayed pinpoint flood and delayed flood treatments were flushed as needed prior to permanent flood establishment. Six varieties were evaluated and included Cypress, Bengal, Jodon, Lacassine, Kaybonnet, and Jackson. Seed to soil contact was evaluated 8 days after planting, and stand density was determined 21 days after planting. Days to 50% heading, plant height, and grain yield were determined.

Conventional tillage, a stale seedbed with native vegetation, and a wheat cover crop were compared in the land preparation by weed management study. This study was conducted in both water-seeded, pinpoint flood and drill-seeded cultural systems. Seedbeds for the stale seedbed and wheat cover crop treatments were established in November 1993. Four levels of weed management were evaluated in each cultural system. In the water-seeded system, weed control consisted of (1) burndown alone

(Roundup plus 2,4-D), (2) burndown followed by Stam (4.0 lb ai/A) early post, (3) burndown followed by Stam (3.0 lb ai/A) early post and Ordram (3.0 lb ai/A) late post, and (4) burndown followed by Bolero (3.0 lb ai/A) preplant and Stam + Basagran (3.0 lb ai/A + 0.5 lb ai/A) late post. In the drill-seeded system, weed control consisted of (1) burndown alone (Roundup plus 2,4-D), (2) burndown followed by Stam (4.0 lb ai/A) early post, (3) burndown followed by Arrosolo (2.0 lb ai/A + 2.0 lb ai/A) early post and Stam (3.0 lb ai/A) late post, and (4) burndown followed by Bolero plus Facet (3.0 lb ai/A + .375 lb ai/A) delayed preemergence and Stam (3.0 lb ai/A) late post. Weed control was evaluated 24 and 28 days after planting in the water- and drill-seeded cultural systems, respectively. Weed number and control were determined in each system prior to harvest. Days to 50% heading, plant height, and grain yield were also determined.

Experiment: Preplant burndown

Location: Rice Research Station, South Unit

Soil Type/Analysis: Crowley silt loam; pH: 5.8; O.M.: 1.77%; extractable nutrients (mg/kg): P-48, Na-50, K-99, Ca-1585, Mg-269, Zn-2.04, S-6.58, As-1.88, Fe-151.1

Variety/Seeding Rate: CPRS, 150 lb/A

Planting Method/Date: Water-seeded, Apr 15

Fertilization: 40 lb/A P_2O_5 and K_2O, Fall 1993; 90 lb N/A (urea) PF, May 5; 67 lb N/A, May 19

Plot Size: 9 x 25 ft (225 ft^2)

Emergence Date: Data not taken

Water Management: Flooded, Apr 13; drained, Apr 18; permanent flood, Apr 25; harvest drainage, Aug 2

Herbicides: Treatments applied Apr 8

Insecticides: 0.5 lb ai/A Furadan (carbofuran), May 19

Fungicides: 0.5 lb ai/A Benlate (benomyl), July 1

Harvest: Aug 17

Experimental Design: Randomized complete block with four replications

Comments: All burndown herbicides gave good control of most existing vegetation. Desiccation of preplant vegetation was most rapid with Gramoxone Extra, followed by Ignite and Roundup. Herbicide ratings reflect their effectiveness in controlling or suppressing weeds when applied as preplant tankmixes. Ratings were taken 12 days after planting. There were no differences in control of yellow sweetclover, little barley, and buttercup due to any herbicide or herbicide tankmix (Table 1). Weed control in the untreated check is due to flooding. Significant seedling injury occurred with all Gramoxone Extra treatments. Stand density in the Gramoxone Extra treatments was adequate up to the 3-leaf stage. Over time, stand density decreased significantly. Maturity as measured by days to 50% heading was increased 5 to 8 days. Grain yield was significantly reduced in the Gramoxone Extra treatments. There is no conclusive explanation for the yield reduction at this time.

Table 1. Preplant burndown evaluation in no-till, water-seeded Cypress rice. Rice Research Station, South Unit, Crowley, LA. 1994.

Herbicide	Rate	% Weed control[1]			Days to 50% heading	Plant height	Grain yield at 12% moisture
		SC	LB	BC			
	(lb ai/A)					(cm)	(lb/A)
Roundup	1.0	97	100	92	86	83	7229
Roundup + Facet	1.0 + .375	97	90	95	86	84	7232
Roundup + Bolero	1.0 + 4.0	100	100	97	86	85	7052
Roundup + Facet + Harmony E.	1.0 + .375 + .023	100	97	95	86	85	7370
Roundup + Bolero + Harmony E.	1.0 + 4.0 + .023	97	95	97	86	84	7416
Gramoxone E.	.63	97	100	96	91	85	5639
Gramoxone E. + Facet	.63 + .375	97	100	92	94	83	5082
Gramoxone E. + Bolero	.63 + 4.0	100	100	97	93	84	5339
Gramoxone E. + Facet + Harmony E.	.63 + .375 + .023	100	92	95	94	84	4749
Gramoxone E. + Bolero + Harmony E.	.63 + 4.0 + .023	97	97	97	95	82	4721
Ignite	.75	100	97	97	86	86	7302
Ignite + Facet	.75 + .375	92	90	85	87	83	7068
Ignite + Bolero	.75 + 4.0	100	97	97	87	83	6841
Ignite + Facet + Harmony E.	.75 + .375 + .023	100	97	99	86	84	7216
Ignite + Bolero + Harmony E.	.75 + 4.0 + .023	100	100	95	87	84	6677
Untreated	-	65	57	40	86	83	6754
C.V.%		8.21	11.10	15.50	2.46	2.36	8.49
LSD (0.05)		11	15	20	3	ns	784
Contrasts:[2]							
Burndown vs tankmix		ns	ns	ns	*	ns	ns
Facet vs Bolero		ns	ns	ns	ns	ns	ns
Facet/Bolero vs Facet/Bolero/Harmony E.		ns	ns	ns	ns	ns	ns
Burndown vs no burndown		*	*	*	ns	ns	ns

[1] SC= yellow sweetclover; LB= little barley; BC= buttercup. Weed control rating 12 days after planting.
[2] * denotes significance at P=0.05; ns = nonsignificant.

Experiment: Tillage x variety x N

Location: Rice Research Station, South Unit

Soil Type/Analysis: Crowley silt loam; pH: 5.7; O.M.: 1.47%; extractable nutrients (mg/kg): P-42, Na-42, K-72, Ca-1405, Mg-270, Zn-5.73, S-6.44, As-2.43, Fe-124.0

Variety/Seeding Rate: LCSN, CPRS, BNGL, JDON, 100 lb/A

Planting Method/Date: Drill-seeded, Apr 22

Fertilization: 40 lb/A P_2O_5 and K_2O, Fall 1993; N source urea

Plot Size: 7 x 25 ft (175 ft^2)

Emergence Date: Data not taken

Water Management: Flushed, May 7; permanent flood, May 25; harvest drainage, Aug 8

Herbicides: 1.0 lb ai/A Roundup (glyphosate) + 0.5 lb ai/A 2,4-D, Mar 30;
3.0 lb ai/A Stam (propanil) + 1.0 lb ai/A Basagran (bentazon), May 4;
3.0 lb ai/A Stam + 0.5 lb ai/A Basagran, May 18;
3.0 lb ai/A Ordram (molinate), June 17

Insecticides: 0.5 lb ai/A Furadan (carbofuran), June 7

Fungicides: 0.5 lb ai/A Benlate (benomyl), July 1

Harvest: Aug 18

Experimental Design: Split plot in a randomized complete block with four replications, tillage assigned to main plots and variety x N treatments assigned to subplots

Comments: Plant height was decreased slightly in the no-till seedbed (Table 2). A significant variety x tillage interaction occurred for grain yield. Lacassine yields were reduced in the no-till planting to a greater extent than the other varieties. Average yield of Jodon was slightly lower in the conventional seedbed than in the no-till seedbed, and was probably due to straighthead. A significant variety x N interaction also occurred. Response to the increasing rate of fertilizer N was relatively flat for all varieties except Jodon.

Table 2. Influence of tillage and N rate on performance and grain yield of drill-seeded rice varieties. Rice Research Station, Crowley, LA. 1994.

Variety	N[1] rate	Days to 50% heading		Plant height		% Lodging/type[2]		Grain yield at 12% moisture	
		Conv	No-till	Conv	No-till	Conv	No-till	Conv	No-till
				-------(cm)--------				------(lb/A)------	
Lacassine	90	88	91	92	86	0/0	0/0	7284	5976
Lacassine	120	89	92	93	85	0/0	0/0	7187	6239
Lacassine	150	90	92	92	93	0/0	0/0	7145	6280
Lacassine	100|50	89	90	88	86	0/0	0/0	6866	6393
Lacassine	180	90	93	94	87	0/0	0/0	7381	6584
Cypress	90	85	86	94	91	0/0	0/0	7928	7616
Cypress	120	85	87	96	90	0/0	0/0	8122	7501
Cypress	150	88	89	95	92	0/0	0/0	7921	7524
Cypress	100|50	85	86	96	92	0/0	0/0	7974	7754
Cypress	180	87	88	97	95	0/0	0/0	7821	7863
Bengal	90	82	82	93	87	0/0	0/0	7339	7073
Bengal	120	83	83	94	89	0/0	0/0	7421	6945
Bengal	150	84	84	92	92	0/0	0/0	7493	7475
Bengal	100|50	82	82	91	89	0/0	0/0	7259	7066
Bengal	180	84	84	96	91	0/0	0/0	7302	7401
Jodon	90	83	83	92	90	0/0	0/0	5744	6273
Jodon	120	84	84	96	89	0/0	0/0	7165	6729
Jodon	150	84	84	98	92	0/0	0/0	7521	7485
Jodon	100|50	83	85	93	92	0/0	0/0	5781	6466
Jodon	180	84	84	98	95	0/0	0/0	7058	8105
Tillage (T) mean		86	86	94	90			7286	7037
C.V., %		1.51		3.51				8.69	
LSD (0.05):[3]									
Tillage		ns		2				ns	
Nitrogen (N) mean									
90		85		91				6904	
120		86		92				7164	
150		87		93				7355	
100|50		86		91				6945	
180		87		94				7439	
LSD (0.05):		1		2				308	
Variety (V) mean									
Lacassine		90		90				6733	
Cypress		87		94				7802	
Bengal		83		92				7277	
Jodon		84		94				6833	
LSD (0.05):		1		1				276	
Main effect interactions[3]									
V x N		ns		ns				*	
V x T		*		ns				*	
N x T		ns		*				ns	
V x N x T		ns		ns				ns	

[1] Two-way application of 150 lb N/A applied as 100 lb preflood and 50 lb at panicle initiation.
[2] Lodging rate in percent/lodging type on a scale of 1 to 5, where 1 = leaning and 5 = complete.
[3] * denotes significance at P = 0.05; ns = nonsignificant.

Experiment: Water-seeded no-till stand establishment

Location: Rice Research Station, South Unit

Soil Type/Analysis: Crowley silt loam; pH: 5.9; O.M.: 1.45%; extractable nutrients (mg/kg): P-27, Na-61, K-62, Ca-1142, Mg-241, Zn-6.48, S-5.65, As-1.42, Fe-152.1

Variety/Seeding Rate: CPRS, BNGL, JDON, LCSN, KBNT, JKSN, 150 lb/A

Planting Method/Date: Water-seeded, Apr 13

Fertilization: 40 lb/A P_2O_5 and K_2O, Fall 1993; 90 lb N/A, May 5; 67 lb N/A May 19; N source urea

Plot Size: 7 x 25 ft (175 ft^2)

Emergence Date: Data not taken

Water Management: Flooded, Apr 12; drained, Apr 15; flooded pinpoint flood and flushed delayed pinpoint and delayed flood, Apr 19; flooded delayed pinpoint and flushed delayed flood, Apr 25; flooded delayed flood, May 5; harvest drainage, Aug 3

Herbicides: 1.0 lb ai/A Roundup (glyphosate) + 0.5 lb ai/A 2,4-D, Mar 30;
3.0 lb ai/A Stam (propanil) + 1.0 lb ai/A Basagran (bentazon), May 4

Insecticides: 0.5 lb ai/A Furadan (carbofuran), May 19

Fungicides: 0.5 lb ai/A Benlate (benomyl), July 1

Harvest: Aug 16

Experimental Design: Split-split plot in a randomized complete block with four replications, water management and preplant vegetation management assigned to main plots and varieties to subplots

Comments: Stand density was decreased when preplant vegetation was not terminated with Roundup (Table 3). Stands were significantly lower for Lacassine and Bengal than the other varieties. Days to 50% heading were increased in the pinpoint flood water management treatment. Grain yields were decreased in the no burndown treatment. A significant water management x variety interaction occurred for grain yield. Yields of most varieties were greater with delayed pinpoint and delayed flood water management. Lacassine and Jackson yields were reduced in the pinpoint flood treatment to a greater extent than the other varieties. Kaybonnet was least affected by water management. Overall yields of Cypress, Jodon, and Kaybonnet were superior to those of Lacassine, Bengal, and Jackson.

Table 3. Effect of preplant vegetation management, water management, and varieties on stand establishment in water-seeded rice. Rice Research Station, South Unit, Crowley, LA. 1994.

Variety	Preplant vegetation management	Water management[1]															
		Stand density				Days to 50% heading				Plant height				Grain yield at 12% moisture			
		PP	DP	DF	Mean	PP	DP	DF	Mean	PP	DP	DF	Mean	PP	DP	DF	Mean
		----(plants/ft²)---								--------(cm)-------				----------(lb/A)----------			
Cypress	No burndown	15	16	15	15	91	85	85	87	87	81	87	85	6484	7685	6929	7033
Cypress	Burndown	16	22	29	22	85	86	85	85	85	87	81	84	7217	7613	7616	7482
Cypress	Burndown + Grooving	17	25	31	24	90	84	84	86	88	84	85	86	7261	7597	7608	7489
Bengal	No burndown	11	13	11	11	86	84	83	84	81	79	80	80	6012	6081	6870	6321
Bengal	Burndown	15	14	20	16	84	82	81	82	79	84	80	81	6675	7161	7517	7118
Bengal	Burndown + Grooving	11	22	18	17	86	83	82	83	82	83	82	82	6157	6521	7136	6605
Jodon	No burndown	12	11	13	12	84	83	81	83	80	86	84	83	6143	6311	6996	6483
Jodon	Burndown	13	19	32	22	83	79	80	81	83	84	83	83	6579	8017	8172	7589
Jodon	Burndown + Grooving	17	28	32	26	82	80	78	80	85	85	83	84	6872	7668	8152	7564
Lacassine	No burndown	6	11	7	8	97	91	88	92	84	85	81	83	4692	5662	5807	5387
Lacassine	Burndown	11	23	17	17	92	85	86	88	83	83	85	84	5462	6740	6361	6188
Lacassine	Burndown + Grooving	9	20	25	18	93	86	87	88	83	85	82	83	6014	6339	6943	6432
Kaybonnet	No burndown	33	21	17	24	86	83	85	85	101	99	100	100	8094	7148	7913	7718
Kaybonnet	Burndown	21	36	39	32	85	82	81	83	100	99	98	99	8092	8287	8794	8391
Kaybonnet	Burndown + Grooving	30	36	42	36	84	83	81	82	100	96	99	98	7882	7757	8256	7965
Jackson	No burndown	11	19	18	16	88	81	81	83	90	90	91	90	5181	7248	6788	6406
Jackson	Burndown	12	21	25	19	83	81	80	81	90	89	90	90	6636	7235	6973	6948
Jackson	Burndown + Grooving	17	22	28	22	84	81	80	82	90	90	92	91	5893	7132	6955	6660
Water management (WM) mean		15	21	23		87	83	83		87	87	87		6519	7122	7321	
C.V., %		27.54				2.11				3.89				8.66			
LSD (0.05):[2]																	
Water management		ns				3				ns				ns			

Continued

Table 3. Continued

	Water management[1]															
	Stand density				Days to 50% heading				Plant height				Grain yield at 12% moisture			
	PP	DP	DF	Mean	PP	DP	DF	Mean	PP	DP	DF	Mean	PP	DP	DF	Mean
	----(plants/ft²)---								--------(cm)-------				----------(lb/A)----------			
Preplant vegetation management (PVM) mean																
No burndown			14				86				87				6558	
Burndown			21				83				87				7286	
Burndown + grooving			24				84				87				7119	
LSD (0.05):[2]			5				1				ns				278	
Variety (V) mean																
Cypress			21				86				85				7334	
Bengal			15				83				81				6681	
Jodon			20				81				84				7212	
Lacassine			14				89				83				6002	
Kaybonnet			31				83				99				8025	
Jackson			19				82				90				6671	
LSD (0.05):			3				1				2				327	
Main effect interactions[2]																
WM x PVM			ns				ns				ns				ns	
WM x V			ns				*				ns				*	
PVM x V			ns				ns				ns				ns	
WM x PVM x V			ns				ns				ns				ns	

[1] PP = pinpoint flood; DP = delayed pinpoint flood; DF = delayed flood.
[2] * denotes significance at P = 0.05; ns = nonsignificant.

Experiment: Water-seeded land preparation x weed management

Location: Rice Research Station, South Unit

Soil Type/Analysis: Crowley silt loam; pH: 5.8; O.M.: 1.77%; extractable nutrients (mg/kg): P-48, Na-50, K-99, Ca-1585, Mg-269, Zn-2.04, S-6.58, As-1.88, Fe-151.1

Variety/Seeding Rate: CPRS, 150 lb/A

Planting Method/Date: Water-seeded, Apr 25

Fertilization: 40 lb/A P_2O_5 and K_2O, Fall 1993; 90 lb N/A (urea) PF, May 19; 67 lb N/A, June 7

Plot Size: 9 x 25 ft (225 ft^2)

Emergence Date: Data not taken

Water Management: Flooded, Apr 23; drained, Apr 27; flooded, Apr 30; drained, May 6; flooded, May 7; drained, May 17; flooded, May 19; harvest drainage, Aug 3

Herbicides: Treatments applied according to growth stage

Insecticides: 0.5 lb ai/A Furadan (carbofuran), May 31

Fungicides: 0.5 lb ai/A Benlate (benomyl), July 1

Harvest: Aug 17

Experimental Design: Split plot in a randomized complete block with four replications, land preparation assigned to main plots and herbicide treatments to subplots

Comments: Stand density and plant height were reduced in the wheat cover crop and stale seedbed (Table 4). Maturity was also delayed in these treatments. Grain yields were highest with the wheat cover crop and stale seedbed. Yields increased as the level of herbicide increased. Early-season control of ducksalad and redstem was best with the wheat cover crop (Table 5). Control also increased as the level of herbicide increased. Late-season control of redstem was similar in the wheat cover crop and stale seedbed. The highest level of herbicide provided season-long control of redstem.

Table 4. Land preparation x weed management interaction effects on water-seeded Cypress rice. Rice Research Station, South Unit, Crowley, LA. 1994.

Herbicide[2]	Time of[3] application	Rate	Land preparation[1]															
			Stand				Days to 50% heading				Plant height				Grain yield at 12% moisture			
			Conv	NTW	SB	Mean	Conv	NTW	SB	Mean	Conv	NTW	SB	Mean	Conv	NTW	SB	Mean
		(lb ai/A)	----(plants/ft²)----								--------(cm)-------				-----------(lb/A)-----------			
Burndown	-	-	28	21	20	23	75	78	78	77	92	89	91	91	5385	7589	7368	6781
Burndown/Stam	EP	4.0	29	24	22	25	75	79	79	78	94	88	90	91	5870	7570	7626	7022
Burndown/Stam/Ordram	EP/LP	3.0/3.0	30	22	23	25	75	79	78	77	96	83	90	90	5963	7027	7885	6958
Burndown/Bolero/Stam + Basagran	PP/LP	3.0/3.0+0.5	37	17	29	28	76	81	79	79	92	92	91	92	7709	7686	8080	7825
Tillage Mean			31	21	24		76	79	79		94	88	91		6232	7468	7740	
C.V.%					19.38				1.24				3.37				10.76	
LSD (0.05):[4]																		
Tillage					5				2				2				811	
Herbicide					ns				1				ns				644	
Tillage x herbicide					*				ns				*				ns	

[1] Conv = conventional tillage; NTW = no-till into wheat; SB = stale seedbed with native cover.
[2] Preplant vegetation in all treatments terminated with Roundup + 2,4-D (1.0 lb + 0.5 lb ai/A).
[3] EP = early post; LP = late post; PP = preplant.
[4] * denotes significance at P = 0.05; ns = nonsignificant.

Table 5. Land preparation x weed management interaction effects on weed control in water-seeded Cypress rice. Rice Research Station, South Unit, Crowley, LA. 1994.

Herbicide[2]	Time of[3] application	Rate	Land preparation[1]											
			Early season								Late season			
			Ducksalad				Redstem				Redstem			
			Conv	NTW	SB	Mean	Conv	NTW	SB	Mean	Conv	NTW	SB	Mean
		(lb ai/A)	(%)											
Burndown	-	-	0	85	24	36	27	75	0	34	12	60	60	44
Burndown/Stam	EP	4.0	67	98	76	80	47	87	79	71	24	67	66	52
Burndown/Stam/Ordram	EP/LP	3.0/3.0	87	95	92	91	89	90	92	90	32	59	76	56
Burndown/Bolero/Stam + Basagran	PP/LP	3.0/3.0+0.5	93	98	94	95	87	90	95	91	98	99	100	99
Tillage														
Mean			62	94	71		63	86	67		42	71	76	
C.V.%					13.72				22.25				21.76	
LSD (0.05):[4]														
Tillage					11				11				22	
Herbicide					9				13				11	
Tillage x herbicide					*				*				*	

[1] Conv = conventional tillage; NTW = no-till into wheat; SB = stale seedbed with native cover.
[2] Preplant vegetation in all treatments terminated with Roundup + 2,4-D (1.0 lb + 0.5 lb ai/A).
[3] EP = early post; LP = late post; PP = preplant.
[4] * denotes significance at P = 0.05; ns = nonsignificant.

Experiment: Drill-seeded land preparation x weed management

Location: Rice Research Station, South Unit

Soil Type/Analysis: Crowley silt loam; pH: 5.9; O.M.: 1.55%; extractable nutrients (mg/kg): P-40, Na-43, K-106, Ca-1398, Mg-257, Zn-6.78, S-6.76, As-2.64, Fe-138.4

Variety/Seeding Rate: CPRS, 100 lb/A

Planting Method/Date: Drill-seeded, Apr 22

Fertilization: 40 lb/A P_2O_5 and K_2O, Fall 1993; 90 lb N/A (urea) PF, May 19; 67 lb N/A, June 7

Plot Size: 9 x 25 ft (225 ft^2)

Emergence Date: Data not taken

Water Management: Flushed, May 7; flooded, May 19; harvest drainage, Aug 3

Herbicides: Treatments applied according to growth stage

Insecticides: 0.5 lb ai/A Furadan (carbofuran), May 31

Fungicides: 0.5 lb ai/A Benlate (benomyl), July 1

Harvest: Aug 17

Experimental Design: Split plot in a randomized complete block with four replications, land preparation assigned to main plots and herbicide treatments to subplots

Comments: Stand density was not influenced by land preparation or herbicide (Table 6). Maturity was delayed and plant height reduced slightly in the wheat cover crop and stale seedbed. Grain yields were similar with respect to land preparation. Yields increased as herbicide increased to the third level. Yields were similar for the third and fourth level of herbicides. Land preparation had no influence on early-season control of junglerice or yellow nutsedge (Table 7). Junglerice control increased as the level of herbicide increased. Yellow nutsedge control was poor in all treatments. Late-season control of barnyardgrass increased as the level of herbicide increased. Complete control occurred with the two highest levels of herbicide.

Table 6. Land preparation x weed management interaction effects on drill-seeded Cypress rice. Rice Research Station, South Unit, Crowley, LA. 1994.

Herbicide[2]	Time of[3] application	Rate	Land preparation[1]															
			Stand				Days to 50% heading				Plant height				Grain yield at 12% moisture			
			Conv	NTW	SB	Mean	Conv	NTW	SB	Mean	Conv	NTW	SB	Mean	Conv	NTW	SB	Mean
		(lb ai/A)	----(plants/ft²)---								--------(cm)-------				----------(lb/A)----------			
Burndown	-	-	20	24	22	22	83	81	82	82	94	87	91	91	5086	3917	4460	4487
Burndown/Stam	EP	4.0	23	19	22	22	83	82	81	82	93	92	91	92	5830	5681	5892	5801
Burndown/Arrosolo/Stam	EP/LP	2.0+2.0/3.0	23	21	25	23	83	82	81	82	95	91	91	92	6603	6468	6359	6477
Burndown/Bolero+Facet/Stam	DP/LP	3.0+0.375/3.0	21	21	18	20	83	81	83	83	94	89	93	92	6842	6454	6450	6582
Tillage																		
Mean			22	21	22		83	82	82		94	90	91		6090	5630	5790	
C.V.%					21.00				1.24				3.57				11.54	
LSD (0.05):[4]																		
Tillage					ns				1				3				ns	
Herbicide					ns				ns				ns				564	
Tillage x herbicide					ns				ns				ns				ns	

[1] Conv = conventional tillage; NTW = no-till into wheat; SB = stale seedbed with native cover.
[2] Preplant vegetation in all treatments terminated with Roundup + 2,4-D (1.0 lb + 0.5 lb ai/A).
[3] EP = early post; LP = late post; DP = delayed preemergence.
[4] ns = nonsignificant.

Table 7. Land preparation x weed management interaction effects on weed control in drill-seeded Cypress rice. Rice Research Station, South Unit, Crowley, LA. 1994.

Herbicide[2]	Time of[3] application	Rate	Land preparation[1]											
			Early season								Late season			
			Junglerice				Yellow nutsedge				Barnyardgrass			
			Conv	NTW	SB	Mean	Conv	NTW	SB	Mean	Conv	NTW	SB	Mean
		(lb ai/A)	(%)											
Burndown	-	-	22	19	47	30	21	17	46	28	36	20	40	32
Burndown/Stam	EP	4.0	64	91	91	82	20	22	64	35	71	85	85	80
Burndown/Arrosolo/Stam	EP/LP	2.0+2.0/3.0	100	100	97	99	26	20	55	34	100	100	98	99
Burndown/Bolero+Facet/Stam	DP/LP	3.0+0.375/3.0	100	100	100	100	39	39	60	46	100	99	100	100
Tillage														
Mean			72	77	84		27	25	56		77	76	81	
C.V.%					29.77				52.97				23.35	
LSD (0.05):														
Tillage					ns				ns				ns	
Herbicide					19				ns				15	
Tillage x herbicide					ns				ns				ns	

[1] Conv = conventional tillage; NTW = no-till into wheat; SB = stale seedbed with native cover.
[2] Preplant vegetation in all treatments terminated with Roundup + 2,4-D (1.0 lb + 0.5 lb ai/A).
[3] EP = early post; LP = late post; DP = delayed preemergence.

RICE WATER QUALITY STUDY

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A water-seeded tillage study was conducted to determine the impact of various tillage methods on the quality of rice field floodwater released during the growing season. These tillage practices were also evaluated for suppression of red rice. The tillage methods closely parallel those previously established in the ASCS cost-sharing program implemented in the Mermentau River Basin. Clear water planting (dry seedbed preparation), no-till (planting into residue with no soil disturbance), water retention for a specified period of time after mudding in (seedbed prepared under flooded conditions with no release of water for 2 weeks), and mudding in with floodwater release through a vegetated filter strip were compared with the traditional mudding in (seedbed prepared under flooded conditions with water release soon after planting).

Water quality measurements and agronomic data were collected on large, replicated plots. Water samples were collected during the initial drain, at midseason, and at harvest drain. TSS, TDS, TS, EC, pH, NH_3, TOC, ionic species and elements, fecal coliform, and pesticide residues were determined. BOD_5, suppressed BOD_{20}, and nonsuppressed BOD_{60} were determined on the initial and harvest drains. Stand density, days to 50% heading, plant height, grain yield, and milling quality were determined. Red rice establishment was determined based on stand density at harvest.

Experiment: Tillage method x water quality

Location: Rice Research Station, South Unit

Soil Type/Analysis: Crowley silt loam; pH: 5.5; O.M.: 2.02%; extractable nutrients (mg/kg): P-77, Na-75, K-158, Ca-1427, Mg-494, Zn-6.88, S-7.90, As-2.78, Fe-193.3

Variety/Seeding Rate: CPRS, 135 lb/A

Planting Method/Date: Water-seeded, Apr 11

Fertilization: 0-45-45 (N-P-K) fall 1993; 90 lb N/A 21 DAP; 67 lb N/A at midseason, May 19

Plot Size: 43 x 286 ft (12,298 ft^2)

Emergence Date: Clear water, mudding in with retention, Apr 17; mudding in, Apr 18; no-till, Apr 21

Water Management: Flooded mudding in with retention, Mar 31; flooded mudding in, clear water and no-till, Apr 10; drained, Apr 14; flooded, Apr 18; drained, Apr 30; flooded, May 5; drained, Aug 4

Herbicides: 3.0 lb ai/A Stam (propanil) + 1.0 lb ai/A Basagran (bentazon), May 4; 3.5 lb ai/A Ordram (molinate), May 10

Insecticides: 0.5 lb ai/A Furadan (carbofuran), May 19

Fungicides: 0.5 lb ai/A Benlate (benomyl), July 1

Harvest: Aug 17

Experimental Design: Randomized complete block with three replications

Comments: Emergence was slow and stand density reduced in the no-till treatment (Table 1). Maturity was delayed and grain yield slightly reduced in the no-till planting. Red rice was most severe in the clear water planting; although, there was no statistical difference due to the extreme variability.

Water quality parameters are shown in Tables 2-4. In the initial drain (Table 2), BOD values tended to be higher in the no-till planting. There was no difference in TDS, TSS, or TS between the clear water and no-till plantings. These parameters were significantly higher in the mudding in treatments. Retention of the floodwater after mudding in did reduce TDS, TSS, and TS when compared with mudding in alone. Only slight differences due to treatments were measured for the other parameters. Treatment effects were very small at the midseason and final drains (Tables 3 and 4).

Table 1. Influence of tillage on agronomic performance of water-seeded Cypress rice. Rice Research Station, South Unit, Crowley, LA. 1994.

Tillage method	Stand density	Days to 50% heading	Plant height	Grain yield at 12% moisture	Red rice
	-(ft²)-		(cm)	-(lb/A)-	(plants/A)
Clear water	21	86	95	5801	955
Mudding in	18	85	99	6024	10
Mudding in|retention	21	85	99	6106	129
No-till	12	88	92	5543	81
C.V., %	10.00	1.33	3.42	7.97	125.15
LSD (0.05)	4	2	ns	ns	ns

Table 2. Influence of tillage method on water quality of rice field floodwater (initial drain) from water-seeded Cypress rice. Rice Research Station, South Unit, Crowley, LA. 1994.[1]

Parameter	Clear water	Mudding in	Mudding in with retention	No-till	Vegetated filter strip	LSD (0.05)
BOD5 (mg/L)	8.1	9.1	9.2	17.3	7.2	5.4
BOD20 (mg/L)	16.5	17.7	19.0	30.2	15.1	9.6
BOD60 (mg/L)	30.8	39.0	37.9	53.7	37.9	ns
pH	7.3	7.3	7.2	7.1	7.3	0.1
EC (dS/m)	0.290	0.250	0.300	0.347	0.257	0.026
TSS (mg/L)	54	353	142	30	400	82
TDS (mg/L)	241	728	344	308	663	123
TS (mg/L)	299	1071	505	331	1112	157
TOC (mg/L)	41.5	44.2	42.4	41.7	34.6	5.2
Fecal (MPN/100 ml)	567	<100	167	400	200	ns
NH3-N (mg/kg)	0.144	0.671	0.240	0.147	0.381	ns
Fe (mg/L)	0.860	0.852	0.801	1.649	0.942	0.344
Mn (mg/L)	0.062	0.102	0.089	0.405	0.122	0.040
Ni (mg/L)	<0.025	<0.025	<0.025	<0.025	<0.025	ns
Al (mg/L)	0.365	0.720	0.549	0.103	0.704	0.258
Cd (mg/L)	<0.005	<0.005	<0.005	<0.005	<0.005	ns
Cu (mg/L)	0.021	0.021	0.018	0.016	0.019	ns
As (mg/L)	<0.065	<0.065	<0.065	<0.065	<0.065	ns
B (mg/L)	0.044	0.041	0.039	0.055	0.049	ns
Cr (mg/L)	0.008	0.008	0.008	0.008	0.008	ns
CO (mg/L)	<0.017	<0.0017	<0.017	<0.017	<0.017	ns
Si (mg/L)	4.2	4.9	2.2	8.9	5.1	1.2
P (mg/L)	<0.121	0.131	<0.121	0.325	0.164	0.085
Pb (mg/L)	<0.087	<0.087	<0.087	<0.087	0.087	ns
Zn (mg/L)	0.020	0.050	0.026	0.029	0.083	0.032
Mg (mg/L)	10.7	9.7	13.0	14.2	9.7	1.0
K (mg/L)	4.6	5.5	5.6	13.4	6.3	0.9
S (mg/L)	1.95	2.31	1.44	1.95	2.41	0.28
Na (mg/L)	46.0	41.6	44.0	48.2	42.8	3.2
Ca (mg/L)	18.4	17.1	21.2	24.7	17.0	2.1
F^- (mg/L)	0.546	0.592	0.781	0.910	0.555	ns
Cl^- (mg/L)	32.1	31.8	36.0	39.8	38.3	ns
Br^- (mg/L)	0.152	0.156	0.134	0.091	0.063	ns
NO_2^- (mg/L)	0.000	0.000	0.000	0.248	0.000	ns
NO_3^- (mg/L)	0.305	0.479	0.351	0.000	0.085	0.221
PO_4^{3-} (mg/L)	0.000	0.000	0.000	0.000	0.000	ns
SO_4^{2-} (mg/L)	4.96	6.06	3.21	3.93	6.11	0.82

[1] Zero values and < may indicate no measured amount at the detection limits for that particular variable.

Table 3. Influence of tillage method on water quality of rice field floodwater (midseason drain) from water-seeded Cypress rice. Rice Research Station, South Unit, Crowley, LA. 1994.[1]

Parameter	Clear water	Mudding in	Mudding in with retention	No-till	Vegetated[2] filter strip	LSD (0.05)
pH	7.1	7.2	7.1	7.3	-	0.1
EC (dS/m)	0.384	0.385	0.378	0.425	-	ns
TOC (mg/L)	59.1	42.8	45.1	50.5	45.2	ns
Fecal (MPN/100 ml)	524	1560	528	1120	-	ns
NH3-N (mg/kg)	0.133	0.150	0.163	0.217	-	ns
Fe (mg/L)	1.40	0.77	1.16	1.87	1.15	0.50
Mn (mg/L)	0.161	0.093	0.122	0.161	0.113	ns
Ni (mg/L)	<0.025	<0.025	<0.025	<0.025	<0.025	ns
Al (mg/L)	0.184	0.123	0.263	0.179	0.309	0.109
Cd (mg/L)	<0.005	<0.005	<0.005	<0.005	<0.005	ns
Cu (mg/L)	0.018	0.031	0.031	0.007	0.015	ns
As (mg/L)	<0.065	<0.065	<0.065	0.073	0.066	ns
B (mg/L)	0.077	0.075	0.071	0.065	0.070	ns
Cr (mg/L)	<0.008	<0.008	<0.008	<0.008	<0.008	ns
CO (mg/L)	<0.017	<0.017	<0.017	<0.017	<0.017	ns
Si (mg/L)	3.61	3.13	3.56	4.67	3.43	ns
P (mg/L)	0.144	<0.121	0.122	0.295	<0.121	0.122
Pb (mg/L)	<0.087	<0.087	<0.087	<0.087	<0.087	ns
Zn (mg/L)	0.020	0.020	0.040	0.013	0.027	ns
Mg (mg/L)	20.0	14.9	17.3	19.9	17.1	3.0
K (mg/L)	1.52	4.20	2.15	3.60	1.85	ns
S (mg/L)	0.534	0.482	0.438	0.467	0.576	ns
Na (mg/L)	48.0	43.3	44.9	55.1	44.9	4.6
Ca (mg/L)	30.4	27.9	28.2	26.4	28.0	ns
F^- (mg/L)	0.581	0.514	0.516	0.507	0.543	ns
Cl^- (mg/L)	20.2	14.8	19.4	27.4	17.7	3.5
Br^- (mg/L)	0.044	0.042	0.077	0.057	0.074	ns
NO_2^- (mg/L)	0.000	0.074	0.116	0.000	0.148	ns
NO_3^- (mg/L)	0.089	0.442	0.415	0.059	1.390	0.535
PO_4^{3-} (mg/L)	0.000	0.000	0.000	0.000	0.000	ns
SO_4^{2-} (mg/L)	0.890	0.618	1.164	0.763	1.038	0.352

[1] Zero values and < may indicate no measured amount at the detection limits for that particular variable.

[2] - indicates these parameters were not measured.

Table 4. Influence of tillage method on water quality of rice field floodwater (final drain) from water-seeded Cypress rice. Rice Research Station, South Unit, Crowley, LA. 1994.[1]

Parameter	Clear water	Mudding in	Mudding in with retention	No-till	Vegetated filter strip	LSD (0.05)
BOD5 (mg/L)	3.7	4.2	3.4	3.6	4.8	ns
BOD20 (mg/L)	7.9	9.6	8.4	8.0	8.7	ns
BOD60 (mg/L)	22.7	25.6	22.6	21.3	24.9	ns
pH	7.2	7.2	7.1	7.2	7.3	ns
EC (dS/m)	0.302	0.300	0.298	0.264	0.276	ns
TSS (mg/L)	7	12	9	9	13	ns
TDS (mg/L)	204	207	191	170	189	ns
TS (mg/L)	209	218	209	190	205	ns
TOC (mg/L)	18.3	20.3	19.5	19.2	22.2	ns
Fecal (MPN/100 ml)	123	160	13	1153	6947	ns
NH3-N (mg/kg)	0.110	0.113	0.153	0.103	0.117	ns
Fe (mg/L)	1.551	1.423	1.645	0.781	1.047	ns
Mn (mg/L)	0.096	0.101	0.076	0.052	0.072	ns
Ni (mg/L)	<0.025	<0.025	<0.025	<0.025	<0.025	ns
Al (mg/L)	0.026	0.021	0.045	0.041	0.047	ns
Cd (mg/L)	<0.005	0.006	<0.005	0.006	<0.005	ns
Cu (mg/L)	0.005	<0.004	0.005	<0.004	0.005	ns
As (mg/L)	<0.065	<0.065	<0.065	<0.065	<0.065	ns
B (mg/L)	0.073	0.085	0.077	0.082	0.080	ns
Cr (mg/L)	<0.008	<0.008	<0.008	<0.008	<0.008	ns
CO (mg/L)	<0.017	<0.017	<0.017	<0.017	<0.017	ns
Si (mg/L)	3.8	3.6	4.4	2.4	4.9	0.7
P (mg/L)	0.256	0.288	0.256	0.147	0.474	0.069
Pb (mg/L)	<0.087	<0.087	<0.087	<0.087	<0.087	ns
Zn (mg/L)	0.020	0.018	0.024	0.019	0.028	ns
Mg (mg/L)	10.8	10.8	10.2	9.4	9.3	ns
K (mg/L)	8.4	8.6	8.0	3.0	10.3	2.3
S (mg/L)	0.344	0.436	0.388	0.315	0.720	ns
Na (mg/L)	36.1	34.5	34.2	36.2	30.6	ns
Ca (mg/L)	12.1	11.4	11.1	7.8	10.7	2.7
F^- (mg/L)	0.324	0.369	0.307	0.302	0.341	ns
Cl^- (mg/L)	33.0	33.6	33.4	24.6	30.1	ns
Br^- (mg/L)	0.389	0.402	0.377	0.276	0.359	0.069
NO_2^- (mg/L)	0.000	0.000	0.000	0.000	0.000	ns
NO_3^- (mg/L)	0.409	0.344	0.259	0.446	0.515	ns
PO_4^{3-} (mg/L)	0.035	0.000	0.000	0.000	0.071	0.394
SO_4^{2-} (mg/L)	0.882	1.115	0.842	0.624	1.841	ns

[1] Zero values and < may indicate no measured amount at the detection limits for that particular variable.

FOUNDATION SEED RICE PROGRAM

Lawrence M. White, III

INTRODUCTION

Foundation seed rice has been produced by the Rice Research Station for distribution to Louisiana farmers since 1949. The station's seed rice program was instituted in response to the critical shortage of pure planting stocks which existed during and after World War II. Since its inception, the program has made available to Louisiana growers over 116,000 cwt. of pedigreed stock of 26 rice varieties.

Concurrent with the distribution of pure seed by the Rice Research Station, there developed in Louisiana an industry comprised of independent seed dealers through whom farmers could conduct trade in registered and certified classes of pedigreed rice.

Foundation seed rice, the planting stock from which registered and certified seed are produced, is the farmers link with the work of the plant breeder. It is the product of hybridization and of successive generations of selection and testing to establish its value as crop seed and eventually as a commercial commodity. For this reason, foundation seed and the basic stocks from which it is produced, must be grown and conditioned in a manner which will insure that viability is maintained and that it be genetically pure and free from mechanical mixtures or contamination by noxious weeds.

Through the Rice Research Station's seed program, Louisiana farmers may obtain seed rice of improved varieties developed through the Louisiana Agricultural Experiment Station breeding program and of established commercial varieties originating either at Crowley or at research centers in neighboring states.

In order to fulfill the objectives of the seed program, the Rice Research Station utilizes the personnel, land, machinery, and other facilities needed to plant, harvest, condition, and store its annual seed rice crop. The production of breeder seed, planting stock for the foundation fields, and the maintenance of purity in commercial rice varieties are functions of the seed program. Breeder seed is sometimes grown within fields of foundation rice, or in a special nursery, set aside for propagating the Rice Research Station's seed stocks. The nursery also serves as a site for evaluating, purifying, and increasing selections from the Louisiana Agricultural Experiment Station breeding program which show promise as new varieties.

The distribution of pedigreed seed rice produced by the Rice Research Station is done according to a formula adopted by the Louisiana Seed Rice Growers Association. For each rice producing parish, the amount of seed allotted to an individual parish is determined by the percentage of the states total rice acreage grown in that parish during the previous crop year.

Personnel of the Louisiana Cooperative Extension Service in cooperation with parish committees of the Seed Rice Growers Association assist in the allocation of foundation seed rice. It is at the parish committee level that the allocation of seed to individual growers is decided. The county agents receive applications for seed rice from growers and handle information and publicity for the pure seed program.

In this state, the official seed certifying agency for all crops is the Louisiana Department of Agriculture. The rules and regulations pertaining to the certification of agricultural seeds are part of the Louisiana Seed Law. They are formulated by the Louisiana Seed Commission and enforced by Agronomic Programs Division of the Louisiana Department of Agriculture. Personnel of the Agronomic Programs Division, operating from district offices conduct field inspections of growing rice and sampling of bagged rice for laboratory analyses which consist of purity determinations and germination tests.

PRODUCTION PRACTICES

Each year, the Rice Research Station devotes approximately 80 acres of land to the production of foundation seed rice. In order to eliminate noxious weeds, especially red rice, which can disqualify rice from certification, the fields are fallowed for a 2-year period preceding planting. This also enables the fields to meet the crop history requirements specified in the seed rice regulations.

Following seedbed preparation, foundation fields are planted by means of a 16-runner grain drill. A basal application of fertilizer (14-40-40 lb/A of NPK) is made at the time of seeding. The breeder stock is planted at the rate of approximately 100 lb/A. The rice receives a preflood application of urea in which the rate of N may vary from 45 to 90 lb/A.

Seedling grasses and weeds are controlled by means of commercially available herbicides, applied by airplane. Similarly, aerial applications of insecticides are used to protect the fields from outbreaks of harmful insects.

Roguing of the rice fields for the removal of off-types, varietal mixtures, and noxious weeds, begins at the onset of heading and continues until the rice is harvested. During this interval, the headed rice is inspected by personnel of the Agronomic Programs Division to determine whether or not it meets minimum field standards of the certifying agency.

The rice is harvested with a conventional combine, and dried in the Rice Research Station's continuous flow drier to a moisture level of approximately 12% During the storage period between drying and cleaning, the rice is treated with an insecticide in order to protect it from stored-grain insects.

Cleaning of foundation and breeder seed usually commences in late October and continues until late December. The rice first moves through an air-and-screen cleaner which removes chaff, straw, and other foreign material and grades the grain according to width and thickness.

It then flows through two sets of length grading machines which consist of rotating, indented metal cylinders. The first set of cylinders removes stemmy rice, grains which have very long awns of which are attached to portions of the panicle. The second set removes small grains and broken or dehulled kernels of rice.

In the final phase of cleaning, the rice moves through a machine which performs diameter grading of the grain by means of rapidly oscillating perforated screens. This machine is designed to separate medium-grain and/or red rice from long-grain rice. It is also capable of removing shrivelled and other slender kernels from medium-grain rice.

From the cleaning machines, foundation and breeder seed rice is bagged, assigned a lot number, and placed in storage in the Station's seed rice warehouse where it remains until the time that it is distributed to Louisiana farmers.

The field and laboratory purity standards for foundation seed rice are very strict with regard to varietal mixtures and noxious weeds. In all phases of production, therefore, great care must be exercised in order to prevent these impurities from contaminating the seed stocks. To that end, it is routine procedure at the Rice Research Station to partially disassemble all planting and harvesting equipment and to clean it thoroughly with water an/or compressed air before using it in the field. The drier and cleaning plant, including all elevators and other conveying equipment, are also subjected to meticulous cleaning and inspection before and after having been used in stubble fields. Therefore, tractors, plows, harrows, and land levelers are carefully washed before they enter land which is in a fallow cycle. These measures, together with the inspection and roguing which are done during the growing season, help to insure that foundation seed is genetically pure and free of mechanical mixtures and noxious weed seeds.

1994 ACTIVITIES

Of the 4320 cwt. of foundation seed rice sold in 1994, the varieties and quantities were as follows: Cypress, 1746 cwt.; Jodon, 1204 cwt.; Bengal, 1010 cwt.; Maybelle, 353 cwt.; and Lacassine, 7 cwt.

The Rice Research Station's foundation seed crop in 1994 consisted of 27.66 acres of Cypress, 23.02 acres of Bengal, 19.67 acres of Jodon, and 6.12 acres of Kaybonnet.

Breeder seed was grown in 1994 as follows: Cypress, 1.00 acre; Bengal, .90 acre; Jodon, .90 acre; Kaybonnet, .40 acre; Lemont, .25 acre; Toro-2, .25 acre; and Saturn, .25 acre.

Headrows of Cypress, Jodon, Bengal, and LA 2085 were grown for replenishment of breeder seed stocks.

RICE PHYSIOLOGY

INTRODUCTION

Plant growth regulators (PGRs) have a significant effect on crop production because of their ability to alter plant growth and development. Therefore, studies of PGR modifications to plant growth and development that improve rice production were conducted.

In greenhouse and small plot trials, emergence has been improved with PGRs that cause mesocotyl, coleoptile and leaf elongation. The mesocotyl and coleoptile are short in semidwarf cultivars, and seeding more than 1 inch below the soil surface can result in poor stands. In addition, seedling height of semidwarf rice increases slowly, resulting in poor seedling vigor. Small plot studies were conducted to evaluate the effects of PGRs on seedling vigor of new varieties and experimental lines under different management practices, including early planting, early flooding, drill and water seeding, conservation tillage and herbicide use.

At present, PGRs have been identified that can modify internode elongation and modification of internode elongation can be beneficial. The reduction of internode elongation of select internodes can prevent exsertion of panicles. Studies of this particular response to properly timed applications of PGRs reduce seed production in red rice. In that respect, PGRs offer the first control measure for established red rice in commercial rice production. Another effect of reducing seed production is a stimulation in vegetative growth. In crawfish production, amount and persistence of vegetative growth and minimal reproductive growth can be beneficial. To address the red rice problem in rice and to improve vegetative biomass of rice for crawfish, studies with PGRs that inhibit panicle exsertion and reduce seed production were conducted.

Some PGRs are reported to increase grain yield directly. Several of those materials were evaluated.

To address the objectives of emergence and seedling vigor improvement of semidwarf cultivars, red rice seed elimination, rice biomass improvement for crawfish and rice yield enhancement, PGRs were tested for their effects on rice growth and development.

SEEDLING VIGOR STUDIES (SEED TREATMENT)

R.T. Dunand and R.R. Dilly, Jr.

Experiment: Fungicide, Gibberellic Acid, Minor Nutrient Seed Treatment and Seedling Vigor in Rice

Location: Rice Research Station, Crowley, LA (North Unit)

Variety: Cypress

Seeding Rate: 100 lb/A

Planting Date: 5 Apr 94

Row Spacing: 7-inch

Planting Depth: 3 inches

Fertilizer: 7-21-21 with 3.5% zinc at 300 lb/A drilled at planting

Water Management: Not applicable

Plot Size: 146 ft^2 - 5.8 (10 rows) x 25 ft

Treated Area: 146 ft^2 - 5.8 (10 rows) x 25 ft

Treatment(s): Fungicide

Carboxin + thiram (520 ppm + 520 ppm) - Vitavax-200 (4 fl. oz./cwt)

Minor Nutrient

Zinc Starter (8 fl. oz./cwt)

Plant Growth Regulator

Gibberellic acid (22 ppm) - RELEASE (0.35 oz/cwt)

All seed treatments applied at the rate of 20 fl. oz./cwt

Timing - 17 Feb

Sprayer: Not applicable

Pertinent Rainfall: Seed treatment - 2.9 inches, 6 Apr
2.1 inches, 12 Apr
0.2 inches, 15 Apr
0.6 inches, 16 Apr
0.2 inches, 20 Apr
0.1 inches, 22 Apr
1.2 inches, 23 Apr
0.1 inches, 24 Apr

Herbicide(s): Stam M4 (3 qt/A), 20 Apr

Insecticide(s): Not applicable

Fungicide(s): See treatment

Emergence: 15 Apr

Permanent Flood: Not applicable

Harvest Date: Not applicable

Harvested Area: Not applicable

Exp. Design: Randomized complete block design and four replications. A drill strip with the seven center rows containing the treatments was divided into four sectional lengths with each section representing a replicate. Each treatment was fixed in a given row in each replicate.

Comments: Emergence was primarily affected by fungicide and gibberellic acid seed treatment (Table 1). Seed treatment with fungicide mixed with gibberellic acid had higher stands compared with the control at 13 days after planting (DAP). This trend continued throughout the observation period and resulted in higher final stands at 22 DAP. Fungicide alone also produced a high final stand.

Zinc starter reduced emergence during the evaluation period between 13 and 22 DAP. Stands with zinc starter alone were lower than stands in the control (no seed treatment), and adding zinc starter to fungicide or fungicide plus gibberellic acid resulted in final stands that were lower than seed treatment with fungicide alone or fungicide plus gibberellic acid.

Table 1. The effect of fungicide, minor nutrient and plant growth regulator seed treatments on seedling vigor. Rice Research Station, Crowley, LA. 1994.

Treatment Name	Fm Ds	Rate	Grow Stg	Stand (plants/ sq ft) 13 DAP	Stand (plants/ sq ft) 15 DAP	Stand (plants/ sq ft) 17 DAP	Stand (plants/ sq ft) 22 DAP
Control				3c	4b	6b	9cd
Zn Starter	l	8	seed	2c	4b	5b	6d
RELEASE	sp	0.35	seed	4bc	4b	6b	8d
Vitavax	l	4	seed	4c	6b	8ab	12bc
Zn Starter	l	8	seed				
RELEASE	sp	0.35	seed	7a	10a	11a	13ab
Vitavax	l	4	seed				
Zn Starter	l	8	seed				
RELEASE	sp	0.35	seed	7ab	9a	11a	15ab
Vitavax	l	4	seed				
Vitavax	l	4	seed	5abc	9a	11a	16a
LSD (.05) =				3	3	3	3
Standard Dev.=				1.9538	1.7994	2.2773	2.3179
CV =				44.12	28.15	27.60	20.67

Means followed by same letter do not significantly differ (Duncan's MRT, P=.05).

SEEDLING VIGOR STUDIES (SEED TREATMENT)

R.T. Dunand, P.K. Bollich, R.R. Dilly, Jr., G.A. Meche, R.P. Regan, and G.R. Romero

Experiment: Gibberellic Acid and Seedling Vigor in Minimum Tillage Rice

Location: Rice Research Station, Crowley, LA (South Unit)

Variety: See treatments

Seeding Rate: 100 lb/A

Planting Date: 22 Apr 94

Row Spacing: 7-inch

Planting Depth: ~1 inch

Fertilizer: Urea (46% N) at 200 lb/A by airplane, 19 May

Water Management: Flushed, 7 May

Plot Size: 152 ft^2 - 7.6 (13 rows) x 20 ft

Treated Area: 152 ft^2 - 7.6 (13 rows) x 20 ft

Treatment(s): **Plant Growth Regulator**

Gibberellic acid (22 ppm) - RELEASE (0.35 oz/cwt)

Varieties

Bengal	Lemont
Cypress	Maybelle
Lacassine	

Timing

Seed treatment, 17 Feb

Sprayer: Not applicable

Pertinent Rainfall:
1.4 inches, 25 Apr
1.8 inches, 2 May
2.1 inches, 3 May

Herbicide(s): Roundup (1 qt/A) + 2,4-D Amine (1 qt/A) by ground rig, 30 Mar
Gramoxone Extra (1 qt/A) by ground rig, 22 Apr
Stam M4 (3 pt/A) + Basagran (1 pt/A) by ground rig, 18 May

Insecticide(s): Furadan 3G (17 lb/A) by airplane, 31 May

Fungicide(s): Vitavax 200 (4 fl. oz./cwt), 17 Feb
Benlate (1 lb/A) by airplane, 1 July

Emergence: 28 Apr

Permanent Flood: 19 May

Harvest Date: 16 Aug

Harvested Area: 152 ft^2 - 7.6 (13 rows) x 20 ft

Exp. Design: Randomized complete block and four replications. Factorial arrangement of treatments (5 varieties x 2 gibberellic acid rates)

Comments: Seedling vigor was affected by seed treatment with gibberellic acid in minimum tillage rice. Initial emergence was evaluated at 8 days after planting (DAP). At that time, all varieties had slightly higher stands with the gibberellic acid seed treatment (Table 1). Untreated (Vitavax only) seed averaged 9 plants/ft^2 compared with 11 plants/ft^2 for gibberellic acid treated seed (RELEASE+Vitavax). Of the varieties, Bengal and Cypress had the highest stands at 12 and 13 plants/ft^2 and Lacassine had the poorest stand at 4 plants/ft^2.

At 11 DAP, visual ratings of seedling vigor showed differences in varietal response to GA seed treatment (Table 2). Visual rating was based on amount, evenness and color of the seedling canopy. Plots within each replicate were ranked from 1 to 10 (best appearance). Seedling vigor ratings were improved with gibberellic acid for Bengal, Cypress and Lemont and unaffected for Lacassine and Maybelle. Vigor ratings for Bengal, Cypress and Lemont without gibberellic acid were 4, 4 and 5, respectively. With gibberellic acid, vigor ratings were 9, 9 and 10, respectively. Vigor ratings for Lacassine and Maybelle without gibberellic acid were 2 and 5, respectively, and with gibberellic acid were 1 and 7, respectively. On a variety basis alone, Lacassine had the poorest seedling vigor rating, and Bengal, Cypress, Lemont and Maybelle had equivalent seedling vigor ratings.

Final emergence was evaluated at 19 DAP, and there was no difference in stand from the gibberellic acid seed treatment except for Maybelle (Table 2). Final stand of gibberellic acid treated seed of Maybelle was lower compared with the control. On average, Bengal Cypress, Lemont and Maybelle had high stands ranging from 18 to 21 plants/ft^2. Lacassine had the lowest final stand with 13 plants/ft^2.

Residual activity from seed treatment with gibberellic acid increased seedling height at 19 DAP. Seedlings from gibberellic acid treated seed averaged 3 cm taller across all varieties (Table 1). Average seedling heights across varieties were 14 and 17 cm for untreated and treated seed, respectively. Seedling heights of the varieties were 17, 16, 14, 15 and 16 cm for Bengal, Cypress, Lacassine, Lemont and Maybelle, respectively.

The residual effects of gibberellic acid were short term and by maturity (117 DAP) the only differences in plant height were varietal differences (Table 1). Mature plant heights were 87, 88, 84, 81 and 92 cm for Bengal, Cypress, Lacassine, Lemont and Maybelle, respectively.

Mature crop development and grain production were relatively unaffected by gibberellic acid seed treatment. Seed treatment with gibberellic acid had no effect on days to 50% heading and Bengal, Cypress, Lacassine, Lemont and Maybelle headed at 69, 72, 76, 77 and 68 DAP, respectively (Table 1). Grain moisture on average was 0.5% higher across varieties with gibberellic acid seed treatment, and there were no differences in grain yield due to seed treatment with gibberellic acid (Table 1). Grain moisture reflected maturity as noted in days to 50% heading, and grain moistures at harvest were 18.9, 20.1 17.3, 19 and 15.9% for Bengal, Cypress, Lacassine, Lemont and Maybelle, respectively. Bengal and Cypress were the highest yielding varieties followed by Maybelle, Lacassine and Lemont. Grain yields were 5946, 5940, 5577, 5293 and 4532 lb/A, respectively.

Table 1. The main effects of plant growth regulator seed treatment on seedling vigor and crop production in minimum tillage rice. Rice Research Station, Crowley, LA. 1994.

Treatment Name	Fm Da	Rate	Grow Stg	Stand (plants/ sq.ft.) 8 DAP	Seedling Vigor Rating 11 DAP	Stand (plants/ sq. ft.) 19 DAP	Pl. Ht. (cm) 19 DAP	Pl. Ht. (cm) 117 DAP	Heading (DAP)	Moisture (%) 117 DAP	Yield (lb/A) 117 DAP
TABLE OF R MEANS											
Replicate 1				5	6	18	15	87	73	18.8	5887
Replicate 2				11	8	20	18	87	72	18.1	5482
Replicate 3				13	8	18	16	88	72	18.2	5238
Replicate 4				9	8	18	15	84	73	18.1	5487
TABLE OF A MEANS											
Bengal				12a	7	18	17a	87b	69c	18.9b	5948a
Cypress				13a	7	21	18ab	88b	72b	20.1a	5940a
Lacassine				4c	2	13	14c	84c	78a	17.3c	5293b
Lemont				9b	7	18	15bc	81c	77a	19.0b	4532c
Maybelle				10b	8	20	16ab	92a	68c	15.9d	5577ab
TABLE OF B MEANS											
Untreated				9b	4	18	14b	87	73	18.0b	5510
RELEASE	sp	0.35	seed	11a	7	18	17a	86	73	18.5a	5405

Table 2. The simple effects of plant growth regulator seed treatment on seedling vigor and crop production in minimum tillage rice. Rice Research Station, Crowley, LA. 1994.

Treatment Name	Fm Ds	Rate	Grow Stg	Stand (plants/ sq.ft.) 8 DAP	Seedling Vigor Rating 11 DAP	Stand (plants/ sq. ft.) 18 DAP	Pl. Ht. (cm) 18 DAP	Pl. Ht. (cm) 117 DAP	Heading (DAP)	Moisture (%) 117 DAP	Yield (lb/A) 117 DAP
Bengal Untreated				11ab	4c	18c	16bc	86cd	69c	18.4bc	5898a
Bengal RELEASE	sp	0.35	seed	14ab	9a	18c	19a	88bc	69c	19.4ab	5994a
Cypress Untreated				11ab	5bc	21ab	14cde	88bc	73b	20.1a	5868a
Cypress RELEASE	sp	0.35	seed	15a	9a	22a	17ab	87bcd	72b	20.1a	6013a
Lacassine Untreated				3d	2d	14d	13e	84de	76a	17.0de	5384ab
Lacassine RELEASE	sp	0.35	seed	5cd	1d	13d	14cde	84de	77a	17.5cd	5203ab
Lemont Untreated				8bc	5c	17c	14de	82e	77a	18.5bc	4708bc
Lemont RELEASE	sp	0.35	seed	10b	10a	19bc	16bc	81e	77a	19.8ab	4359c
Maybelle Untreated				8bc	5bc	21ab	15cd	93a	68c	15.9e	5807a
Maybelle RELEASE	sp	0.35	seed	11ab	7b	18c	18a	91ab	68c	16.0e	5458ab
LSD (.05) =				4	2	2	2	3	1	1.2	782
Standard Dev.=				3.0107	1.3179	1.7112	1.0345	2.2509	.68655	.83707	536.82
CV =				30.83	23.12	9.52	6.72	2.60	1.19	4.58	9.87

Means followed by same letter do not significantly differ (Duncan's MRT, P=.05).

SEEDLING VIGOR STUDIES (FOLIAR TREATMENT)

R.T. Dunand and R.R. Dilly, Jr.

Experiment: Gibberellic Acid, Adjuvants and Seedling Vigor in Rice

Location: Rice Research Station, Crowley, LA (North Unit)

Variety: Cypress

Seeding Rate: 100 lb/A

Planting Date: 5 Apr 94

Row Spacing: 7-inch

Planting Depth: 1 inch

Fertilizer: 7-21-21 with 3.5% zinc at 300 lb/A drilled at planting

Water Management: Not applicable

Plot Size: 146 ft^2 - 5.8 (10 rows) x 25 ft

Treated Area: 146 ft^2 - 5.8 (10 rows) x 25 ft

Treatment(s): Plant Growth Regulator

Gibberellic acid (1.5 g/A) - RyzUp (1.5 fl. oz./A)

Adjuvants

AG-98	Prime Ag Oil
CS-7	Prime Oil
Dyne-maic	Tween 20
Kinetic	Unifilm 8020
Penetrator Plus	X-77 Spreader

Herbicide

Propanil (4 lb/A) - Stam M4 (1 gal/A)

Timing (2- to 3-leaf), 26 Apr

Sprayer: CO_2-driven, hand-held, 32 psi, 15 GPA, 8002 nozzles

Pertinent Rainfall: 0.5 inches, 30 Apr
0.1 inches, 1 May
0.2 inches, 2 May
1.3 inches, 3 May
0.1 inches, 4 May

Herbicide(s): Stam M4 (3 qt/A) by airplane, 20 Apr

Insecticide(s): Not applicable

Fungicide(s): Not applicable

Emergence: 15 Apr

Permanent Flood: Not applicable

Harvest Date: Not applicable

Harvested Area: Not applicable

Exp. Design: Randomized complete block design and four replications.

Comments: Foliar application of gibberellic acid increased seedling height during the period from 3 to 14 days after treatment (DAT) (Table 1). The response to gibberellic acid was influenced by adjuvant. At 3 DAT, Tween 20 improved response to gibberellic acid significantly over Prime Ag Oil. The effect of Tween 20 on seedling response to gibberellic acid continued through 7 and 14 DAT and was significantly better than all other adjuvants.

At 3 DAT, there was no difference in response between gibberellic acid alone and gibberellic acid plus an adjuvant. This changed at 7 and 14 DAT. AG-98, Kinetic, Penetrator Plus, Tween 20, X-77 Spreader and Unifilm 8020 improved the activity of gibberellic acid at 5 DAT. Of these adjuvants, only Penetrator Plus failed to continue to improve the activity of gibberellic acid at 11 DAT. Dyne-maic, CS-7, Prime Ag Oil and Prime Oil had no influence on gibberellic acid activity at 7 and 14 DAT.

Table 1. The effect of plant growth regulator foliar treatment and adjuvants on seedling vigor. Rice Research Station, Crowley, LA. 1994.

Treatment Name	Fm Ds	Rate	Rate Unit	Grow Stg	Pl. Ht (cm) 3 DAT	Pl. Ht. (cm) 7 DAT	Pl. Ht. (cm) 14 DAT
Control					20c	24g	26f
RyzUp	1	1.5	oz p/A	2-3L	24ab	33ef	38cd
Latron AG-98	1	4.8	oz p/A	2-3L	25ab	36bc	41b
RyzUp	1	1.5	oz p/A	2-3L			
Dyne-maic	1	4.8	oz p/A	2-3L	25ab	34c-f	38c
RyzUp	1	1.5	oz p/A	2-3L			
Latron CS-7	1	4.8	oz p/A	2-3L	24ab	35cde	40bc
RyzUp	1	1.5	oz p/A	2-3L			
Kinetic	1	4.8	oz p/A	2-3L	25ab	37bc	42b
RyzUp	1	1.5	oz p/A	2-3L			
Penetrator Plus	1	16	oz p/A	2-3L	24ab	36bc	40bc
RyzUp	1	1.5	oz p/A	2-3L			
Prime Ag Oil	1	16	oz p/A	2-3L	23b	32f	35e
RyzUp	1	1.5	oz p/A	2-3L			
Prime Oil	1	16	oz p/A	2-3L	24ab	33def	36de
RyzUp	1	1.5	oz p/A	2-3L			
Tween 20	1	4.8	oz p/A	2-3L	26a	41a	47a
RyzUp	1	1.5	oz p/A	2-3L			
X-77 Spreader	1	4.8	oz p/A	2-3L	25ab	37b	42b
RyzUp	1	1.5	oz p/A	2-3L			
Unifilm 8020	1	4.8	oz p/A	2-3L	24ab	35cd	41b
RyzUp	1	1.5	oz p/A	2-3L			
Stam M4	ec	4	lb/A	2-3L	24ab	35cd	41b
RyzUp	1	1.5	oz p/A	2-3L			
LSD (.05) =					2	2	2
Standard Dev.=					1.5243	1.3716	1.4853
CV =					8.39	3.99	3.83

Means followed by same letter do not significantly differ (Duncan's MRT, P=.05).

SEEDLING VIGOR STUDIES (FOLIAR TREATMENT)

R.T. Dunand and R.R. Dilly, Jr.

Experiment: Gibberellic Acid, water pH and Seedling Vigor in Rice

Location: Rice Research Station, Crowley, LA (North Unit)

Variety: Cypress

Seeding Rate: 100 lb/A

Planting Date: 5 Apr 94

Row Spacing: 7-inch

Planting Depth: 1 inch

Fertilizer: 7-21-21 with 3.5% zinc at 300 lb/A drilled at planting

Water Management: Not applicable

Plot Size: 146 ft^2 - 5.8 (10 rows) x 25 ft

Treated Area: 146 ft^2 - 5.8 (10 rows) x 25 ft

Treatment(s): Plant Growth Regulator

Gibberellic acid (1.5 g/A) - RyzUp (1.5 fl. oz./A)

pH - 3, 5, 7, 9 and 11 using sodium hydroxide and hydrochloric acid to adjust the pH

Timing (2- to 3-leaf), 25 Apr

Sprayer: N_2-driven, hand-held, 32 psi, 15 GPA, 8002 nozzles

Pertinent Rainfall:
0.5 inches, 30 Apr
0.1 inches, 1 May
0.2 inches, 2 May
1.3 inches, 3 May
0.1 inches, 4 May

Herbicide(s): Stam M4 (3 qt/A) by airplane, 20 Apr

Insecticide(s): Not applicable

Fungicide(s): Not applicable

Emergence: 15 Apr

Permanent Flood: Not applicable

Harvest Date: Not applicable

Harvested Area: Not applicable

Exp. Design: Randomized complete block design and four replications.

Comments: Seedling height was increased significantly by gibberellic acid (Table 1). Response to gibberellic acid was noted within 4 days after treatment (DAT) and continued through 14 DAT. Increases in height from gibberellic acid application ranged between 4 and 6 cm at 4 DAT and between 11 and 13 cm at 7 and 14 DAT. At 7 and 14 DAT, the higher end of the range in response occurred most often at alkaline pH values of 9 and 11.

Table 1. The effect of plant growth regulator foliar treatment and pH on seedling vigor. Rice Research Station, Crowley, LA. 1994.

Treatment Name	Fm Ds	Rate	Grow Stg	Pl. Ht. (cm) 4 DAT	Pl. Ht. (cm) 7 DAT	Pl Ht. (cm) 14 DAT
Control				20c	22b	26c
RyzUp/pH 3	1	1.5	2-3L	26a	33a	37ab
RyzUp/pH 5	1	1.5	2-3L	24b	33a	35b
RyzUp/pH 7	1	1.5	2-3L	25ab	33a	37ab
RyzUp/pH 9	1	1.5	2-3L	25ab	35a	39a
RyzUp/pH 11	1	1.5	2-3L	26ab	34a	39a
LSD (.05) =				2	2	2
Standard Dev.=				1.1972	1.5156	1.5776
CV =				4.95	4.81	4.45

Means followed by same letter do not significantly differ (Duncan's MRT, P=.05).

SEEDLING VIGOR STUDIES (Foliar Treatment)

R.T. Dunand and R.R. Dilly, Jr.

Experiment: Post Emergence Herbicides, Gibberellic Acid and Seedling Vigor in Semidwarf Rice

Location: Rice Research Station, Crowley, LA (South Unit)

Variety: Lemont

Seeding Rate: 100 lb/A

Planting Date: 11 May 94

Row Spacing: 7-inch

Planting Depth: 2 inches

Fertilizer: 7-21-21 with 3.5% zinc at 300 lb/A drilled preplant, 11 May; urea (46% N) at 200 lb/A by airplane, 14 June

Water Management: Flushed, 24 May

Plot Size: 195 ft^2 - 6.5 x 30 ft

Treated Area: 195 ft^2 - 6.5 x 30 ft

Treatment(s):

Plant Growth Regulator

Gibberellic acid (1.5 g/A) - RyzUp (1.5 fl oz/A)

Herbicide(s)

Arrosolo (1 gal/A)
Facet (0.5 lb/A)
Propanil 4 (1 gal/A)
Stam 80 EDF (5 lb/A)
Stam M4 (1 gal/A)
Stam M4 + Bolero 8 EC (3 qt/A + 3 pt/A)
Stam M4 + Grandstand (3 qt/A + 1 pt/A)
Super Wham (1 gal/A)
Terra Propanil 60 DF (6.67 lb/A)
Wham 80 DF (5 lb/A)

Timing: 3- to 4-leaf stage, 7 June;
Stam M4 + Grandstand at 4- to 5-leaf stage, 17 June

Sprayer: CO_2-driven, hand-held, 32 psi, 15 GPA, 8002 nozzles

Pertinent Rainfall: No rainfall within 24 hours of application

Herbicide(s): Londax (1 oz/A) by airplane, 21 June

Insecticide(s): Furadan 3G (17 lb/A) by airplane, 27 June and 15 Aug;
Methyl parathion (1 pt/A) by airplane, 9 Aug

Fungicide(s): Benlate (1 lb/A) by airplane, 9 Aug

Growth Regulator(s): RELEASE (0.35 oz/cwt) seed treatment

Emergence: 17 May

Permanent Flood: 16 June

Harvest Date: 12 Sept

Harvested Area: 195 ft^2 - 6.5 x 30 ft

Exp. Design: Randomized complete block and four replications

Comments: Seedling evaluations of plant height, herbicide injury and weed control were made approximately 1 week after application. In most treatments, mixing RyzUp with standard rice herbicides significantly increased seedling height. The increase is expressed as height difference, which is the difference between the treatment and control (Table 1). Amount of increase was dependent on herbicide. RyzUp mixed with Arrosolo, Stam M4+Bolero 8E and Propanil 4 resulted in height increases of 15, 12 and 11 cm, respectively. RyzUp mixed with Wham EZ and Stam M4+Grandstand had no effect on seedling height. Height increases, ranging from 3 to 8 cm, were noted with other herbicides mixed with RyzUp. Rice injury was relatively constant for most treatments, ranging between 20 and 30%, and RyzUp had no effect on injury. Facet was an exception and caused little injury. Stam M4+Grandstand was not evaluated for injury or weed control. Rice injury and weed control were inversely related. For most treatments, weed control ranged between 60 and 80%. Weed control with Facet was 15%. RyzUp had no effect on weed control.

At maturity, plant stature and crop maturity and production were evaluated. Mature plant height ranged between 80 and 85 cm for a majority of the treatments. Plant height was lowest at 76 cm in the Facet treatments due to weed competition. RyzUp had no effect on plant height. Grain moisture ranged mainly between 15 and 17%. Arrosolo, Wham 80DF and Wham EZ alone and Facet alone or with RyzUp produced slightly higher grain moistures between 18 and 19%. RyzUp had no effect on maturity. Grain yields ranged mainly between 2500 and 3500 lb/A for the majority of the treatments. Arrosolo + RyzUp, Super Wham + RyzUp and Terra Propanil DF + RyzUp had the highest yields, ranging between 3700 and 4000 lb/A. These treatments were exceptions and RyzUp in general had little effect on grain yield.

Table 1. The effects of plant growth regulator foliar treatment and herbicides on chemical efficacy and productivity of rice (Oryza sativa 'Lemont'). Rice Research Station, Crowley, LA. 1994.

Treatment Name	Fm Ds	Rate	Rate Unit	Grow Stg	Rice Plant Height Diff. (cm) 7 DAT	Rice Injury (%) 8 DAT	Weed Control (%) 8 DAT	Rice Plant Height (cm) 100 DAT	Rice Grain Moisture (%) 100 DAT	Rice Grain Yield (lb/A) 100 DAT
RyzUp	l	0	oz p/A		0fgh	25ab	63ab	79bcd	16.5ab	2670bcd
Stam M4	ec	4	lb/A	3-4L						
RyzUp	l	1.5	oz p/A	3-4L	8c	25ab	70ab	83ab	16.4ab	3400abc
Stam M4	ec	4	lb/A	3-4L						
RyzUp	l	0	oz p/A		2efg	28ab	65ab	83ab	17.5ab	3194a-d
Propanil 4	ec	4	lb/A	3-4L						
RyzUp	l	1.5	oz p/A	3-4L	11b	25ab	65ab	81a-d	17.1ab	2826a-d
Propanil 4	ec	4	lb/A	3-4L						
RyzUp	l	0	oz p/A		1fgh	25ab	78ab	81abc	16.6ab	3077a-d
Terra Propanil	df	4	lb/A	3-4L						
RyzUp	l	1.5	oz p/A	3-4L	8c	25ab	80ab	84ab	15.9ab	4006a
Terra Propanil	df	4	lb/A	3-4L						
RyzUp	l	0	oz p/A		-0gh	23ab	63ab	81abc	16.3ab	3002a-d
Stam 80 EDF	df	4	lb/A	3-4L						
RyzUp	l	1.5	oz p/A	3-4L	8c	23ab	73ab	84ab	16.0ab	3432abc
Stam 80 EDF	df	4	lb/A	3-4L						
RyzUp	l	0	oz p/A		3efg	20ab	73ab	80a-d	19.0a	2983a-d
Wham 80 DF	df	4	lb/A	3-4L						
RyzUp	l	1.5	oz p/A	3-4L	6cd	23ab	65ab	79bcd	16.2ab	2985a-d
Wham 80 DF	df	4	lb/A	3-4L						
RyzUp	l	0	oz p/A		1fgh	30a	83a	83ab	16.1ab	3182a-d
Wham EZ	l	4	lb/A	3-4L						
RyzUp	l	1.5	oz p/A	3-4L	3def	25ab	70ab	84ab	16.8ab	3300abc
Wham EZ	l	4	lb/A	3-4L						

Continued.

Table 1. Continued.

Treatment Name	Fm Ds	Rate	Rate Unit	Grow Stg	Rice Plant Height Diff. (cm) 7 DAT	Rice Injury (%) 8 DAT	Weed Control (%) 8 DAT	Rice Plant Height (cm) 100 DAT	Rice Grain Moisture (%) 100 DAT	Rice Grain Yield (lb/A) 100 DAT
RyzUp	1	0	oz p/A		1fgh	25ab	60b	84ab	15.7ab	3146a-d
Super Wham	1	4	lb/A	3-4L						
RyzUp	1	1.5	oz p/A	3-4L	6cd	25ab	75ab	84ab	15.5ab	3673ab
Super Wham	1	4	lb/A	3-4L						
RyzUp	1	0	oz p/A		1fgh	25ab	78ab	85a	18.0ab	3525abc
Arrosolo	ec	6	lb/A	3-4L						
RyzUp	1	1.5	oz p/A	3-4L	15a	18b	75ab	82ab	16.0ab	3745ab
Arrosolo	ec	6	lb/A	3-4L						
RyzUp	1	0	oz p/A		0fgh	3c	15c	76cd	18.1ab	2342cd
Facet	df	.375	lb/A	3-4L						
RyzUp	1	1.5	oz p/A	3-4L	4de	3c	13c	76d	18.6a	2059d
Facet	df	.375	lb/A	3-4L						
RyzUp	1	0	oz p/A		1e-h	25ab	65ab	81a-d	16.1ab	3259abc
Stam M4	ec	3	lb/A	3-4L						
Bolero 8E	ec	3	lb/A	3-4L						
RyzUp	1	1.5	oz p/A	3-4L	12b	20ab	68ab	80a-d	15.4ab	3125a-d
Stam M4	ec	3	lb/A	3-4L						
Bolero 8E	ec	3	lb/A	3-4L						
RyzUp	1	0	oz p/A		-2h	0c	0c	83ab	14.2b	2766bcd
Stam M4	ec	3	lb/A	4-5L						
Grandstand	ec	.375	lb/A	4-5L						
RyzUp	1	1.5	oz p/A	3-4L	1e-h	0c	0c	84ab	16.6ab	3367abc
Stam M4	ec	3	lb/A	4-5L						
Grandstand	ec	.375	lb/A	4-5L						
LSD (.05) =					3	9	17	5	3.3	981
Standard Dev.=					1.9972	6.0457	12.244	3.2016	2.3132	693.54
CV =					48.62	30.42	20.83	3.93	13.89	22.03

Means followed by same letter do not significantly differ (Duncan's MRT, P=.05).

SEEDLING VIGOR STUDIES (FOLIAR TREATMENT)

R.T. Dunand and R.R. Dilly, Jr.

Experiment: Post Emergence Herbicides, Gibberellic Acid, Early Flooding and Seedling Vigor in Semidwarf Rice

Location: Rice Research Station, Crowley, LA (South Unit)

Variety: Lemont

Seeding Rate: 100 lb/A

Planting Date: 11 May 94

Row Spacing: 7-inch

Fertilizer: 7-21-21 with 3.5% zinc at 300 lb/A drilled preplant, 11 May; urea (46% N) at 200 lb/A by airplane, 14 June

Water Management: Flushed, 24 May

Plot Size: 195 ft^2 - 6.5 x 30 ft

Treated Area: 195 ft^2 - 6.5 x 30 ft

Treatment(s): **Plant Growth Regulator**

Gibberellic acid (1.5 g/A) - GibGro 4LS (1.5 fl. oz./A)
RyzUp (1.5 fl. oz./A)

Herbicide(s)

Stam M4 (2, 3 and 4 qt/A)
Arrosolo (2, 3 and 4 qt/A)

Timing: 2- to 3-leaf stage, 30 May

Sprayer: CO_2-driven, hand-held, 32 psi, 15 GPA, 8002 nozzles

Pertinent Rainfall: No rainfall within 24 hours of application

Herbicide(s): Londax (1 oz/A) by airplane, 21 June

Insecticide(s): Furadan 3G (17 lb/A) by airplane, 27 June and 15 Aug
Methyl parathion (1 pt/A) by airplane, 9 Aug

Fungicide(s): Benlate (1 lb/A) by airplane, 9 Aug

Growth Regulator(s): RELEASE (0.35 oz/cwt) seed treatment

Emergence: 17 May

Permanent Flood: 6 June

Harvest Date: 14 Sept

Harvested Area: 195 ft^2 - 6.5 x 30 ft

Exp. Design: Randomized complete block and four replications

Comments: Seedling evaluations of plant height and weed control were made between 4 and 17 days after treatment (DAT) (Table 1). Mixing gibberellic acid with Arrosolo and Stam M4 significantly increased seedling height compared with the controls, which were standard rates (1 gal/A) of the herbicides alone. Amount of increase was independent of herbicide rate. Height increases ranged between 10 and 12 cm at 4 DAT and between 18 and 25 cm at 7 DAT. By 17 DAT, height increases were less than 7 cm.

Weed control at 17 DAT varied with herbicide and rate of herbicide and was unaffected by the addition of gibberellic acid. In general, weed control was better with Arrosolo. At the 3 and 4 qt/A rates, weed control ranged between 85 and 100% with Arrosolo and between 68 and 78% with Stam M4. At the 2 qt/A rate, weed control declined to 73 and 33% for Arrosolo and Stam M4, respectively. At the 1 qt/A rate, weed control was less than 40% for both herbicides.

At maturity, weed control, plant stature, crop maturity and production were evaluated. Trends in weed control were similar to those noted during the seedling evaluations. Arrosolo gave better weed control, and weed control dropped noticeably at rates less than 3 qt/A. Late season ratings were lower than early season ratings and the amount of decrease was related to herbicide. At the 3 and 4 qt/A rates, ratings for Stam M4 decreased about 20%. For Arrosolo, the decrease averaged less than 10%. Gibberellic acid had no effect on weed control.

Degree of weed control affected mature plant height. At the 3 and 4 qt/A rates, weed control was highest, and plant height ranged between 81 and 83 cm. At the lower herbicide rates where weed control was low, plant height ranged between 78 and 80 cm. Gibberellic acid had no effect on mature plant height.

Grain moisture was low and the rice over mature due to weather delayed harvest. Consequently, crop maturity as measured by grain moisture was unaffected by herbicide, herbicide rate or gibberellic acid.

Crop production was related to degree of weed control. Grain yields were higher with Arrosolo, and higher grain yields were recorded at the 3 and 4 qt/A rates. Gibberellic acid tended to increase yields. Highest yields for each herbicide resulted when gibberellic acid was added to the 4 qt/A rate, and equivalent yields for each herbicide were noted for the 4 qt/A rates alone and the 3 qt/A rates + gibberellic acid.

Table 1. The effects of plant growth regulator foliar treatment, herbicides and herbicide rates on chemical efficacy and productivity of rice (Oryza sativa 'Lemont'). Rice Research Station, Crowley, LA. 1994.

Treatment Name	Fm Ds	Rate	Rate Unit	Grow Stg	Rice Lemont Pl. Ht. (cm) 4 DAT	Rice Lemont Pl. Ht. (cm) 7 DAT	Rice Lemont Pl. Ht. (cm) 17 DAT	Weed General Control (%) 17 DAT	Weed General Control (%) 89 DAT	Rice Lemont Pl. Ht. (cm) 89 DAT	Rice Lemont Moisture (%) 89 DAT	Rice Lemont Yield (lb/A) 89 DAT
Early Flood					21c	30c	48c	68b	40cd	80abc	15.1ab	2308cd
Stam M4	ec	4	lb/A	2-3L								
Early Flood					32ab	50ab	49c	73b	55bc	83a	14.4ab	2718abc
Stam M4	ec	4	lb/A	2-3L								
GibGro 4LS	1	1.5	oz p/A	2-3L								
Early Flood					32ab	48b	49c	78ab	55bc	81ab	13.9b	2449bcd
Stam M4	ec	3	lb/A	2-3L								
GibGro 4LS	1	1.5	oz p/A	2-3L								
Early Flood					32ab	51ab	52ab	33c	20d	80abc	15.8a	2258cd
Stam M4	ec	2	lb/A	2-3L								
GibGro 4LS	1	1.5	oz p/A	2-3L								
Early Flood					33a	51ab	51bc	38c	23d	79bc	15.3ab	1868d
Stam M4	ec	1	lb/A	2-3L								
GibGro 4LS	1	1.5	oz p/A	2-3L								
Early Flood					20c	30c	48c	100a	88a	83a	14.3ab	3098ab
Arrosolo	ec	6	lb/A	2-3L								
Early Flood					32ab	55a	52ab	93ab	98a	82ab	13.6b	3231a
Arrosolo	ec	6	lb/A	2-3L								
RyzUp	1	1.5	oz p/A	2-3L								
Early Flood					32ab	54ab	53ab	85ab	80ab	83a	13.7b	3144ab
Arrosolo	ec	4.5	lb/A	2-3L								
RyzUp	1	1.5	oz p/A	2-3L								
Early Flood					32ab	52ab	54a	73b	58bc	82a	13.9b	2755abc
Arrosolo	ec	3	lb/A	2-3L								
RyzUp	1	1.5	oz p/A	2-3L								
Early Flood					30b	50ab	52ab	28c	13d	78c	15.1ab	1722d
Arrosolo	ec	1.5	lb/A	2-3L								
RyzUp	1	1.5	oz p/A	2-3L								
LSD (.05) =					2	6	3	24	28	3	1.5	692
Standard Dev.=					1.3917	3.8551	1.7795	16.788	19.576	1.9988	1.007	476.57
CV =					4.70	8.20	3.50	25.25	37.11	2.47	6.94	18.65

Means followed by same letter do not significantly differ (Duncan's MRT, P=.05).

SEEDLING VIGOR STUDIES (Foliar Treatment)

R.T. Dunand and R.R. Dilly, Jr.

Experiment: KIH-2023 and Safening Effects of Gibberellic Acid in Dry-Seeded Rice

Location: Rice Research Station, Crowley, LA (South Unit)

Variety: Mars

Seeding Rate: 100 lb/A

Planting Date: 11 May 94

Row Spacing: 7 inch

Fertilizer: 7-21-21 with 3.5% zinc at 300 lb/A drilled preplant, 11 May; ammonium sulfate (21% N) at 450 lb/A by gandy, 6 June

Water Management: Flushed, 24 May

Plot Size: 195 ft^2 - 6.5 (11 rows) x 30 ft

Treated Area: 195 ft^2 - 6.5 (11 rows) x 30 ft

Treatment(s):

Plant Growth Regulator

RyzUp (1.5 and 3 oz/A)

Herbicide(s)

Stam M4 (1 gal/A)
KIH-2023 (.04 and .08 lb/A)

Adjuvant

Valent X-77 (4.8 fluid oz/A)

Timing

3- to 4-leaf stage, 2 June

Sprayer: CO_2-driven, hand-held, 32 psi, 15 GPA, 8002 nozzles

Pertinent Rainfall: 0.5 inch rainfall within 2 hours after application

Herbicide(s): Londax (1 oz/A) by airplane, 21 June

Insecticide(s): Furadan 3G (17 lb/A) by airplane, 27 June and 15 July
Methyl parathion (1 pt/A) by airplane, 9 Aug

Fungicide(s): Benlate (1 lb/A) by airplane, 9 Aug

Emergence: 17 May

Permanent Flood: 9 June

Harvest Date: 12 Sept

Harvested Area: 195 ft^2 - 6.5 x 30 ft

Exp. Design: Randomized complete block and four replications

Comments:

Weed Control

Weed control ratings were made at 7, 14, 30, and 46 days after treatment (DAT). KIH-2023 gave better weed control than Stam M4 and weed control was best with the higher rate of KIH-2023 (Table 1). For example, weed control ratings at 7 DAT averaged 35, 56, and 80% for Stam M4, all three treatments with KIH-2023 at .04 lb/A, and all three treatments with KIH-2023 at .08 lb/A. By 46 DAT, weed control had increased. For the three treatment groupings, weed control ratings were 63, 73, and 84%, respectively.

Major grass weeds present were barnyardgrass, broadleaf signalgrass, and sprangletop. The major broadleaf weed was yellow nutsedge. Of these weeds, barnyardgrass comprised about 80% of the total weed population and was the only weed of the three that was controlled. In addition, the plant growth regulator, RyzUp, had no effect on weed control ratings.

Rice Injury

Rice injury ratings were taken at the same time as the weed control ratings. In general, KIH-2023 was injurious to the rice and degree of injury was related to rate (Table 1). For comparison, at 7 DAT, the injury rating for Stam M4 was 0%. For KIH-2023, injury ratings averaged 28% for the three treatments at the .04 lb/A rate and injury ratings averaged 60% for the three treatments at the .08 lb/A rate. Injury ratings declined with time showing the rice recovered significantly by 30 DAT. By 46 DAT, there were no injury symptoms. RyzUp had no effect on injury ratings.

Table 1. The effect of foliar plant growth regulator and herbicide rates on weed control and rice injury. Rice Research Station, Crowley, LA. 1994.

Treatment Name	Fm Ds	Rate	Rate Unit	Grow Stg	Weeds Control (%) 7 DAT	Weeds Control (%) 14 DAT	Weeds Control (%) 30 DAT	Weeds Control (%) 46 DAT	Rice Injury (%) 7 DAT	Rice Injury (%) 14 DAT	Rice Injury (%) 30 DAT	Rice Injury (%) 46 DAT
Control					0d	0d	0e	0e	0c	0c	0d	0a
Stam M4	ec	4	lb/A	3-4L	35c	45c	55d	63d	0c	0c	0d	0a
KIH-2023	WP	.04	lb/A	3-4L	55bc	73b	70c	70cd	20b	23b	10bc	0a
Valent X-77	1	4.8	oz p/A	3-4L								
KIH-2023	WP	.04	lb/A	3-4L	58b	78ab	78bc	70cd	33b	20b	13bc	0a
Valent X-77	1	4.8	oz p/A	3-4L								
RyzUp	1	1.5	oz p/A	3-4L								
KIH-2023	WP	.04	lb/A	3-4L	55bc	73b	78bc	78bc	30b	20b	8c	0a
Valent X-77	1	4.8	oz p/A	3-4L								
RyzUp	1	3	oz p/A	3-4L								
KIH-2023	WP	.08	lb/A	3-4L	75ab	88ab	78bc	75c	60a	40a	13bc	0a
Valent X-77	1	4.8	oz p/A	3-4L								
KIH-2023	WP	.08	lb/A	3-4L	83a	90a	88ab	88ab	60a	38a	20a	0a
Valent X-77	1	4.8	oz p/A	3-4L								
RyzUp	1	1.5	oz p/A	3-4L								
KIH-2023	WP	.08	lb/A	3-4L	83a	85ab	90a	90a	60a	45a	18ab	0a
Valent X-77	1	4.8	oz p/A	3-4L								
RyzUp	1	3	oz p/A	3-4L								
LSD (.05)	=				21	14	10	11	15	7	7	0
Standard Dev.	=				13.999	9.6978	6.8573	7.2065	10.037	4.9401	4.7559	0
CV	=				25.31	14.64	10.25	10.83	30.59	21.36	47.56	0

Means followed by same letter do not significantly differ (Duncan's MRT, P=.05).

Injury symptoms were all related to alterations in the growth habit of the rice. Following KIH-2023 application, the most pronounced form of injury was stunting of newly emerging leaves. Leaves were shorter than normal and new leaves were not fully emerging through the sheath of the previous leaf. Leaves were thinner than normal and curled at the edges of the blades giving a rolled appearance. Tiller development was also retarded and canopy color was faded to a light green. There were no phototoxicity symptoms such as dead or necrotic leaf tissue, although older leaves appeared to turn yellow and senesce at a faster than normal rate.

Shoot Growth and Development - Vegetative Phase

Plant Height. Plant height was measured at 7, 14, and 40 DAT and again at maturity (96 DAT). The injury symptom of stunting previously discussed was clearly apparent in the plant height results at 7 DAT (Table 2). With Stam M4, plant height was 35 cm. On average, plant height for all KIH-2023 treatments was 30 cm. From 14 DAT until maturity, there were no differences in plant height between herbicide treatments and RyzUp had no effect on seedling height at any time.

Tiller Density. Tiller production was retarded initially by KIH-2023 but later recovered. For the first evaluation at 14 DAT, tiller density was highest at 24 tillers/10 plants in the Stam M4 treatment (Table 2). For the KIH-2023 treatments, tiller density was lower and ranged between 14 and 20 tillers/10 plants. By 40 DAT, tiller production had recovered and was slightly higher in the KIH-2023 treatments. For the KIH-2023 treatments, tiller density ranged from 23 to 45 tillers/10 plants compared with 20 tillers/10 plants in the Stam M4 treatment. The highest tiller density was observed in the treatment with KIH-2023 at .08 lb/A + RyzUp at 3 oz/A. Tiller density was 45 tillers/10 plants and significantly higher than in the Stam M4 treatment. RyzUp, overall, had no effect on tiller density.

Tiller Dry Weight. Tiller growth, as measured by dry weight, reflected the results noted with tiller density (Table 2). At 14 DAT, tiller dry weight was .407 g/plant with the Stam M4 treatment and was lower in the KIH-2023 treatments ranging between .11 and .245 g/plant. Evaluations made 5 weeks later at 40 DAT show the Stam M4 treatment had a tiller dry weight of 8.33 g/plant and with equivalent tiller dry weights noted in the KIH-2023 treatments, which ranged between 7.99 and 19.92 g/plant. Again, due to the high number of tillers, tiller dry weight of the .08 lb/A KIH-2020 + 3 oz/A RyzUp treatment was significantly higher compared with the Stam M4 treatment, although RyzUp, overall, had no consistent effect on tiller dry weight.

Shoot Dry Weight. Total canopy development was measured as shoot dry weight, including tillers and main stem. Since much of the canopy is composed of tillers in rice, the results reflect those noted in the previous discussion on tiller dry weight (Table 2). At 14 DAT, shoot dry weight in the Stam M4 treatment was .896 g/plant. In comparison, shoot dry weight of the KIH-2023 treatments was lower and ranged between .361 and .61 g/plant. At 40 DAT, shoot dry weights had increased dramatically and there was little difference between treatments showing the recovery from the early injury. Shoot dry weight in the Stam M4 treatment was 13.11 g/plant and shoot dry weight ranged between 12.07 and 23.98 g/plant in the KIH-2023 treatments. RyzUp had no effect on shoot dry weight.

Table 2. The effect of folier plant growth regulator and herbicide rates on rice shoot growth during the vegetative phase. Rice Research Station, Crowley, LA. 1994.

Treatment Name	Fm Ds	Rate	Rate Unit	Stg	Pl. Ht. (cm) 7 DAT	Pl. Ht. (cm) 14 DAT	Pl. Ht. (cm) 40 DAT	Density (tillers/ 10 plants) 14 DAT	Density (tillers 10 plants) 40 DAT	Tiller shoot dry wt. (g/plant) 14 DAT	Tiller Shoot Dry wt. (g/plant) 40 DAT	Plant shoot dry wt. (g/plant) 14 DAT	Plant shoot dry wt. (g/plant) 40 DAT
Control					31b	55a	78ab	12b	15c	0.177ab	6.73b	0.602ab	11.28a
Stam M4	ec	4	lb/A	3-4L	35a	50b	79a	24a	20bc	0.407a	8.33ab	0.896a	13.11a
KIH-2023	WP	.04	lb/A	3-4L	29b	53ab	72ab	14b	33abc	0.145b	7.99ab	0.450b	12.07a
Valent X-77	1	4.8	oz p/A	3-4L									
KIH-2023	WP	.04	lb/A	3-4L	31b	55a	78ab	17ab	29abc	0.153b	9.95ab	0.504b	14.91a
Valent X-77	1	4.8	oz p/A	3-4L									
Ryz Up	1	1.5	oz p/A	3-4L									
KIH-2023	WP	.04	lb/A	3-4L	31b	53ab	74ab	16ab	27abc	0.130b	10.10ab	0.434b	15.53a
Valent X-77	1	4.8	oz p/A	3-4L									
Ryz Up	1	3	oz p/A	3-4L									
KIH-2023	WP	.08	lb/A	3-4L	31b	51ab	70b	15ab	40ab	0.110b	11.76ab	0.361b	16.33a
Valent X-77	1	4.8	oz p/A	3-4L									
KIH-2023	WP	.08	lb/A	3-4L	30b	52ab	70ab	20ab	23abc	0.245ab	8.84ab	0.610ab	12.51a
Valent X-77	1	4.8	oz p/A	3-4L									
Ryz Up	1	1.5	oz p/A	3-4L									
KIH-2023	WP	.08	lb/A	3-4L	32b	53ab	76ab	18ab	45a	0.198ab	19.92a	0.494b	23.98a
Valent X-77	1	4.8	oz p/A	3-4L									
Ryz Up	1	3	oz p/A	3-4L									
LSD (.05)	=				4	4	8	9	20	0.217	10.99	0.330	11.67
Standard Dev.	=				2.4315	2.6681	5.547	5.9965	13.498	.1473	7.4697	.22467	7.9364
CV	=				7.80	5.06	7.44	35.40	46.60	75.29	71.47	41.32	53.03

Means followed by same letter do not significantly differ (Duncan's MRT, P=.05).

Root Growth and Development - Vegetative Phase

Root Length. Root growth was retarded initially following KIH-2023 application and showed signs of recovery almost 4 weeks later (Table 3). At 14 DAT, root length was 104 mm in the Stam M4 treatment. In the KIH-2023 treatments, root length ranged between 87 and 94 mm. At 40 DAT, there were no major differences between herbicide treatments. Root length in the Stam M4 treatment was 151 mm, and root length ranged between 138 and 182 mm in the KIH-2023 treatments. RyzUp had no effect on root length.

Root Dry Weight. Root biomass measurements reflected the results of the herbicide treatment effects on root length (Table 3). At 14 DAT, root dry weight of the Stam M4 treatment was .259 g/plant. For the KIH-2023 treatments, root dry weights were lower and ranged from .031 to .071 g/plant. At 40 DAT, the Stam M4 treatment had a root dry weight of 1.75 g/plant and similar root dry weights of the KIH-2023 treatments were noted and ranged between 1.13 and 2.28 g/plant. Again, RyzUp had no effect on root dry weight.

Plant Growth and Development - Vegetative Phase

Plant Dry Weight. Plant growth and development is a composite of the growth and development of the shoot and root system. Since the effect of KIH-2023, in general, was the suppression of shoot and root growth at 14 DAT and recovery by 40 DAT, the effect on overall plant growth and development was identical (Table 3). At 14 DAT, plant dry weight for the Stam M4 treatment was 1.155 g/plant and plant dry weights for the KIH-2023 treatments were lower and ranged between 0.391 and .681 g/plant. At 40 DAT, plant dry weight of the Stam M4 treatment had increased to 14.86 g/plant and the range in plant dry weights of the KIH-2023 treatments had increased to similar levels, ranging between 13.53 to 26.25 g/plant. RyzUp, as previously noted, had no effect on plant dry weight.

Mature Plant Development - Reproductive Phase

Maturity. Effects of chemical treatments on maturity of rice were evaluated by determining the number of days from planting to 50% heading (DTH). KIH-2023 applied alone or in combination with RyzUp delayed maturity by 3 to 4 days compared with the Stam M4 treatment (Table 4). These results show the injurious effects of KIH-2023 during the vegetative phase delayed crop development.

Grain Production. At harvest maturity, grain moisture was constant for all chemical treatments and grain yield was significantly decreased by KIH-2023 (Table 4). The only exception was the treatment with KIH-2023 at .08 lb/A + RyzUp at 3 oz/A. There was no difference statistically between the yield of the treatment with the high rates of KIH-2023 + RyzUp and the Stam M4 treatment.

Table 3. The effect of foliar plant growth regulator and herbicide rates on rice root growth and whole plant growth during the vegetative phase. Rice Research Station, Crowley, LA. 1994.

Treatment Name	Fm Ds	Rate	Rate Unit	Grow Stg	Root Length (mm) 14 DAT	Root Length (mm) 40 DAT	Root Dry wt. (g/plant) 14 DAT	Root Dry wt. (g/plant) 40 DAT	Plant Dry wt. (g/plant) 14 DAT	Plant Dry wt. (g/plant) 40 DAT
Control					103ab	156a	0.108b	1.42a	0.709b	12.70a
Stam M4	ec	4	lb/A	3-4L	104a	151a	0.258a	1.75a	1.155a	14.86a
KIH-2023	WP	.04	lb/A	3-4L	87b	148a	0.045b	1.46a	0.484b	13.53a
Valent X-77	1	4.8	oz p/A	3-4L						
KIH-2023	WP	.04	lb/A	3-4L	92ab	182a	0.056b	2.14a	0.560b	17.06a
Valent X-77	1	4.8	oz p/A	3-4L						
RyzUp	1	1.5	oz p/A	3-4L						
KIH-2023	WP	.04	lb/A	3-4L	89ab	138a	0.039b	1.65a	0.473b	17.19a
Valent X-77	1	4.8	oz p/A	3-4L						
RyzUp	1	3	oz p/A	3-4L						
KIH-2023	WP	.08	lb/A	3-4L	87b	162a	0.031b	1.87a	0.391b	18.20a
Valent X-77	1	4.8	oz p/A	3-4L						
KIH-2023	WP	.08	lb/A	3-4L	94ab	148a	0.071b	1.13a	0.681b	13.65a
Valent X-77	1	4.8	oz p/A	3-4L						
RyzUp	1	1.5	oz p/A	3-4L						
KIH-2023	WP	.08	lb/A	3-4L	88b	144a	0.051b	2.28a	0.545b	26.25a
Valent X-77	1	4.8	oz p/A	3-4L						
RyzUp	1	3	oz p/A	3-4L						
LSD (.05)	=				15	42	0.089	1.50	0.390	12.85
Standard Dev.	=				9.8745	28.314	6.0591	1.0201	.26489	8.806
CV	=				10.63	18.47	73.50	59.50	42.30	52.80

Means followed by same letter do not significantly differ (Duncan's MRT, P=.05).

In general, KIH-2023 reduced grain yield approximately 1400 lb/A, independent of rate. Grain yield of the Stam M4 treatment was 5987 lb/A and the average yield for the two KIH-2023 rates without RyzUp was 4515 lb/A. The addition of 1.5 oz RyzUp/A to KIH-2023 reduced the yield loss only slightly, but 3 oz RyzUp/A added to KIH-2023, on average, resulted in a 700 lb/A decrease in grain yield compared with Stam M4. The addition of RyzUp cut the yield reduction from KIH-2023 by half, acting, in part, as a safener. This may be related to the increase in tiller density noted at 40 DAT.

Milling Yield. Total milling yield was unaffected by KIH-2023 and RyzUp, and whole milling yield was decreased by the high rates of KIH-2023 and RyzUp (Table 4). Total milling yields ranged between 64.4 and 65.4% for the control and all treatments. Whole milling yield was lowest in the control at 52.8%. Whole milling yield generally improved with KIH-2023, propanil and RyzUp treatments and ranged between 55.2 and 58.3% for these treatments. The high rates of KIH-2023 and RyzUp had the lowest milling yield of 55.2% for all chemical treatments.

Table 4. The effect of foliar plant growth regulator and herbicide rates on mature rice plant development during the reproductive phase. Rice Research Station, Crowley, LA. 1994.

Treatment Name	Fm	Rate	Unit	Grow Stg	Time to 50% Head Heading (DAP)	Grain Moisture (%)	Yield (lb/A)	Total Milling (%)	Whole Milling (%)
Control					83c	17.3a	2853c	64.4a	52.8d
Stam M4	ec	4	lb/A	3-4L	85b	18.6b	5987a	65.2a	58.8b
KIH-2023	WP	.04	lb/A	3-4L	89a	18.6b	4552b	65.4a	57.7ab
Valent X-77	1	4.8	oz p/A	3-4L					
KIH-2023	WP	.04	lb/A	3-4L	89a	18.6b	4839b	65.2a	57.7ab
Valent X-77	1	4.8	oz p/A	3-4L					
RyzUp	1	1.5	oz p/A	3-4L					
KIH-2023	WP	.04	lb/A	3-4L	88a	18.7b	5125b	65.2a	57.2ab
Valent X-77	1	4.8	oz p/A	3-4L					
RyzUp	1	3	oz p/A	3-4L					
KIH-2023	WP	.08	lb/A	3-4L	89a	18.6b	4476b	65.3a	58.3a
Valent X-77	1	4.8	oz p/A	3-4L					
KIH-2023	WP	.08	lb/A	3-4L	89a	17.1ab	4871b	64.8a	58.5b
Valent X-77	1	4.8	oz p/A	3-4L					
RyzUp	1	1.5	oz p/A	3-4L					
KIH-2023	WP	.08	lb/A	3-4L	89a	17.1ab	5352ab	64.5a	55.2c
Valent X-77	1	4.8	oz p/A	3-4L					
RyzUp	1	3	oz p/A	3-4L					
LSD (.05)	=				2	0.5	794	0.9	1.3
Standard Dev.	=				1.1527	.33807	539.86	.59415	.89853
CV	=				1.32	2.00	11.47	0.91	1.59

Means followed by same letter do not significantly differ (Duncan's MRT, P=.05).

SEEDLING VIGOR STUDIES (SEED AND FOLIAR TREATMENT)

R.T. Dunand and R.R. Dilly, Jr.

Experiment: Gibberellic Acid and Seedling Vigor and Crop Production in Rice

Location: Rice Research Station, Crowley, LA (North Unit)

Variety: See treatments

Seeding Rate: 100 lb/A

Planting Date: 9 June 94

Row Spacing: 7-inch

Planting Depth: 1 inch for untreated seed; 3 inches for gibberellic acid treated seed

Fertilizer: 7-21-21 with 3.5% zinc at 300 lb/A drilled preplant, 9 June; ammonium sulfate (21% N) at 400 lb/A by airplane, 27 June

Water Management: Flushed, 17 June

Plot Size: 225 ft^2 - 5.25 x 100 ft

Treated Area: 225 ft^2 - 5.25 x 100 ft

Treatment(s): Plant Growth Regulator

Gibberellic acid seed treatment (22 ppm) - 0.35 oz RELEASE/cwt
Gibberellic acid foliar treatment (1 g/A) - 1 fl. oz. RyzUp/A

Timing

Seed treatment, 22 Feb
Foliar treatment, 27 June

Sprayer: CO_2-driven, hand-held, 32 psi, 15 GPA, 8002 nozzles

Pertinent Rainfall: Seed treatment - 1.5 inches, 11 June; 1.8 inches, 12 June
Foliar treatment - 0.1 inch, 1 July; 0.6 inch, 8 July; 1.0 inch, 9 July; 0.1 inch, 10 July; and 1.1 inches, 11 July

Herbicide(s): Stam M-4 (3 qt/A) by airplane, 21 June
Stam M-4+Londax (4 qt+1 oz/A) by airplane, 27 June;
Londax (2 oz/A) by airplane, 7 July

Insecticide(s): Furadan 3G (17 lb/A) by airplane, 7 and 21 July and 9 Aug
Methyl parathion (2 pt/A) by airplane, 22 July
Methyl parathion (1 pt/A) by airplane, 9 and 26 Aug and 3 Sept
Methyl parathion (0.5 pt/A) by airplane, 23 Aug

Fungicide(s): Benlate - 2.8 lb/A by airplane, 22 July
1.0 lb/A by airplane, 9 and 23 Aug and 23 Sept

Growth Regulator(s): RELEASE (0.35 oz/cwt) seed treatment

Emergence: 15 June

Permanent Flood: 1 July

Harvest Date: 28 Sept

Harvested Area: 525 ft^2 - 5.25 x 100 ft

Exp. Design: Randomized complete block and four replications

Comments: Seedling vigor evaluations included emergence and seedling height. On average, seed treated with gibberellic acid and planted deep had 1 to 2 days later emergence and lower stands than seed planted shallow (Table 1). Rainfall in excess of 3 inches during the 2 days following planting saturated the soil and had an adverse effect on the deep planted rice. Foliar gibberellic acid application increased seedling height by 3 cm at 4 days after treatment (DAT) and decreased seedling height by 6 cm at 14 DAT. The decrease noted at 14 DAT was in part due to the decline in activity of gibberellic acid after 2 weeks and the tendency for shorter plants when stands were low.

Lower stands in the deep planted rice delayed maturity and reduced grain yield (Table 1). Grain moisture of the deep planted rice was 3% higher (22.2% versus 18.6%) compared with the shallow planted rice. This translates into a 4- to 6-day delay in maturity. Grain yields were reduced 1100 lb/A in Cypress and over 1500 lb/A in Bengal, Lemont and Mars due to the effect of adverse weather and deep planting on stand.

Table 1. The effect of plant growth regulator seed and foliar treatment on seedling vigor and crop productivity. Rice Research Station, Crowley, LA. 1994.

Treatment Name	Fm Ds	Rate	Grow Stg	Emergence (DAP)	Stand (plants/ sq ft) 11 DAP	Pl. Ht. (cm) 4 DAT	Pl. Ht. (cm) 14 DAT	Moisture (%)	Yield lb/A
Deep Lemont RELEASE, 22ppm RyzUp	sp 1	0.35 1	2-3L	8bc	14c	23cd	46c	21.2a	3493f
Deep Cypress RELEASE, 22ppm RyzUp	sp 1	0.35 1	2-3L	7cd	12c	25bc	50bc	22.3a	4233de
Deep Bengal RELEASE, 22ppm RyzUp	sp 1	0.35 1	2-3L	8ab	11cd	30a	57ab	23.2a	4495cd
Deep Mars RELEASE, 22ppm RyzUp	sp 1	0.35 1	2-3L	8a	9d	28ab	53bc	22.2a	3779ef
Shallow Lemont				6f	24b	20d	54ab	18.0b	4957bc
Shallow Cypress				6f	29a	22d	54b	19.2b	5398b
Shallow Bengal				7de	26ab	26b	62a	18.6b	6056a
Shallow Mars				6ef	29a	27ab	57ab	16.8b	5323b
LSD (.05) =				1	3	3	7	2.0	631
Standard Dev.=				.47559	2.2217	1.8208	4.799	1.3646	428.75
CV =				6.79	11.60	7.23	8.91	6.76	9.09

Means followed by same letter do not significantly differ (Duncan's MRT, P=.05).

SEEDLING VIGOR STUDIES (SEED AND FOLIAR TREATMENT)

R.T. Dunand and R.R. Dilly, Jr.

Experiment: Gibberellic Acid and Seedling Vigor in Rice - February Planting Date

Location: Rice Research Station, Crowley, LA (Blast Nursery)

Variety: See treatments

Seeding Rate: 40 seed/2 row ft

Planting Date: 24 Feb 94

Row Spacing: 2-inch

Planting Depth: 1 inch

Fertilizer: 20-10-10 with 2% zinc at 300 lb/A topdress, 21 Mar

Water Management: Not applicable

Plot Size: 0.33 ft^2 - 2 inches x 2ft

Treated Area: 0.33 ft^2 - 2 inches x 2 ft

Treatment(s):

Varieties

Bengal	Jodon
Cypress	Mars
Jackson	Maybelle

Plant Growth Regulator(s)

Gibberellic acid (22, 44 ppm) - GibGro (0.17 and 0.35 oz/cwt)
RELEASE (0.35 and 0.7 oz/cwt)
Gibberellic acid (3 g/A) - RyzUp (3 fl. oz./A) applied with Stam M4 (3 qt/A) by CO_2 sprayer

Timing

Seed treatment, 17 Feb
Foliar treatment (2- to 3-leaf), 29 Mar

Sprayer: CO_2-driven, hand-held, 32 psi, 15 GPA, 8002 nozzles

Pertinent Rainfall: Seed treatment - 1.5 inches, 1 Mar
1.5 inches, 9 Mar
Foliar treatment - 2.9 inches, 6 Apr
2.1 inches, 12 Apr
0.2 inches, 15 Apr
0.6 inches, 16 Apr

Herbicide(s): See foliar treatment

Insecticide(s): Not applicable

Fungicide(s): Dithane (4 fl. oz./cwt), 17 Feb

Emergence: 10 Mar

Permanent Flood: Not applicable

Harvest Date: Not applicable

Harvested Area: Not applicable

Exp. Design: Each variety was planted in a three-row group (one row had untreated seed, one had GibGro treated seed and one had RELEASE treated seed). All groupings were blocked and replicated four times. Half of each row was sprayed with RyzUp.

Comments: Initial and final evaluations of stand were made at 14 and 29 days after planting (DAP). Intermediate evaluations were also made.

In the early emergence evaluation at 14 DAP, all varieties exhibited a significant response to gibberellic acid (GA_3) seed treatment (Table 1). The response was independent of GA_3 formulation and rate. Emergence was 3 to 4 fold greater with GA_3 seed treatment. In general, there were 4 to 6 plants/row without GA_3 seed treatment and 13 to 22 plants/row with the seed treatment. The most responsive variety was Cypress, which had five plants in the untreated compared with 20 and 22 plants with the GibGro and RELEASE formulations of GA_3, respectively (Table 1). Jodon had the lowest initial emergence. There were 0 plants/row without the seed treatment and 7 and 9 plants/row with the two GA_3 seed treatments.

By 29 DAP, final stands had been reached and stands were equivalent for all treatments (Table 1). Stands ranged between 24 and 28 plants/row for all varieties without GA_3 seed treatment and stands ranged between 23 and 31 plants/row with GA_3.

Emergence results were affected by soil temperature. During the period from planting to first evaluation (14 DAP), daily average soil temperatures for the 14-day period averaged 58°F. Between 14 DAP and final stand (29 DAP), daily average soil temperatures had warmed markedly and for the 15-day period averaged 67°F.

Residual effects of GA_3 seed treatment enhanced seedling length (Table 1). At 29 DAP, there were significant differences in plant height between seedlings from untreated and treated seed of Cypress and Jodon. Seedlings from GA_3 treated seed were 10 mm taller. Jackson, Mars and Maybelle were unaffected.

During the seedling stages, RyzUp was applied to determine response to a foliar application of GA_3. During the period from 7 to 21 days after treatment (DAT), plant height of all varieties was increased by RyzUp (Table 2). At 7 DAT, plant height differentials ranged between 2 and 4 cm. The differential increased from 3 to 6 cm by 15 DAT, and RyzUp was causing a height increase from 5 to 7 cm by 21 DAT. Differences in degree of response were related to air temperatures. As air temperature increased, degree of response increased. The average daily air temperatures for the first, second and third week after application of RyzUp were 59°F, 64°F and 69°F, respectively.

Table 1. The effect of plant growth regulator seed treatment on seedling vigor of rice. Rice Research Station, Crowley, LA. 1994.

Treatment Name	Fm Ds	Rate	Grow Stg	Stand (Plants/ 40 seed) 14 DAP	Stand (Plants/ 40 seed) 18 DAP	Stand (Plants/ 40 seed) 18 DAP	Stand (Plants/ 40 seed) 20 DAP	Stand (Plants/ 40 seed) 22 DAP	Stand (Plants/ 40 seed) 29 DAP	Pl. Ht. (mm) 29 DAP
Bengal										
Control		0		4gh	12def	22c-f	28a-e	28a-e	27a-e	105efg
GibGro	sp	0.17	seed	17bcd	22abc	29ab	32ab	32ab	31a	113b-f
RELEASE	sp	0.35	seed	13cde	19bc	28a-d	28a-d	28a-d	29a-e	116b-e
Cypress										
Control		0		5fg	12def	21def	27a-e	28a-e	28a-e	90h
GibGro	sp	0.17	seed	20ab	27a	31a	33a	33a	30abc	109c-g
RELEASE	sp	0.35	seed	22a	28a	31a	32ab	32a	31ab	111b-g
Jackson										
Control		0		8fg	15cde	21def	24c-f	26cde	28a-e	104efg
GibGro	sp	0.17	seed	16bcd	21abc	24b-e	25c-f	25cde	24e	109c-g
RELEASE	sp	0.35	seed	17bcd	20abc	24b-f	27a-e	28a-e	26a-e	107d-g
Jodon										
Control		0		0h	3g	11h	20f	25cde	28a-e	98gh
GibGro	sp	0.17	seed	7fg	18cde	23c-f	27a-e	28a-e	29a-e	109c-g
RELEASE	sp	0.35	seed	9ef	16cde	23c-f	27a-e	29abc	30a-d	109c-g
Mars										
Control		0		5fg	10ef	17fg	21ef	24cde	28a-e	103efg
GibGro	sp	0.17	seed	17bc	24ab	28abc	30abc	30abc	28a-e	122abc
GibGro	sp	0.35	seed	15cd	19bc	24b-e	26b-e	26b-e	25b-e	120a-d
RELEASE	sp	0.35	seed	13cde	20abc	24b-e	28a-d	28a-d	27a-e	115b-e
RELEASE	sp	0.70	seed	15cd	21abc	22c-f	24c-f	25cde	23e	118b-e
Maybelle										
Control				4fgh	9fg	14gh	19f	22e	24de	100fgh
GibGro	sp	0.17	seed	16bcd	19bcd	23c-f	25c-f	26b-e	27a-e	116b-e
GibGro	sp	0.35	seed	15cd	17cd	23c-f	25c-f	28cde	24cde	123ab
RELEASE	sp	0.35	seed	12de	18bcd	20def	23def	25cde	25cde	115b-e
RELEASE	sp	0.70	seed	13cde	16cde	19efg	22def	23de	23e	130a
LSD (.05)	=			4	8	5	5	5	5	11
Standard Dev.	=			2.8794	4.0224	3.8004	3.7673	3.5144	3.6067	7.9229
CV	=			24.39	23.29	18.71	14.52	13.08	13.46	7.15

Means followed by same letter do not significantly differ (Duncan's MRT, P=.05).

Table 2. The effect of plant growth regulator foliar treatment on seedling vigor of rice. Rice Research Station, Crowley, LA. 1994.

Treatment Name	Fm Ds	Rate	Grow Stg	Pl. Ht. (cm) 7 DAT	Pl. Ht. (cm) 15 DAT	Pl. Ht. (cm) 21 DAT
Bengal						
Control	1	0	2-3 L	14ef	15c	16d
RyzUp	1	3	2-3 L	17ab	19ab	21abc
Cypress						
Control	1	0	2-3 L	12g	13d	15d
RyzUp	1	3	2-3 L	15cd	18b	20c
Jackson						
Control		0	2-3 L	13fg	14cd	15d
RyzUp	1	3	2-3 L	17a	19ab	22ab
Jodon						
Control		0	2-3 L	13fg	14d	15d
RyzUp	1	3	2-3 L	16abc	20a	22a
Mars						
Control	1	0	2-3 L	14de	15c	16d
RyzUp	1	3	2-3 L	16bc	18b	21abc
Maybelle						
Control	1	0	2-3 L	14ef	14d	16d
RyzUp	1	3	2-3 L	16abc	18b	21bc
LSD (.05)	=			1	1	2
Standard Dev.	=			.73897	.74366	1.0543
CV	=			5.05	4.59	5.80

Means followed by same letter do not significantly differ (Duncan's MRT, P=.05).

SEEDLING VIGOR STUDIES (SEED AND FOLIAR TREATMENT)

R.T. Dunand and R.R. Dilly, Jr.

Experiment: Gibberellic Acid and Seedling Vigor in Rice - March Planting Date

Location: Rice Research Station, Crowley, LA (Blast Nursery)

Variety: See treatments

Seeding Rate: 40 seed/2 row ft

Planting Date: 18 Mar 94

Row Spacing: 2-inch

Planting Depth: 1-inch

Fertilizer: 20-10-10 with 2% zinc at 300 lb/A topdress, 5 Apr (sprinkle irrigated)

Water Management: Not applicable

Plot Size: 0.33 ft^2 - 2 inches x 2ft

Treated Area: 0.33 ft^2 - 2 inches x 2 ft

Treatment(s): **Varieties**

Bengal	Jodon
Cypress	Mars
Jackson	Maybelle

Plant Growth Regulator(s)

Gibberellic acid (22, 44 ppm) - GibGro (0.17 and 0.35 oz/cwt)
RELEASE (0.35 and 0.7 oz/cwt)

Gibberellic acid (3 g/A) - RyzUp (2 fl. oz./A) applied with Stam M4 (3 qt/A) by CO_2 sprayer

Timing

Seed treatment, 17 Feb
Foliar treatment (2- to 3-leaf), 14 Apr

Sprayer: CO_2-driven, hand-held, 32 psi, 15 GPA, 8002 nozzles

Pertinent Rainfall: Seed treatment - 0.2 inches, 27 Mar
2.9 inches, 6 Apr
2.1 inches, 12 Apr

Foliar treatment - 0.2 inches, 15 Apr
0.6 inches, 16 Apr
0.2 inches, 20 Apr
0.1 inches, 22 Apr
1.2 inches, 23 Apr
0.1 inches, 24 Apr
0.5 inches, 30 Apr
0.1 inches, 1 May
0.2 inches, 2 May
1.3 inches, 3 May
0.1 inches, 4 May

Herbicide(s): See foliar treatment

Insecticide(s): Not applicable

Fungicide(s): Dithane (4 fl. oz./cwt), 17 Feb

Emergence: 23 Mar

Permanent Flood: Not applicable

Harvest Date: Not applicable

Harvested Area: Not applicable

Exp. Design: Each variety was planted in a three-row group (one row had untreated seed, one had GibGro-treated seed and one had RELEASE-treated seed). All groupings were blocked and replicated four times. Half of each row was sprayed with RyzUp.

Comments: Initial and final evaluations of stand were made at 5 and 26 days after planting (DAP). Intermediate evaluations were also made.

In the early emergence evaluation at 5 DAP, all varieties exhibited a significant response to gibberellic acid (GA_3) seed treatment (Table 1). The response was independent of GA_3 formulation and rate. In general, there was 1 plant/row without GA_3 seed treatment and 6 to 13 plants/row with the seed treatment. The most responsive variety was Cypress, which had 0 plants in the untreated compared with 13 plants with the GibGro and

RELEASE formulations of GA_3 (Table 1). The least responsive variety was Bengal. There were 2 plants/row without the seed treatment and 6 and 5 plants/row with the GibGro and RELEASE formulations of GA_3, respectively.

By 26 DAP, final stands had been reached and stands were equivalent for all treatments (Table 1). Stands ranged between 28 and 33 plants/row for all varieties without GA_3 seed treatment, and stands ranged between 25 and 33 plants/row with GA_3.

Emergence results were affected by soil temperature, which was favorable for emergence. During the period from planting to first evaluation (5 DAP), daily average soil temperatures for the 5-day period averaged 72°F. Between 5 DAP and final stand (26 DAP), daily average soil temperatures had cooled slightly but were still favorable for emergence and for the 21-day period averaged 68°F.

Residual effects of GA_3 seed treatment enhanced seedling length (Table 1). At 21 DAP, there were significant differences in plant height between seedlings from untreated and treated seed of Cypress and with the high rate of seed treatment for Mars and Maybelle. Seedlings from GA_3-treated seed were approximately 15 mm taller. Bengal, Jackson and Jodon were unaffected.

During the seedling stages, RyzUp was applied to determine response to a foliar application of GA_3. During the period from 8 to 22 days after treatment (DAT), plant height of all varieties was increased by RyzUp (Table 2). The amount of increase remained relatively constant over the period. At 8 DAT, plant height differentials ranged between 10 and 14 cm. The differential increased slightly to 14 to 15 cm by 14 DAT, and RyzUp was causing a height increase from 11 to 14 cm by 21 DAT. The constant response with time was in part related to relatively constant air temperatures during the 22-day period following application. The average daily air temperatures for the first, second and third week after application of RyzUp were 70°F, 75°F and 70°F, respectively.

Table 1. The effect of plant growth regulator seed treatment on seedling vigor of rice. Rice Research Station, Crowley, LA. 1994.

Treatment Name	Fm Ds	Rate	Grow Stg	Stand (Plants/ 40 seed) 5 DAP	Stand (Plants/ 40 seed) 7 DAP	Stand (Plants/ 40 seed) 9 DAP	Stand (Plants/ 40 seed) 11 DAP	Stand (Plants/ 40 seed) 26 DAP	Pl. Ht. (mm) 26 DAP
Bengal									
Control		0		2de	19de	29abc	31abc	30a-e	121d-g
GibGro	sp	0.17	seed	6bc	27abc	34a	34abc	32abc	127c-g
RELEASE	sp	0.35	seed	5bcd	25bcd	31abc	32abc	29a-e	129b-f
Cypress									
Control		0		0e	20de	29abc	32abc	33ab	99h
GibGro	sp	0.17	seed	13a	32a	34a	34ab	31abc	114fg
RELEASE	sp	0.35	seed	13a	28abc	29abc	30abc	27cde	116efg
Jackson									
Control		0		1e	20de	27c	29c	30a-d	116efg
GibGro	sp	0.17	seed	8bc	27abc	30abc	30abc	28a-e	131b-e
RELEASE	sp	0.35	seed	9ab	27abc	30abc	31abc	29a-e	125c-g
Jodon									
Control		0		1e	18e	29abc	30abc	29a-e	111gh
GibGro	sp	0.17	seed	7bc	28ab	33ab	35a	33a	125c-g
RELEASE	sp	0.35	seed	7bc	26abc	30abc	32abc	30a-e	129b-f
Mars									
Control		0		1e	20de	29abc	33abc	32abc	127c-f
GibGro	sp	0.17	seed	6bc	27abc	31abc	32abc	29a-e	130b-f
GibGro	sp	0.35	seed	6bcd	27abc	32abc	32abc	29a-e	136a-d
RELEASE	sp	0.35	seed	8b	30ab	33a	34ab	33ab	145ab
RELEASE	sp	0.70	seed	7bc	28abc	32abc	34abc	29a-e	144ab
Maybelle									
Control		0		1e	19de	28bc	29c	28b-e	123d-g
GibGro	sp	0.17	seed	7bc	27abc	32abc	33abc	28a-e	124c-g
GibGro	sp	0.35	seed	8bc	27abc	31abc	32abc	28a-e	144ab
RELEASE	sp	0.35	seed	6bcd	22cde	29abc	29bc	26de	140abc
RELEASE	sp	0.70	seed	4cde	24b-e	29abc	29c	25e	150a
LSD (.05)	=			4	6	5	4	4	14
Standard Dev.	=			2.5157	3.9505	3.225	3.1183	3.1059	9.5764
CV	=			45.55	15.98	10.58	9.87	10.61	7.52

Means followed by same letter do not significantly differ (Duncan's MRT, P=.05).

Table 2. The effect of plant growth regulator foliar treatment on seedling vigor of rice. Rice Research Station, Crowley, LA. 1994.

Treatment Name	Fm Ds	Rate	Grow Stg	Pl. Ht. (cm) 8 DAT	Pl. Ht. (cm) 14 DAT	Pl. Ht. (cm) 22 DAT
Bengal						
Control		0		20e	26cd	28ef
RyzUp	1	3	2-3 L	32ab	41a	42a
Cypress						
Control		0		16f	23e	27g
RyzUp	1	3	2-3 L	30c	38b	38c
Jackson						
Control		0		20e	25cde	28ef
RyzUp	1	3	2-3 L	31c	39b	40b
Jodon						
Control		0		19e	24e	28fg
RyzUp	1	3	2-3 L	31bc	38b	40b
Mars						
Control		0		22d	27c	30d
RyzUp	1	3	2-3 L	33a	42a	43a
Maybelle						
Control		0		20e	25de	29de
RyzUp	1	3	2-3 L	30c	39b	40b
LSD (.05) =				2	2	1
Standard Dev.=				1.0966	1.1997	.91425
CV =				4.35	3.74	2.67

Means followed by same letter do not significantly differ (Duncan's MRT, P=.05).

SEEDLING VIGOR STUDIES (SEED AND FOLIAR TREATMENT)

R.T. Dunand and R.R. Dilly, Jr.

Experiment: Gibberellic Acid and Seedling Vigor in Rice - April Planting Date

Location: Rice Research Station, Crowley, LA (North Unit)

Variety: See treatments

Seeding Rate: 100 lb/A

Planting Date: 5 Apr 94

Row Spacing: 7-inch

Planting Depth: 3 inches

Fertilizer: 7-21-21 with 3.5% zinc at 300 lb/A drilled at planting

Water Management: Not applicable

Plot Size: 11.7 ft^2 - 0.58 (1 row) x 20 ft

Treated Area: 11.7 ft^2 - 0.58 (1 row) x 20 ft

Treatment(s): **Varieties/Experimental Lines**

AB647	Jackson	Lemont	LA2192
Adair	Jodon	Maybelle	9302008
Bengal	Kaybonnet	RT7015	9302062
Cypress	LaGrue	LA2085	9302065

Plant Growth Regulator(s)

Seed Treatment
Gibberellic acid (22 ppm) - GibGro (0.17 oz/cwt)
- RELEASE (0.35 oz/cwt)

Foliar Treatment (tank mixed with 1 gal Stam M4/A)
Gibberellic acid (1.5 g/A) - GibGro 4LS (1.5 fl. oz./A)
- RyzUp (1.5 fl. oz./A)

Timing

Seed treatment, 17 Feb
Foliar treatment (2- to 3-leaf), 28 Apr

Sprayer: CO_2-driven, hand-held, 32 psi, 15 GPA, 8002 nozzles

Pertinent Rainfall: Seed treatment - 2.9 inches, 6 Apr; 2.1 inches, 12 Apr; 0.2 inches, 15 Apr; 0.6 inches, 16 Apr; 0.2 inches, 20 Apr; 0.1 inches, 22 Apr; 1.2 inches, 23 Apr; 0.1 inches, 24 Apr

Foliar treatment - 0.5 inches, 30 Apr; 0.1 inches, 1 May; 0.2 inches, 2 May; 1.3 inches, 3 May; 0.1 inches, 4 May

Herbicide(s): Stam M4 (3 qt/A), 20 Apr

Insecticide(s): Not applicable

Fungicide(s): Dithane (4 fl. oz./cwt), 17 Feb

Emergence: 15 Apr

Permanent Flood: Not applicable

Harvest Date: Not applicable

Harvested Area: Not applicable

Exp. Design: Randomized complete block design and four replications. A given plot contained a different variety or experimental line in each row. There were three such plots. One contained six rows and two contained five rows in accommodating 16 varieties and experimental lines. The position of a variety or experimental line within a given plot was constant. Each given plot was planted in triplicate in each replicate. Of each triplicate, one plot had untreated seed, one plot had seed treated with GibGro, and one plot had seed treated with RELEASE according to the randomization of plots.

Comments: Gibberellic acid had a significant effect during the initial stages of emergence in all varieties and experimental lines (Table 1). On average, plots planted with untreated seed had 2 plants/ft^2 at 14 days after planting (DAP). Seed treated with GibGro and RELEASE produced 3 and 4 plants/ft^2, respectively. Similarly, at 16 DAP, untreated seed on average resulted in 4 plants/ft^2 compared with 5 and 6 plants/ft^2 with GibGro and RELEASE, respectively.

Differences in varietal/experimental line response to gibberellic acid seed treatment were noted during the middle and final stages of emergence (Table 2). At 18 and 23 DAP, AB647, Adair, Cypress, Lemont, RT7015, LA2085, LA2192, 9302008, 9302062 and 9302065 had increases in stands with the gibberellic acid seed treatment. Varieties with stands unaffected by gibberellic acid at 18 and 23 DAP were Bengal, Jackson, Jodon, Kaybonnet, LaGrue and Maybelle.

In general, the six unresponsive varieties were among the 10 more vigorous varieties and experimental lines that had final stands of 10 plants/ft^2 or more at 23 DAP. Stands between 10 and 20 plants/ft^2 are considered ideal for optimum grain production. Varieties and experimental lines with final stands of 10 plants/ft^2 or better at 23 DAP were Adair, Bengal, Cypress, Jackson, Jodon, Kaybonnet, LaGrue, Maybelle, RT7015 and 9302065 (Table 2).

Seed treatment with gibberellic acid increased seedling height for all varieties/experimental lines (Table 1). At 31 DAP, small significant differences were noted. Seedling heights averaged 14, 15 and 16 cm for seedlings from untreated seed and seed treated with GibGro and RELEASE, respectively.

Overspraying each plot with GA_3 at the 2- to 3-leaf stage resulted in a significant increase in seedling height of all varieties and experimental lines (Table 3). With the exception of LA2085, the varieties and experimental lines as a group had an average increase in seedling height of 7 to 8 cm at 7 days after treatment with foliar GA_3. LA2085 was slightly more responsive with an average increase of 10 cm (Table 4).

Two varieties and one experimental line had a significant difference in response to GA_3 formulation (Table 4). AB647, Lemont and LA2085 had a 2-cm greater increase in plant height from treatment with RyzUp compared with GibGro 4LS. The other varieties and experimental lines had a 1-cm or less difference in plant height between the two formulations.

Table 1. The main effects of plant growth regulator seed treatment on seedling vigor of current rice varieties and experimental lines. Rice Research Station, Crowley, LA. 1994.

Treatment Name	Fm Ds Rate	Grow Stg	Stand (Plants/ sq ft) 14 DAP	Stand (Plants/ sq ft) 16 DAP	Stand (Plants/ sq ft) 16 DAP	Stand (Plants/ sq ft) 23 DAP	Pl. Ht. (cm) 31 DAP
TABLE OF R MEANS							
Replicate 1			2	4	8	10	15
Replicate 2			2	4	8	10	15
Replicate 3			4	8	7	11	16
Replicate 4			5	7	7	12	16
TABLE OF A MEANS							
AB647			2 fgh	3 hi	4	9	12 gh
Adair			4 cdef	6 def	7	11	19 ab
Bengal			8 ab	7 cde	8	13	20 a
Cypress			7 a	9 a	11	14	17 bcd
Jackson			6 ab	9 ab	10	14	17 bcd
Jodon			5 bcd	6 abcd	9	14	18 abc
Kaybonnet			3 defg	5 ef	8	12	15 def
LaGrue			2 fgh	3 fgh	5	10	18 cde
Lemont			2 fgh	3 hi	4	7	13 fgh
Maybelle			5 bc	8 abc	9	12	17 bcd
RT7015			3 defg	5 efg	7	10	18 ce
LA2085			2 fgh	3 hi	5	8	11 h
LA2192			1 h	2 i	3	8	11 h
9302008			1 gh	3 hi	5	9	14 efg
9302062			2 efgh	3 ghi	5	9	14 efg
9302085			4 bcde	7 bcde	9	12	15 def
TABLE OF B MEANS							
Control			2 b	4 b	8	11	14 c
GibGro	sp 0.17	seed	3 a	5 a	7	11	15 b
RELEASE	sp 0.35	seed	4 a	8 a	7	11	18 a

Table 2. The simple effects of plant growth regulator seed treatment on seedling vigor of current rice varieties and experimental lines. Rice Research Station, Crowley, LA. 1994.

Treatment Name	Fm Da	Rate	Grow Stg	Stand (Plants/ sq ft) 14 DAP	Stand (Plants/ sq ft) 16 DAP	Stand (Plants/ sq ft) 18 DAP	Stand (Plants/ sq ft) 23 DAP	Pl. Ht. (cm) 31 DAP
AR647								
Control				0m	1mn	2n	7l-p	10q
GibGro	sg	0.17	seed	1i-m	3h-n	4k-n	9i-p	14i-p
RELEASE	sg	0.35	seed	4c-k	5c-k	5g-n	10d-o	13j-q
Adair								
Control				2f-m	4f-n	8f-n	9g-p	17c-i
GibGro	sg	0.17	seed	4c-j	7b-i	8c-j	13a-i	19a-d
RELEASE	sg	0.35	seed	5c-i	7a-f	7c-k	12a-k	20abc
Bengal								
Control				4c-l	6b-i	8b-i	12a-i	20ab
GibGro	sg	0.17	seed	5c-g	5c-l	7d-l	12a-k	16a-g
RELEASE	sg	0.35	seed	9ab	9a-d	8b-i	14a-f	21a
Cypress								
Control				5c-h	9a-d	10b-e	12a-j	15g-n
GibGro	sg	0.17	seed	7bcd	9a-e	9b-f	14a-f	17c-i
RELEASE	sg	0.35	seed	10a	11a	13a	16a	18a-e
Jackson								
Control				5c-h	9a-d	11abc	14a-d	17c-i
GibGro	sg	0.17	seed	6c-f	7a-g	9b-f	13a-h	17c-i
RELEASE	sg	0.35	seed	7abc	10ab	10a-d	13a-g	18a-f
Jodon								
Control				4c-k	7a-h	9b-f	14a-g	17c-i
GibGro	sg	0.17	seed	5c-i	7a-g	9b-g	13a-h	18a-h
RELEASE	sg	0.35	seed	6b-e	8a-e	9b-f	15abc	18a-e
Kaybonnet								
Control				3d-m	6b-i	10b-e	16a	15f-n
GibGro	sg	0.17	seed	1i-m	4f-n	6e-m	10f-p	15f-m
RELEASE	sg	0.35	seed	4c-l	6b-j	7c-k	11c-o	16c-j
LaGrue								
Control				1i-m	4f-n	7d-l	13a-g	15e-m
GibGro	sg	0.17	seed	2h-m	3f-n	5h-n	10f-p	17c-i
RELEASE	sg	0.35	seed	2f-m	3g-n	5i-n	8j-p	16d-j
Lemont								
Control				1klm	1lmn	2n	6op	11pq
GibGro	sg	0.17	seed	2h-m	3g-n	4j-n	7nop	13k-q
RELEASE	sg	0.35	seed	3d-m	5d-n	5g-n	8j-p	16e-k
Maybelle								
Control				6b-e	10ab	12ab	15ab	17c-i
GibGro	sg	0.17	seed	4c-i	6b-i	9b-h	11b-m	16e-k
RELEASE	sg	0.35	seed	4c-j	7b-i	8c-j	10e-p	18a-e
RT7015								
Control				1i-m	5d-m	6e-m	10d-o	16e-l
GibGro	sg	0.17	seed	3d-m	5d-m	7c-k	10e-p	16e-k
RELEASE	sg	0.35	seed	4c-j	5c-l	8c-k	11b-n	18a-g

Continued.

Table 2. Continued.

Treatment Name	Fm Ds	Rate	Grow Stg	Stand (Plants/ sq ft) 14 DAP	Stand (Plants/ sq ft) 16 DAP	Stand (Plants/ sq ft) 18 DAP	Stand (Plants/ sq ft) 23 DAP	Pl. Ht. (cm) 31 DAP
LA2085								
Control				0m	0n	2n	6p	11pq
GibGro	sg	0.17	seed	3d-m	5d-n	7d-l	11b-l	11opq
RELEASE	sg	0.35	seed	2g-m	4f-n	5i-n	8k-p	10q
LA2192								
Control				0lm	1mn	2n	7m-p	11q
GibGro	sg	0.17	seed	2h-m	3i-n	5h-n	11c-o	10q
RELEASE	sg	0.35	seed	1j-m	1k-n	3mn	8j-p	12m-q
9302008								
Control				0m	1lmn	2n	7l-p	12n-q
GibGro	sg	0.17	seed	3e-m	5d-n	8c-k	12a-j	14h-o
RELEASE	sg	0.35	seed	1i-m	2i-n	4j-n	9i-p	15f-m
9302082								
Control				1klm	2j-n	3lmn	8j-p	12l-q
GibGro	sg	0.17	seed	3e-m	3f-n	6f-n	11c-o	15e-m
RELEASE	sg	0.35	seed	4c-m	4e-n	8f-n	9h-p	13j-q
9302085								
Control				2f-m	5d-n	7d-l	11b-l	14i-p
GibGro	sg	0.17	seed	6b-e	9abc	11a-d	14a-e	17b-h
RELEASE	sg	0.35	seed	4c-l	8a-f	8b-i	11b-m	15e-m
LSD (.05) =				3	3	3	3	3
Standard Dev.=				2.0595	2.4888	2.2445	2.4829	1.931
CV =				82.41	48.24	33.35	23.04	12.71

Table 3. The main effects of plant growth regulator foliar treatment on seedling vigor of current rice varieties and experimental lines. Rice Research Station, Crowley, LA. 1994.

Treatment Name	Fm Ds	Rate	Grow Stg	Pl. Ht. (cm) 7 DAT
				TABLE OF R MEANS
Replicate 1				20
Replicate 2				20
Replicate 3				21
Replicate 4				21
				TABLE OF A MEANS
AB647				19
Adair				23
Bengal				23
Cypress				22
Jackson				22
Jodon				23
Kaybonnet				20
LaGrue				21
Lemont				19
Maybelle				22
RT7015				21
LA2085				18
LA2192				17
9302008				18
9302062				19
9302065				20
				TABLE OF B MEANS
Control				15
GibGro 4LS	1	1.5	2-3 L	22
RyzUp	1	1.5	2-3 L	24

Table 4. The simple effects of plant growth regulator foliar treatment on seedling vigor of current rice varieties and experimental lines. Rice Research Station, Crowley, LA. 1994.

Treatment Name	Fm Ds	Rate	Grow Stg	Pl. Ht. (cm) 7 DAT
AB647				
Control				13r
GibGro 4LS	1	1.5	2-3 L	20ijk
RyzUp	1	1.5	2-3 L	23c-g
Adair				
Control				18klm
GibGro 4LS	1	1.5	2-3 L	24a-e
RyzUp	1	1.5	2-3 L	26a
Bengal				
Control				19jkl
GibGro 4LS	1	1.5	2-3 L	25a-d
RyzUp	1	1.5	2-3 L	26a
Cypress				
Control				17nop
GibGro 4LS	1	1.5	2-3 L	24a-e
RyzUp	1	1.5	2-3 L	25ab
Jackson				
Control				17mno
GibGro 4LS	1	1.5	2-3 L	25ab
RyzUp	1	1.5	2-3 L	25abc
Jodon				
Control				18lmn
GibGro 4LS	1	1.5	2-3 L	25ab
RyzUp	1	1.5	2-3 L	26a
Kaybonnet				
Control				15pq
GibGro 4LS	1	1.5	2-3 L	23e-h
RyzUp	1	1.5	2-3 L	24b-f
LaGrue				
Control				16op
GibGro 4LS	1	1.5	2-3 L	23d-g
RyzUp	1	1.5	2-3 L	24a-e
Lemont				
Control				13r
GibGro 4LS	1	1.5	2-3 L	21hij
RyzUp	1	1.5	2-3 L	23c-g
Maybelle				
Control				17mno
GibGro 4LS	1	1.5	2-3 L	24b-f
RyzUp	1	1.5	2-3 L	25abc
RT7015				
Control				16nop
GibGro 4LS	1	1.5	2-3 L	23d-g
RyzUp	1	1.5	2-3 L	24b-f

Continued.

Table 4. Continued.

Treatment Name	Fm Da	Rate	Grow Stg	Pl. Ht. (cm) 7 DAT
LA2085				
Control				11s
GibGro 4LS	1	1.5	2-3 L	20ij
RyzUp	1	1.5	2-3 L	22fgh
LA2192				
Control				11s
GibGro	1	1.5	2-3 L	19jkl
RyzUp	1	1.5	2-3 L	20ij
9302008				
Control				14qr
GibGro 4LS	1	1.5	2-3 L	20ij
RyzUp	1	1.5	2-3 L	21hi
9302062				
Control				14qr
GibGro 4LS	1	1.5	2-3 L	22ghi
RyzUp	1	1.5	2-3 L	23c-g
9302063				
Control				16op
GibGro 4LS	1	1.5	2-3 L	22fgh
RyzUp	1	1.5	2-3 L	24b-f

LSD (.05) =	2
Standard Dev.=	1.0951
CV =	5.36

Means followed by same letter do not significantly differ (Duncan's MRT, P=.05).

YIELD ENHANCEMENT STUDIES

R.T. Dunand and R.R. Dilly, Jr.

Experiment: Chitosan and Yield Enhancement in Water-Seeded, Pinpoint Flood Rice

Location: Rice Research Station, Crowley, LA (North Unit)

Variety: Lemont

Seeding Rate: 140 lb/A

Planting Date: 14 June 94

Row Spacing: Broadcast seeded

Planting Depth: Not applicable

Fertilizer: 20-10-10 with 2% zinc at 300 lb/A drilled preplant, 9 June; ammonium sulfate (21%N) at 400 lb/A by airplane, 27 June

Water Management: Flooded, 14 June

Plot Size: 115 ft^2 - 5 x 23 ft

Treated Area: 115 ft^2 - 5 x 23 ft

Treatment(s): **Plant Growth Regulator**

Chitosan (20 g/cwt)

Seed Treatment

Dry - seed treatment allowed to dry on seed for several weeks before planting
Wet - seed treatment allowed to dry on seed over night before planting
Soak - seed soaked in water for 24 hours, drained and kept damp for 24 hours

Sprayer: Not applicable

Pertinent Rainfall: Not applicable

Herbicide(s): Stam M-4 (3 qt/A) by airplane, 21 June;
Stam M-4+Londax (4 qt+1 oz/A) by airplane, 27 June;
Londax (2 oz/A) by airplane, 7 July

Insecticide(s): Furadan 3G (17 lb/A) by airplane, 7 and 21 July and 9 Aug;
Methyl parathion (2 pt/A) by airplane, 22 July;
Methyl parathion (1 pt/A) by airplane, 9 and 26 Aug and 3 Sept;
Methyl parathion (0.5 pt/A) by airplane, 23 Aug

Fungicide(s): Benlate - 2.8 lb/A by airplane, 22 July and 1.0 lb/A by airplane, 9 and 23 Aug and 23 Sept

Growth Regulator(s): Not applicable

Emergence: 15 June

Permanent Flood: 20 June

Harvest Date: 27 Oct

Harvested Area: 115 ft^2 - 5 x 23 ft

Exp. Design: Randomized complete block and four replications

Comments: Seedling vigor evaluations show untreated seed had the best vigor (significantly different from the other treatments) at 13 DAP when rice seedlings were first beginning to emerge through the water (Table 1). The ratings were 4, 4, 5, 5 and 7 for the wet control, chitosan, dry control, soaked and untreated, respectively. By 21 DAP, the trend had reversed and untreated seed had the lowest vigor and was significantly lower than the wet, chitosan seed treatment. The ratings were 5, 5, 5, 6 and 6 for the untreated, soaked, dry control, wet control and chitosan, respectively.

At maturity, there was a trend noted between early seedling vigor and grain yield (Table 1). Although there were no significant differences in yield, the highest and lowest yields occurred in the untreated and chitosan, respectively. Grain yields were 2137, 2175, 2582, 2608 and 2619 lb/A for the chitosan, wet control, dry control, soaked and untreated, respectively. There were no significant differences in maturity with grain moisture, ranging between 16.0 and 16.5% for all treatments.

Table 1. The effect of plant growth regulator seed treatment on rice production in water-seeded, pinpoint flooded rice. Rice Research Station, Crowley, LA. 1994.

Treatment Name	Fm Ds Rate	Grow Stg	Vigor (r.u.) 13 DAP	Vigor (r.u.) 21 DAP	Moisture (%)	Yield (lb/A)
Lemont,dry Control			5b	5bc	16.4a	2582a
Lemont,wet Control			4b	6ab	16.4a	2175a
Lemont,wet 400 cps			4b	6a	16.5a	2137a
Lemont Untreated			7a	5c	16.2a	2619a
Lemont Soaked			5b	5bc	16.0a	2608a
LSD (.05)	=		1	1	0.9	688
Standard Dev.	=		.81137	.39791	.59021	446.66
CV	=		16.56	7.44	3.62	18.43

Means followed by same letter do not significantly differ (Duncan's MRT, P=.05).

YIELD ENHANCEMENT STUDIES

R.T. Dunand and R.R. Dilly, Jr.

Experiment: Chitosan and Yield Enhancement in Drill-Seeded Rice

Location: Rice Research Station, Crowley, LA (North Unit)

Variety: Lemont

Seeding Rate: 100 lb/A

Planting Date: 10 June 94

Row Spacing: 7-inch

Planting Depth: 3 inches

Fertilizer: 7-21-21 with 3.5% zinc at 300 lb/A drilled preplant, 9 June; ammonium sulfate (21%N) at 400 lb/A by airplane, 27 June

Water Management: Flushed, 17 June

Plot Size: 102 ft^2 - 4.1 x 25 ft

Treated Area: 102 ft^2 - 4.1 x 25 ft

Treatment(s): **Plant Growth Regulator**

Chitosan (20 g/cwt)
Gibberellic Acid (22 ppm) - 0.35 oz RELEASE/cwt

Seed Treatment

Dry - seed treatment allowed to dry on seed for several weeks before planting
Wet - seed treatment allowed to dry on seed over night before planting

Sprayer: Not applicable

Pertinent Rainfall: 1.5 inches, 11 June; 1.8 inches, 12 June

Herbicide(s): Stam M-4 (3 qt/A) by airplane, 21 June;
Stam M-4+Londax (4 qt+1 oz/A) by airplane, 27 June;
Londax (2 oz/A) by airplane, 7 July

Insecticide(s): Furadan 3G (17 lb/A) by airplane, 7 and 21 July and 9 Aug;
Methyl parathion (2 pt/A) by airplane, 22 July;
Methyl parathion (1 pt/A) by airplane, 9 and 26 Aug and 3 Sept
Methyl parathion (0.5 pt/A) by airplane, 23 Aug

Fungicide(s): Benlate - 2.8 lb/A by airplane, 22 July; 1.0 lb/A by airplane, 9 and 23 Aug and 23 Sept

Growth Regulator(s): Not applicable

Emergence: 15 June

Permanent Flood: 30 June

Harvest Date: 11 Oct

Harvested Area: 102 ft^2 - 4.1 x 25 ft

Exp. Design: Randomized complete block and four replications

Comments: Seed treatment with chitosan and gibberellic acid influenced seedling vigor and grain production (Table 1). Evaluations of emergence date and final stand reflected the effects on seedling vigor. Measurements of grain moisture and yield reflected the effects on grain production.

Emergence was 2 days earlier from seed treated with gibberellic acid (GA_3) and chitosan (Table 1). Several weeks prior to planting, seed was treated with GA_3 and then the GA_3 treated seed was over treated with chitosan 1 day prior to planting (400 cps+GA). Final stand with the GA_3 and chitosan treated seed was 6 plants/ft^2 compared with 2 and 4 plants/ft^2 with the other seed treatments. For the other seed treatments, seed treatment with chitosan 2 weeks prior to planting (400 cps-dry) had the lowest stand of 2 plants/ft^2. Seed treatment with water alone 2 weeks prior to planting (control-dry) and seed treatment with water alone (control-wet) and chitosan (400 cps-wet) 1 day prior to planting had intermediate stands of 4 plants/ft^2. In general, these stands are low and rainfall in excess of 3 inches over the period of 2 days after planting contributed to the poor stands. These results show that GA_3 plus chitosan seed treatment can improve emergence and stand under adverse growing conditions. The response is probably due to GA_3 seed treatment, and the results show seed treatment with chitosan does not interfere with GA_3 activity. In addition, seed treatment with chitosan several weeks before planting can adversely affect stand under poor growing conditions. The difference in response to chitosan applied dry and wet is not understood.

At maturity, differences in grain production were observed (Table 1). The highest yield was 5244 lb/A from seed treatment with chitosan plus GA_3. Intermediate grain yields of 4372, 4519 and 4640 lb/A were obtained with the control-wet, control-dry and 400 cps-wet seed treatments, respectively. The lowest grain yield was 3541 lb/A with the 400 cps-dry seed treatment. These grain yields are closely related to stand and are related to seed treatment through the effect of the seed treatments on stand.

Table 1. The effect of plant growth regulator seed treatment on rice production in drill-seeded rice. Rice Research Station, Crowley, LA. 1994.

Treatment Name	Fm Ds Rate	Grow Stg	Emergence (DAP)	Stand (plants/ sq ft) (10 DAP)	Grain Moisture (%)	Grain Yield (lb/A)
Control - Dry			9a	4bc	22.5a	4519ab
400 cps - Dry			9a	2c	22.3a	3541b
Control - Wet			9a	4bc	21.5a	4372ab
400 cps - Wet			9a	4ab	23.1a	4640ab
400 cps + GA			7b	6a	21.8a	5244a
LSD (.05)	=		0	2	1.9	1313
Standard Dev.	=		6.1589	1.3322	1.2501	852.42
CV	=		0.00	32.49	5.62	19.10

Means followed by same letter do not significantly differ (Duncan's MRT, P=.05).

YIELD ENHANCEMENT STUDIES

R.T. Dunand and R.R. Dilly, Jr.

Experiment: Chitosan and Yield Enhancement in Continuous-Flood Rice

Location: Rice Research Station, Crowley, LA (North Unit)

Variety: See treatments

Seeding Rate: 140 lb/A

Planting Date: 15 June 94

Row Spacing: Water-seeded: dry seeded by hand directly into a 3- to 4-inch flood

Fertilizer: 20-10-10 with 2% zinc at 300 lb/A drilled preplant, 10 June; ammonium sulfate (21%N) at 400 lb/A by airplane, 27 June

Water Management: Flooded for seeding (3 to 4 inches), 14 June; flood maintained until drained for harvest

Plot Size: 110 ft^2 - 5 x 22 ft

Treated Area: 110 ft^2 - 5 x 22 ft

Treatment(s):

Varieties

Cypress	Jackson
Maybelle	Lemont

Plant Growth Regulator

Chitosan - 200, 300, 400 and 500 cps (20 g/cwt)

Formulations

LSU - chitosan and L-glutamic acid solutions formulated the day of seed treatment and 1 day before seeding

Vanson - chitosan and L-glutamic acid solutions formulated 2 weeks before seed treatment and 15 days before seeding

Additives

Acetate - acetic acid
Cmc - carboxymethylcellulose
Glu - glutamic acid
Lactate - lactic acid
Trace metals - minor nutrient elements

Timing

Dry - treated 2 weeks before planting
Wet - treated 1 day before planting

Seed Treatment

3 lb of seed was treated with 189 ml of treatment solution for 5 minutes in a rolling jar mixer. An untreated control had no seed treatment. The check controls (dry and wet) were treated with water alone.

Sprayer: Not applicable

Pertinent Rainfall: Not applicable

Herbicide(s): Stam M4+Londax (1 gal+1 oz/A) by plane, 27 June
Londax (2 oz/A) by airplane, 7 July

Insecticide(s): Furadan 3G (17 lb/A) by airplane, 7 and 21 July and 9 Aug; Methyl parathion (1 pt/A) by airplane, 22 July and (0.5 pt/A) by airplane, 9 and 23 Aug

Fungicide(s): Benlate (2 lb/A) by airplane, 22 July and (1 lb/A) by airplane, 9 and 23 Aug

Emergence: 17 June

Permanent Flood: 14 June

Harvest Date: Not applicable

Harvested Area: Not applicable

Exp. Design: Randomized complete block and four replications

Comments: **Seedling Vigor**

Visual ratings of seedling vigor (appearance of shoots above the flood) at 14 and 20 days after planting (DAP) and seedling density measurement at 28 DAP showed no significant effect of chitosan on seedling vigor (Table 1). Seedling vigor ratings range between 0 and 10 with 10 being perfect seedling vigor. Seedling vigor ratings in this study ranged between 5 and 7. With the LSU formulations, seedling vigor response to chitosan viscosity was similar in pattern to past yield responses to chitosan viscosity. The effect was most noticeable at 20 DAP. As viscosity increased from 200 to around 300 and 400 cps, seedling vigor ratings increased and then declined at 500 cps. With the Vanson formulations, a similar relationship was noted between seedling density and chitosan viscosity. In general, the LSU and Vanson formulations gave different response patterns with the visual ratings and seedling density.

The only significant differences in seedling vigor were associated with varieties (Table 1). Cypress, Jackson and Maybelle were equally superior to Lemont in seedling vigor ratings and seedling density.

Shoot Growth and Development

Shoot growth and development were studied for a select group of seed treatments. Evaluations were made on shoot and root growth during the vegetative phase for the Vanson and RRS viscosity series on Lemont only.

Plant height. During the vegetative phase of growth, evaluations of shoot growth and development included measurements of plant height, shoot dry weight, tillering and leaf size at 28 and 42 DAP. Height and weight growth rates for the 2-week period were calculated. Leaf size was used to determine leaf surface area of the uppermost three fully developed leaves on the main shoot.

There was no significant effect of chitosan on plant height at 28 DAP, and at 42 DAP, 500 cps chitosan (LSU formulation) produced significantly taller plants compared with the control and check (Table 2). With Vanson formulations, even though there were no significant effects, there was a response pattern at 42 DAP in which plant height peaked at 400 cps viscosity. This pattern was not noted for the LSU formulations at either 28 or 42 DAP or for the Vanson formulation at 28 DAP. Plant height growth rate exhibited the response pattern for the Vanson formulation with the peak rate occurring at 400 cps. The LSU formulation did not exhibit this rate pattern although plant height growth rate at 500 cps was almost double the controls.

Plant weight. Chitosan had no significant effect on seedling weight at 28 and 42 DAP, although at 28 DAP, there were interesting response patterns (Table 2). At 28 DAP, both the LSU and Vanson formulations produced increases in shoot dry weight with weight peaking around 400 cps. This pattern was not observed at 42 DAP for total plant weight, main shoot weight, tiller shoot weight or shoot weight growth rate. The results at 28 DAP show shoot dry weight for the controls averaged 1.05 g/plant. Seed treatment with 400 cps chitosan averaged 1.13 g/plant across formulations. This represents approximately

Table 1. The effect of plant growth regulator seed treatment on rice seedling vigor. Rice Research Station, Crowley, LA. 1994.

Treatment Name	Fm Ds Rate	Grow Stg	Vigor (r.u.) 14 DAP	Vigor (r.u.) 20 DAP	Stand (plants/ sq.ft.) 28 DAP
Lemont Untreated			6.0abc	5.5b	12de
Lemont,wet Control			5.5bc	6.3ab	13cde
Lemont,wet 200 cps Vanson soln.			6.3ab	6.3ab	11e
Lemont,wet 300 cps Vanson soln.			5.5bc	6.5ab	13b-e
Lemont,wet 400 cps Vanson soln.			5.8abc	5.8ab	13de
Lemont,wet 500 cps Vanson soln.			6.3ab	6.5ab	11e
Lemont,wet 200 cps RRS soln.			5.0c	5.8ab	13de
Lemont,wet 300 cps RRS soln.			6.3ab	6.5ab	11e
Lemont,wet 400 cps RRS soln.			6.0abc	6.3ab	11e
Lemont,wet 500 cps RRS soln.			6.0abc	5.8ab	11e
Lemont, dry control			5.5bc	6.3ab	12de
Lemont, dry flash coated			6.0abc	6.5ab	11e
Lemont, dry trace metals			6.0abc	6.0ab	11e
Lemont, dry 400 cps blend			5.5bc	6.0ab	12de
Lemont, dry glu ratio			6.0abc	6.0ab	12de
Lemont, dry acetate			6.3ab	6.5ab	11e
Lemont, dry lactate			6.3ab	6.5ab	12e

Continued.

Table 1. Continued.

Treatment Name	Fm Ds Rate	Grow Stg	Vigor (r.u.) 14 DAP	Vigor (r.u.) 20 DAP	Stand (plants/ sq.ft.) 28 DAP
Lemont, dry glu/cmc			6.8a	6.8a	10e
Maybelle Untreated			3.8d	3.8c	19a
Maybelle, wet Control			3.0d	3.5c	18ab
Maybelle, wet 400 cps Vanson soln.			3.0d	3.3c	17a-d
Cypress Untreated			3.3d	3.8c	19a
Cypress, wet Control			3.0d	3.8c	19a
Cypress, wet 400 cps Vanson soln.			3.0d	3.3c	22a
Jackson Untreated			3.5d	4.0c	18abc
Jackson, wet Control			3.3d	3.5c	21a
Jackson, wet 400 cps Vanson soln.			3.0d	4.0c	19a
LSD (.05) =			0.9	0.9	4
Standard Dev.=			.6568	.64328	3.0851
CV =			13.09	12.04	22.02

Means followed by same letter do not significantly differ (Duncan's MRT, P=.05).

Table 2. The effect of plant growth regulator seed treatment on rice shoot growth. Rice Research Station, Crowley, LA. 1994.

Treatment Name	Fm Ds Rate	Grow Stg	Pl. Ht. (mm) 28 DAP	Pl. Ht. (mm) 42 DAP	Shoot Dry wt./ plant (g) 28 DAP	Shoot Tot. dry wt./pl. (g) 42 DAP	Tillers/ plant 28 DAP	Tillers/ plant 42 DAP
Lemont Untreated			331a	370bc	1.028a	3.557c	0.6ab	1.1ab
Lemont,wet Control			322a	360c	1.067a	3.830abc	0.6ab	0.7ab
Lemont,wet 200 cps Vanson soln.			335a	366bc	0.966a	3.725bc	0.7ab	0.8ab
Lemont,wet 300 cps Vanson soln.			332a	378abc	1.076a	4.174abc	0.5ab	0.8ab
Lemont,wet 400 cps Vanson soln.			326a	391ab	1.125a	3.831abc	1.0a	0.8ab
Lemont,wet 500 cps Vanson soln.			319a	374abc	1.088a	4.156abc	0.9a	1.0ab
Lemont,wet 200 cps RRS soln.			331a	391ab	1.077a	4.967a	0.4b	1.5a
Lemont,wet 300 cps RRS soln.			340a	390ab	1.147a	3.792abc	0.7ab	0.9ab
Lemont,wet 400 cps RRS soln.			332a	365bc	1.134a	3.439c	0.9a	0.4b
Lemont,wet 500 cps RRS soln.			328a	398a	1.089a	4.778ab	0.7ab	1.3a
LSD (.05)	=		23	23	0.223	1.055	0.4	0.8
Standard Dev.	=		15.845	15.97	.15392	.72714	.29969	.52518
CV	=		4.81	4.22	14.26	18.07	42.21	56.17

Means followed by same letter do not significantly differ (Duncan's MRT, P=.05).

an 8% increase in shoot dry weight. This response at 28 DAP was similar to previously noted responses in grain yield. In the last 5 years of research with chitosan in rice, grain yield response to chitosan has averaged a 10% increase. These results may indicate that chitosan is influencing grain yield by promoting the seedling biomass aspect of shoot growth and development.

Tillering. One other aspect of seedling growth and development was tiller production. Although there were no significant effects on tillering from chitosan seed treatment, familiar response patterns were observed at 28 DAP but not at 42 DAP (Table 2). At 28 DAP, for both the LSU and Vanson formulations, tiller density peaked at 400 cps. This response pattern was similar to the response pattern of seedling weight at 28 DAP and explains, in part, the weight response to chitosan. Chitosan may influence early tiller production thereby influencing seedling weight.

Leaf area. The uppermost fully developed leaf (y-leaf), the second to uppermost fully developed leaf (penultimate leaf) and the third to uppermost fully developed leaf (third leaf) on the main shoot were evaluated at 28 and 42 DAP for the effect of chitosan on leaf length, leaf width and leaf surface area (LSA). Chitosan had no significant effect on any of these parameters associated with main shoot leaf development; however, some trends were noted.

At 28 DAP, y-leaf lengths ranged between 189 and 201 mm, y-leaf widths ranged between 6 and 7 mm, and there were no patterned relationships between chitosan viscosity or formulation with length or width (Table 3). For the penultimate leaf, lengths ranged between 156 and 168 mm for the treatments. There was a patterned relationship with both formulations. Leaf length peaked at 300 to 400 cps although the difference from the control and untreated was negligible. Leaf widths ranged between 5 and 6 mm. Leaf lengths of the third leaf ranged between 144 and 156 mm, and treatments produced a patterned response similar to the effects of chitosan viscosity on the length of the penultimate leaf. Leaf widths were constant at 4 mm for all treatments. Leaf surface area followed the patterned response noted between leaf lengths of the penultimate and third leaf and viscosity. With both formulations, LSA increased with viscosity and peaked at 300 cps, and the difference from the controls was minimal.

Fourteen days later at 42 DAP, y-leaf lengths ranged between 217 and 239 mm, y-leaf widths ranged between 9 and 10 mm, and there was the familiar patterned relationship between chitosan viscosity (Vanson formulation only) and length, with leaf length peaking at 400 cps (Table 4). Leaf length at 400 cps was approximately 8% greater than the controls. For the penultimate leaf, lengths ranged between 214 and 231 mm, widths were constant at 9 mm and there was no patterned relationship between chitosan and treatments. Leaf length of the third leaf ranged between 220 and 237 mm, widths ranged between 8 and 9 mm and there was no patterned relationship between either length or width and chitosan viscosity. Leaf surface area followed the patterned response noted between leaf lengths of the y-leaf and viscosity. With the Vanson formulation, LSA increased with viscosity, peaked at 400 cps and the difference between LSA at 400 cps and the controls was minimal.

Table 3. The effect of plant growth regulator seed treatment on rice leaf growth at 28 days after planting. Rice Research Station, Crowley, LA. 1994.

Treatment Name	Fm Ds Rate	Grow Stg	Y-Leaf Blade Length (mm) 28 DAP	Y-Leaf Blade Width (mm) 28 DAP	Pen.Leaf Blade Length (mm) 28 DAP	Pen.Leaf Blade Width (mm) 28 DAP	3rd Leaf Blade Length (mm) 28 DAP	3rd Leaf Blade Width (mm) 28 DAP	Leaf Area (sq cm) 28 DAP
Lemont Untreated			198a	7a	165a	6a	151ab	4a	27.63a
Lemont,wet Control			190a	7a	163a	6a	145b	4a	28.15a
Lemont,wet 200 cps Vanson soln.			192a	7a	159a	6a	154ab	4a	27.36a
Lemont,wet 300 cps Vanson soln.			195a	7a	164a	6a	156a	4a	29.18a
Lemont,wet 400 cps Vanson soln.			189a	6a	165a	6a	149ab	4a	26.42a
Lemont,wet 500 cps Vanson soln.			190a	7a	156a	6a	144b	4a	26.72a
Lemont,wet 200 cps RRS soln.			201a	7a	161a	5a	147ab	4a	27.33a
Lemont,wet 300 cps RRS soln.			200a	7a	168a	5a	150ab	4a	27.76a
Lemont,wet 400 cps RRS soln.			194a	7a	165a	5a	147ab	4a	26.83a
Lemont,wet 500 cps RRS soln.			190a	6a	159a	5a	146b	4a	25.69a
LSD (.05) =			18	1	12	1	8	1	4.81
Standard Dev.=			12.418	.58373	8.5346	.53748	5.7599	.5986	3.3138
CV =			6.41	8.98	5.25	9.86	3.87	15.25	12.14

Means followed by same letter do not significantly differ (Duncan's MRT, P=.05).

Table 4. The effect of plant growth regulator seed treatment on rice leaf growth at 42 days after planting. Rice Research Station, Crowley, LA. 1994.

Treatment Name	Fm Ds Rate	Grow Stg	Y-Leaf Blade Length (mm) 42 DAP	Y-Leaf Blade Width (mm) 42 DAP	Pen.Leaf Blade Length (mm) 42 DAP	Pen.Leaf Blade Width (mm) 42 DAP	3rd Leaf Blade Length (mm) 42 DAP	3rd Leaf Blade Width (mm) 42 DAP	Leaf Area (sq cm) 42 DAP
Lemont Untreated			219ab	9ab	216a	9a	220a	8b	55.15ab
Lemont,wet Control			221ab	9ab	214a	9a	228a	8ab	57.50ab
Lemont,wet 200 cps Vanson soln.			217ab	9ab	215a	9a	224a	8ab	56.89ab
Lemont,wet 300 cps Vanson soln.			223ab	9ab	218a	9a	233a	8ab	58.90ab
Lemont,wet 400 cps Vanson soln.			237a	9ab	223a	9a	224a	8ab	59.87ab
Lemont,wet 500 cps Vanson soln.			222ab	9ab	225a	9a	228a	8ab	56.71ab
Lemont,wet 200 cps RRS soln.			239a	9ab	231a	9a	237a	9a	62.94a
Lemont,wet 300 cps RRS soln.			236a	9ab	215a	9a	230a	8ab	59.10ab
Lemont,wet 400 cps RRS soln.			212b	9b	215a	9a	223a	8b	53.29b
Lemont,wet 500 cps RRS soln.			231ab	10a	225a	9a	237a	8ab	61.13a
LSD (.05)	=		20	1	17	1	19	1	6.80
Standard Dev.	=		13.517	.48304	11.712	.4544	13.287	.49441	4.6865
CV	=		5.99	5.31	5.34	5.15	5.82	6.22	8.06

Means followed by same letter do not significantly differ (Duncan's MRT, P=.05).

Root Growth and Development

Overall (primary and secondary root systems), root length and weight and secondary root initiation were evaluated at 28 and 42 DAP. Length, weight and root initiation growth rates for the 2-week period were calculated.

Root length. Root length response to chitosan viscosity and formulation at 28 DAP followed no pattern (Table 5). At 48 DAP, the results were quite different. For both the LSU and Vanson formulations, root length increased as chitosan viscosity increased from 200 to 400 cps and declined after 400 cps. As previously mentioned, this response pattern is similar to past yield responses of Lemont to chitosan viscosity. Root length for the 400 cps chitosan using the Vanson formulation was significantly greater than the root length for the untreated or check. Root length for the 400 cps chitosan using the LSU formulation was significantly greater than the root length for the check but not the untreated.

Growth rate expressed as increase in length per week (mm/wk) over the 2-week period from 28 to 42 DAP showed the familiar patterned response to chitosan viscosity (Table 5). For the Vanson formulation, growth rate peaked at 400 cps, and for the LSU formulation, growth rate peaked at 300 and 400 cps. Only growth rate for the 400 cps Vanson formulation was significantly greater compared with the other treatments, control and check. These results may provide some insight into the direct effect chitosan has on rice growth and development, which eventuates into higher grain yield.

Root weight. The effects of chitosan on root weight were not significant, yet the response pattern of root weight to chitosan viscosity at 28 DAP was familiar (Table 5). Root weight peaked at 300 cps with the Vanson formulation and at 400 cps with the LSU formulation. The patterns at 42 DAP showed no consistencies as did not root weight growth rate.

Root density. Secondary root density was unaffected by chitosan seed treatment. Across all treatments, secondary root density ranged between six and seven roots/plant at 28 DAP, and at 42 DAP, secondary root density ranged between 11 and 12 roots/plant (Table 5). Similar results were noted for secondary root density growth rate. Most treatments had growth rates between two and three new roots/plant/week. The exception was 500 cps LSU formulated chitosan with a rate of four new roots/plant/week.

Grain production

Seed treatment with chitosan in general had no direct significant effect on grain production (Table 6). Patterns of yield response to chitosan viscosity and method of application were observed. Some differences in varietal response to chitosan were also noted.

Table 5. The effect of plant growth regulator seed treatment on rice root growth at 28 and 42 days after planting. Rice Research Station, Crowley, LA. 1994.

Treatment Name	Fm Ds Rate	Grow Stg	Root Length (mm) 28 DAP	Root Length (mm) 42 DAP	Root growth rate (mm/wk)	Root Dry wt./ plant (mg) 28 DAP	Root Dry wt./ plant (g) 42 DAP	Root growth rate (g/wk)	Secondary roots/ plant 28 DAP	Secondry roots/ plant 42 DAP	Root growth rate (new roots/wk)
Lemont Untreated			69a	110bcd	21b	157ab	2.463ab	1.153ab	7a	11a	3ab
Lemont,wet Control			61a	101cd	20b	177ab	2.366ab	1.095ab	7ab	12a	3ab
Lemont,wet 200 cps Vanson soln.			59a	104bcd	23b	132b	2.009b	0.938b	7ab	11a	2b
Lemont,wet 300 cps Vanson soln.			61a	109bcd	24b	184ab	2.977a	1.396a	7a	12a	3ab
Lemont,wet 400 cps Vanson soln.			58a	136a	40a	163ab	2.168ab	1.002ab	7ab	12a	3ab
Lemont,wet 500 cps Vanson soln.			67a	118bc	26b	167ab	2.471ab	1.152ab	7ab	11a	2b
Lemont,wet 200 cps RRS soln.			69a	97d	15b	142ab	2.765ab	1.312ab	7ab	12a	3ab
Lemont,wet 300 cps RRS soln.			59a	111bcd	26b	157ab	2.231ab	1.037ab	7ab	12a	3ab
Lemont,wet 400 cps RRS soln.			72a	123ab	26b	202a	2.244ab	1.021ab	7a	11a	2b
Lemont,wet 500 cps RRS soln.			72a	107bcd	18b	139ab	2.392ab	1.126ab	6b	12a	4a
LSD (.05)	=		19	17	12	58	0.710	0.350	1	2	1
Standard Dev.	=		13.336	11.853	8.2322	39.736	.48906	.24149	.63537	1.1575	.70906
CV	=		20.67	10.65	34.81	24.52	20.31	21.50	9.55	10.00	26.02

Means followed by same letter do not significantly differ (Duncan's MRT, P=.05).

Table 6. The effect of plant growth regulator seed treatment on rice grain production and milling yield. Rice Research Station, Crowley, LA. 1994.

Treatment Name	Fm Ds Rate	Grow Stg	Rice Treat 10-27-94 Moisture (%)	Rice Treat 10-27-94 Yield (lb/A)	Rice Treat 12-01-94 Brown Rice (%)	Rice Treat 12-01-94 Total Milling (%)	Rice Treat 12-01-94 Whole Milling (%)
Lemont Untreated			20.4abc	3538abc	78.6a-e	68.4abc	54.9abc
Lemont,wet Control			22.5ab	3303b-e	78.1cde	68.1bc	54.6abc
Lemont,wet 200 cps Vanson soln.			20.8abc	3297b-e	78.8a-d	68.5abc	54.5abc
Lemont,wet 300 cps Vanson soln.			20.9abc	3618abc	79.3a-d	68.6abc	55.6abc
Lemont,wet 400 cps Vanson soln.			21.4abc	3305b-e	78.5a-e	68.5abc	55.8abc
Lemont,wet 500 cps Vanson soln.			19.5c	2998cde	79.0a-d	69.1ab	56.5abc
Lemont,wet 200 cps RRS soln.			19.3c	3929ab	79.5a-d	68.7abc	56.6abc
Lemont,wet 300 cps RRS soln.			21.3abc	3355b-e	78.4a-e	68.4abc	55.6abc
Lemont,wet 400 cps RRS soln.			20.2abc	3482abc	78.7a-e	68.4abc	55.8abc
Lemont,wet 500 cps RRS soln.			19.9abc	3404bc	78.5a-e	68.3abc	54.8abc
Lemont, dry control			20.8abc	3407bc	78.6a-e	68.5abc	55.9abc
Lemont, dry flash coated			19.6bc	2510def	79.2a-d	67.5c	53.0bc
Lemont, dry trace metals			21.3abc	3418abc	78.0de	67.4c	52.6c
Lemont, dry 400 cps blend			19.4c	3897abc	77.1e	68.0bc	55.6abc
Lemont, dry glu ratio			22.6a	3376bcd	78.4a-e	68.6abc	55.5abc
Lemont, dry acetate			20.3abc	3612abc	79.8abc	68.9ab	55.6abc
Lemont, dry lactate			21.7abc	3161b-e	78.3b-e	68.1bc	54.5abc

Continued.

Table 6. Continued.

Treatment Name	Fm Ds Rate	Grow Stg	Rice Treat 10-27-94 Moisture (%)	Rice Treat 10-27-94 Yield (lb/A)	Rice Treat 12-01-94 Brown Rice (%)	Rice Treat 12-01-94 Total Milling (%)	Rice Treat 12-01-94 Whole Milling (%)
Lemont, dry glu/cmc			20.8abc	3664abc	78.6a-e	68.9ab	56.6abc
Maybelle Untreated			21.2abc	1932f	79.2a-d	68.4abc	53.2abc
Maybelle, wet Control			20.7abc	2473ef	78.9a-d	68.6abc	56.3abc
Maybelle, wet 400 cps			20.7abc	1997f	79.9ab	68.9ab	54.7abc
Cypress Untreated			20.6abc	3954ab	80.1a	69.5a	57.3a
Cypress, wet Control			19.2c	3965ab	78.8a-e	68.4abc	57.0ab
Cypress, wet 400 cps			20.0abc	4298a	79.0a-d	69.0ab	57.3a
Jackson Untreated			20.3abc	3105b-e	78.1cde	67.8bc	55.3abc
Jackson, wet Control			20.7abc	3237b-e	78.8a-d	68.6abc	56.4abc
Jackson, wet 400 cps			19.4c	3249b-e	78.8a-e	67.8bc	54.4abc
LSD (.05)	=		2.3	741	1.4	1.1	3.4
Standard Dev.	=		1.6609	524.23	1.0017	.74856	2.3975
CV	=		8.08	15.82	1.27	1.09	4.33

Means followed by same letter do not significantly differ (Duncan's MRT, P=.05).

Wet Seed Treatment

Two chitosan viscosity series were evaluated using the wet application (seed treatment 1 day before planting). In each series viscosities were 200, 300, 400 and 500 centipoise (cps). One series included chitosan prepared by Vanson (Vanson soln.) and one series was prepared at the Rice Research Station (RRS soln.).

In the Vanson series, grain yields were 3303, 3297, 3618, 3305 and 2998 lb/A for the control and viscosity series, respectively. Grain yield peaked at 300 cps and progressively declined as viscosities increased to 400 and 500 cps. This response pattern is very similar to response patterns from past experiments. With the RRS soln., grain yields were 3303, 3929, 3355, 3482 and 3404 lb/A for the control and viscosity series, respectively. Grain yield was highest at 200 cps and was lower and relatively constant with the 300 to 500 cps treatments. The highest yield increases were 10 and 20% above the control for the 300 cps Vanson soln. and 200 cps RRS soln., respectively. These percentages are similar to those noted in past experiments in which yield increases ranged between 7 and 15% from four years of testing.

Solutions prepared at the Rice Research Station have caused peak responses in yield at 300 and 400 cps in the past and the response has always shown a decline at 500 cps. The results this year did not follow the established pattern. This was the first year solutions have been made entirely from raw materials at the Rice Research Station. In the past, the procedure has involved only adding water to a premixture of chitosan and amino acid provided by Mr. Don Freepons. How this may have made a difference is open to discussion.

There were two main procedural differences between the Vanson soln. and RRS soln. The Vanson soln. series included heating and filtering solutions. These procedural differences may have affected the composition of the chitosan solutions and caused the differences in response pattern of grain yield between the Vanson soln. and RRS soln.

In addition to the rice variety, Lemont, used in the two viscosity series, three long-grain varieties, Cypress, Jackson and Maybelle, were also evaluated for response to chitosan seed treatment. These varieties were treated with only the 400 cps Vanson soln. An untreated control and water treated control were included for comparison. Only Cypress exhibited a slight response to chitosan. With Cypress, the wet control yielded 3965 lb/A compared with 4298 lb/A from the chitosan treatment. This is a yield increase of 7%. Jackson had no yield increase and Maybelle had a yield decrease of 25%. The differences in response between Cypress, Jackson, Lemont and Maybelle may be genetic or may be related to the experimental conditions. Lemont had a maximum response at 300 cps this year and the other varieties were tested at 400 cps. If these varieties had been tested at 300 cps, more valid conclusions could be drawn about varietal response to chitosan.

Dry Seed Treatment

Several treatments using the method of treating the seed several weeks before planting were evaluated to determine the effects of drying procedure, micro nutrients, chitosan blending and organic/amino acid additives. The chitosan viscosity with all treatments was 400 cps.

The flash drying procedure appears to be detrimental. The dry control (water treated) yielded 3407 lb/A, and this yield was significantly higher than the yield of 2510 lb/A from the flash drying treatment. In the future, the addition of a flash dried control would provide more insight into the effects of flash drying.

The addition of trace metals to chitosan had no effect on grain production and using a 400 cps blend of chitosan gave a numerical yield increase of 14%. Grain yields were 3407, 3418 and 3897 lb/A for the dry control, trace metals and blend treatments, respectively. The 400 cps blend gave a much higher yield increase than the standard 400 cps treatments in the wet series and may deserve further investigation in the future.

The organic/amino acid additives included glutamic acid, glutamic acid with carboxy methyl cellulose (cmc), acetic acid and lactic acid. Glutamic acid with cmc and acetic acid additives had numerically higher yields than the dry control. Grain yields for the dry control and the two additives were 3407, 3664 and 3612 lb/A, respectively. The glutamic acid additive treatment yielded 3376 lb/A, which was not very different from the dry control and the lactic acid additive treatment yielded 3161 lb/A, which was 240 lb/A less than the control. The additive of most interest is the acetic acid. For these results, it appears acetic acid is an acceptable additive.

Milling Yield

Brown rice and total and whole milling yields were evaluated for all treatments. No significant differences were detected between the wet treatments with Lemont. Brown rice ranged between 78.1 and 79.3%. Total and whole milling yields ranged between 68.1 and 69.1% and 54.5 and 56.5%, respectively. For the dry treatments with Lemont including the organic/amino acid additives, there were no significant differences from the control. Brown rice ranged between 77.1 and 79.8%. Total and whole milling yields ranged between 67.4 and 68.9% and 52.6 and 56.6%, respectively. Similar results were noted for the wet treatments with Cypress, Jackson and Maybelle. Brown rice ranged between 78.1 and 79.9%. Total and whole milling yields ranged between 67.8 and 69.5% and 53.2 and 57.0%, respectively.

YIELD ENHANCEMENT STUDIES

R.T. Dunand and R.R. Dilly, Jr.

Experiment: PGR-IV Post Herbicide Applications and Yield Enhancement in Dry-Seeded Rice

Location: Rice Research Station, Crowley, LA (South Unit)

Variety: Lemont

Seeding Rate: 100 lb/A

Planting Date: 11 May 94

Row Spacing: 7-inch

Fertilizer: 7-21-21 with 3.5% zinc at 300 lb/A drilled preplant, 11 May; ammonium sulfate (21% N) at 450 lb/A by gandy, 6 June

Water Management: Flushed, 24 May

Plot Size: 195 ft^2 - 6.5 x 30 ft

Treated Area: 195 ft^2 - 6.5 x 30 ft

Treatment(s):

Plant Growth Regulator

PGR-IV (6 oz/A)

Herbicide(s)

Stam M4 (1 gal/A)
Bolero 8 EC (3 pt/A)
Facet (0.5 lb/A)

Timing

Plant Growth Regulator: 3- to 4-leaf stage, 6 June;
panicle initiation, 6 July

Herbicides: Delayed preemergence, 13 May;
2- to 3-leaf stage, 30 May

Sprayer: CO_2-driven, hand-held, 32 psi, 15 GPA, 8002 nozzles

Pertinent Rainfall: No rainfall within 24 hours of application

Herbicide(s): Londax (1 oz/A) by airplane, 21 June

Insecticide(s): Furadan 3G (17 lb/A) by airplane, 27 June and 15 Aug; Methyl parathion (1 pt/A) by airplane, 9 Aug

Fungicide(s): Benlate (1 lb/A) by airplane, 9 Aug

Emergence: 17 May

Permanent Flood: 9 June

Harvest Date: 12 Sept

Harvested Area: 195 ft^2 - 6.5 x 30 ft

Exp. Design: Randomized complete block and four replications

Comments: At harvest maturity, four evaluations were made (Table 1). These were weed control, plant height, grain moisture and grain yield. There were no significant differences between treatments in each of these evaluations.

Facet+Bolero and Facet+Stam M4 gave equivalent weed control of the primary weed, barnyardgrass. Weed ratings ranged between 88 and 95% and were unaffected by either herbicide treatment or PGR-IV timing. Some sprangletop were present, accounting for less than 100% weed control.

Lemont is a semidwarf variety that averages approximately 100 cm in mature plant height. Plant height ranged between 92 and 95 cm and was unaffected by either herbicide treatment or PGR-IV timing.

Harvest was delayed due to rainy conditions, and the rice was overripe at harvest. Ideal harvest moisture is 18 to 21%. Grain moisture ranged between 14.5 and 15.3% and was unaffected by either herbicide treatment or PGR-IV timing.

Grain yields were fair to moderate. The state average rice yields are slightly less than 5000 lb/A. Grain yield ranged between 4935 and 5442 lb/A and was unaffected by either herbicide treatment or PGR-IV timing. The only instance in which a PGR-IV treatment had a noticeable numerical increase was the application of PGR-IV at the 3- to 4-leaf stage following Facet+Stam M4 at the 2- to 3-leaf stage. The yield increase was approximately 200 lb/A. In all cases, yields with PGR-IV were either lower than the herbicide control or less than a 30 lb/A increase.

Table 1. The effects of plant growth regulator treatment timing and herbicides on rice production. Rice Research Station, Crowley, LA. 1994.

Treatment Name	Fm Ds	Rate	Rate Unit	Grow Stg	Lep. Pan. Control (%)	Rice Pl. Ht. (cm)	Grain Moisture (%)	Grain Yield (lb/A)
Facet	df	.375	lb/A	DPre	90a	93a	14.9a	5282a
Bolero 8 EC	ec	3	lb/A	DPre				
PGR-IV	l	0	oz p/A	3-4L				
Facet	df	.375	lb/A	DPre	88a	92a	15.1a	4935a
Bolero 8 EC	ec	3	lb/A	DPre				
PGR-IV	l	6	oz p/A	3-4L				
Facet	df	.375	lb/A	DPre	93a	94a	14.5a	5056a
Bolero 8 EC	ec	3	lb/A	DPre				
PGR-IV	l	6	oz p/A	PI				
Facet	df	.375	lb/A	2-3L	88a	94a	15.3a	5236a
Stam M4	ec	3	lb/A	2-3L				
PGR-IV	l	0	oz p/A	3-4L				
Facet	df	.375	lb/A	2-3L	95a	95a	14.6a	5442a
Stam M4	ec	3	lb/A	2-3L				
PGR-IV	l	6	oz p/A	3-4L				
Facet	df	.375	lb/A	2-3L	98a	94a	14.7a	5263a
Stam M4	ec	3	lb/A	2-3L				
PGR-IV	l	6	oz p/A	PI				
LSD (.05) =					9	3	0.8	572
Standard Dev.=					6.1463	2.0622	.50131	374.8
CV =					6.71	2.21	3.38	7.20

Means followed by same letter do not significantly differ (Duncan's MRT, P=.05).

YIELD ENHANCEMENT STUDIES

R.T. Dunand and R.R. Dilly, Jr.

Experiment: PGR-IV and Yield Enhancement in Rice

Location: Rice Research Station, Crowley, LA (North Unit)

Variety: Jodon

Seeding Rate: See treatments

Planting Date: 10 June 94

Row Spacing: 7-inch

Fertilizer: See treatments

Water Management: Flushed, 17 June

Plot Size: 167 ft^2 - 7.5 (13 rows) x 22 ft

Treated Area: 167 ft^2 - 7.5 (13 rows) x 22 ft

Treatment(s): **Plant Growth Regulator**

PGR-IV (4 and 6 oz/A)

Timing

2- to 3-leaf stage, 28 June
Panicle initiation, 8 Aug
50% heading, 29 Aug

Seeding Rate: 50 and 100 lb/A

Nitrogen Fertility

Low nitrogen rate (62 lb N/A) -- 7-21-21 with 3.5% zinc at 300 lb/A drilled preplant, 10 June; ammonium sulfate (21% N) at 200 lb/A by airplane, 27 June

Normal nitrogen rate (114 lb N/A) -- 7-21-21 with 3.5% zinc at 300 lb/A drilled preplant, 10 June; ammonium sulfate (21% N) at 200 lb/A by airplane, 27 June; ammonium sulfate (21% N) at 250 lb/A by Gandy, 28 June

Sprayer: CO_2-driven, hand-held, 32 psi, 15 GPA, 8002 nozzles

Pertinent Rainfall: Rainfall (2 inches) within 1 hours of panicle initiation application and resprayed same day

Herbicide(s): Stam M4 (3 qt/A) by airplane, 21 June;
Stam M4+Londax (4 qt+1 oz/A) by airplane, 27 June;
Londax (2 oz/A) by airplane, 7 July

Insecticide(s): Furadan 3G (17 lb/A) by airplane, 7 and 21 July and 9 Aug
Methyl parathion - 2 pt/A, 22 July; 1 pt/A, 9 & 26 Aug & 3 Sept
0.5 pt/A by airplane, 23 Aug

Fungicide(s): Benlate - 2.8 lb/A, 22 July; 1.0 lb/A by airplane, 9 and 23 Aug and 3 Sept

Emergence: 17 June

Permanent Flood: 30 June

Harvest Date: 26 Sept

Harvested Area: 167 ft^2 - 7.5 x 22 ft

Exp. Design: Randomized complete block and four replications

Comments: The evaluation of PGR-IV on rice with a wide range in yield potential was attempted. Varying seeding rate and nitrogen fertility had an affect on yield potential but the effect was severely moderated by lower stands in general and a high, persistent rice water weevil infestation. Heavy rainfall following planting reduced stands and several applications of Furadan were necessary for insect control.

In general stand density was low (<10 plants/ft^2). Even with this limitation, seeding rate did have a significant affect on stand density and consequently affected grain moisture and grain yield. For the low seeding rate treatments, stand densities ranged between 2 and 5 plants/ft^2. For the normal seeding rate treatments, stand densities ranged between 5 and 10 plants/ft^2.

The lower stand density treatments were later maturing as noted in grain moisture at harvest. Grain moisture of the low seeding rate treatments ranged between 27.3 and 30.6%. With the normal seeding rate treatments grain moisture ranged between 23.9 and 27.1%. This is expected since lower stands have a long period of tillering and the later tillers are late maturing and increase grain moisture.

Maximum rice yield is usually obtained with stand densities between 10 and 20 plants/ft^2. Below 10 plants/ft^2, rice yield is proportional to stand density and as stand density decreases grain yield decreases. Consequently, the lower stand density treatments had lower grain yield. Grain yield of the low seeding rate treatments ranged between 1980 and 2991 lb/A. In comparison, grain yield of the normal seeding rate treatments ranged between 2650 and 3970 lb/A.

Nitrogen fertility and PGR-IV appear to have had little impact on grain moisture. In the low stand treatments, the average grain moisture of the low nitrogen treatments was 29% compared with 28.1% grain moisture in the high nitrogen treatments. In the low seeding rate, low nitrogen treatments the application of PGR-IV at different rates and timings produced grain moistures ranging from 27.7 to 30.6%. Without PGR-IV, the low seeding rate, low nitrogen treatment alone had a grain moisture of 27.3%. In the low seeding rate, normal nitrogen treatments results were similar. With PGR-IV, grain moistures ranged between 27.1 and 30% compared with 27.7% without PGR-IV. In the normal stand, low nitrogen treatments PGR-IV produced grain moistures ranging from 23.9 to 26.4% compared with 27.1% without PGR-IV. None of these differences were significant.

Nitrogen fertility and PGR-IV appear to have had little impact on grain yield. In the low stand treatments, the average grain yield of the low nitrogen treatments was 2586 lb/A compared with 2502 lb/A in the high nitrogen treatments. In the low seeding rate, low nitrogen treatments the application of PGR-IV at different rates and timings produced grain yields ranging from 2324 to 2610 lb/A. Without PGR-IV, the low seeding rate, low nitrogen treatment alone had a grain yield of 2972 lb/A. In the low seeding rate, normal nitrogen treatments results were similar. With PGR-IV, grain yields ranged between 1950 and 2991 lb/A compared with 2316 lb/A without PGR-IV. In the normal stand, low nitrogen treatments PGR-IV produced grain yields ranging from 2650 to 3957 lb/A compared with 3970 lb/A without PGR-IV. None of these differences were significant.

Table 1. The effect of plant growth regulator foliar treatment timing and rate on rice production. Rice Research Station, Crowley, LA. 1994.

Treatment Name	Fm Ds	Rate	Grow Stg	Stand (plants/ sq ft)	Moisture (%)	Yield (lb/A)
Low Stand Low Nitrogen PGR-IV		0		4cd	27.3cde	2972abc
Low Stand Low Nitrogen PGR-IV	1	6	2-3L	3d	29.2abc	2342bc
Low Stand Low Nitrogen PGR-IV	1	6	PI	4d	30.6a	2585bc

Continued.

Table 1. Continued.

Treatment Name	Fm Ds	Rate	Grow Stg	Stand (plants/ sq ft)	Moisture (%)	Yield (lb/A)
Low Stand Low Nitrogen PGR-IV	1	4	2-3L	4cd	27.7b-e	2423bc
PGR-IV	1	4	PI			
Low Stand Low Nitrogen PGR-IV	1	6	50%H	2d	30.0ab	2610abc
Low Stand Normal Nitrog PGR-IV		0		3d	27.7b-e	2316bc
Low Stand Normal Nitrog PGR-IV	1	6	2-3L	4d	30.0ab	2991abc
Low Stand Normal Nitrog PGR-IV	1	6	PI	5cd	27.1cde	2367bc
Low Stand Normal Nitrog PGR-IV	1	4	2-3L	5cd	27.2cde	2857abc
PGR-IV	1	4	PI			
Low Stand Normal Nitrog PGR-IV	1	6	50%H	4d	28.7a-d	1980c
Normal Stand Low Nitrogen PGR-IV		0		6bcd	27.1c-f	3970a
Normal Stand Low Nitrogen PGR-IV	1	6	2-3L	10a	23.9g	3199abc
Normal Stand Low Nitrogen PGR-IV	1	6	PI	5cd	26.4def	2935abc
Normal Stand Low Nitrogen PGR-IV	1	4	2-3L	9ab	24.5fg	3957a
PGR-IV	1	4	PI			
Normal Stand Low Nitrogen PGR-IV	1	6	50%H	6bcd	25.3efg	2650abc
Normal Stand Normal Nitrog PGR-IV		0		8abc	25.2efg	3501ab
LSD (.05) =				3	2.3	1164
Standard Dev.=				2.2001	1.6363	814.31
CV =				43.33	5.98	28.54

Means followed by same letter do not significantly differ (Duncan's MRT, P=.05).

RED RICE STUDIES

R.T. Dunand and R.R. Dilly, Jr.

Experiment: Direct Effect of Maleic Hydrazide for Red Rice Suppression on Rice

Location: Rice Research Station, Crowley, LA (North Unit)

Variety: Cypress

Seeding Rate: 100 lb/A

Planting Date: 9 June 94

Row Spacing: 7-inch

Fertilizer: 7-21-21 with 3.5% zinc at 300 lb/A drilled preplant, 9 June; ammonium sulfate (21%N) at 450 lb/A by airplane, 27 June

Water Management: Flushed, 17 June

Plot Size: 117 ft^2 - 4.67 x 25 ft

Treated Area: 117 ft^2 - 4.67 x 25 ft

Treatment(s): **Plant Growth Regulator**

Maleic hydrazide - Royal MH 30 SG (2.5 lb/A)

Timing

Heading, 26 Aug
Milk stage, 1 Sept
Dough stage, 7 Sept
Physiological maturity, 13 Sept

Sprayer: CO_2-driven, hand-held, 32 psi, 15 GPA, 8002 nozzles

Pertinent Rainfall: No rainfall within 24 hours of applications

Herbicide(s): Stam M4 (3 qt/A) by airplane, 21 June; Stam M4 + Londax (4 qt + 1 oz/A) by airplane, 27 June; Londax (2 oz/A) by airplane, 7 July

Insecticide(s): Furadan 3G (17 lb/A) by airplane, 7 and 21 July and 9 Aug; methyl parathion (2 pt/A) by airplane, 22 July; methyl parathion (1 pt/A) by airplane, 9 and 26 Aug and 3 Sept; methyl parathion (0.5 pt/A) by airplane, 23 Aug

Fungicide(s): Benlate - 2.8 lb/A by airplane, 22 July
1.0 lb/A by airplane, 9 and 23 Aug and 23 Sept

Emergence: 15 June

Permanent Flood: 30 June

Harvest Date: 27 Sept

Harvested Area: 117 ft^2 - 4.67 x 25 ft

Exp. Design: Randomized complete block and four replications

Comments: At harvest maturity, mainly evaluations of reproductive development were made. These included panicle density, panicle development (infertile and partially developed panicles), plant height, grain moisture, and grain yield. Panicle development and yield were the more significantly affected parameters measured.

Since applications of maleic hydrazide (MH) were made after heading, panicle density was unaffected by time of application (Table 1). Panicle densities ranged between 26 and 32 panicles/ft^2. Under average growing conditions, rice averages approximately 30 panicles/ft^2.

Table 1. The effects of plant growth regulator foliar treatment timing on mature plant development in rice. Rice Research Station, Crowley, LA. 1994.

Treatment Name	Fm Ds	Rate	Grow Stg	Total pan. den. (pan./ft^2 panicles 110 DAP	Sterile pan. den. (%) panicles 110 DAP	Partial pan. den. (%) panicles 110 DAP	Abnormal pan. den. (%) panicles 110 DAP	Plant Height (cm) shoot 110 DAP	Moisture (%) grain 110 DAP	Yield (lb/A) grain 110 DAP
Royal MH 30 SG	df	0		29a	0b	16b	16b	80a	18.0a	6147a
Royal MH 30 SG	df	1.5	HD	31a	16a	33a	49a	82a	18.4a	4182b
Royal MH 30 SG	df	1.5	MS	32a	1b	17b	18b	81a	18.0a	5305a
Royal MH 30 SG	df	1.5	DS	27a	2b	17b	18b	82a	18.5a	5645a
Royal MH 30 SG	df	1.5	PM	26a	0b	15b	15b	83a	19.0a	5567a
LSD (.05) =				6	13	14	22	3	1.3	836
Standard Dev.=				3.8654	8.1266	9.3603	13.96	2.2638	.87417	522.96
CV =				13.40	213.86	48.25	60.17	2.78	4.75	9.74

Means followed by same letter do not significantly differ (Duncan's MRT, P=.05).

Panicle development was significantly affected by time of application of MH. The occurrence of sterile panicles or panicles producing no grain and remaining erect at harvest was greatest for the heading time of application. The control and milk stage (MS), dough stage (DS) and physiological maturity (PM) times of application resulted in less than 2% sterile panicles/ft^2. The heading application had 16% sterile panicles/ft^2. The difference was significant.

Similar results were noted for partially developed panicles on which florets on the upper half of the panicle produced grain and florets on the lower half of the panicle did not produce grain. For the control, MS, DS and PM timings partially filled panicles accounted for between 15 and 17% of all panicles. For the heading timing, 33% of the panicles were partially filled. Of the total number of panicles that did not develop completely (sterile + partially filled panicles combined), almost half of the panicles in the heading timing were incompletely developed compared with 15 to 18% in the other treatments. The difference was significant.

The effects of MH timing on panicle development directly impacted grain production. Applying MH at heading significantly reduced grain yield and was the only treatment to do so. Grain yield in the control was 6147 lb/A. In the heading treatment, grain yield was 4182 lb/A, approximately a 2000 lb/A yield decrease. Applications of MH from MS to PM resulted in yields that ranged from 5305 to 5645 lb/A. Although these yields were approximately 700 lb/A less than the control, this was not a significant difference.

Mature plant height and grain moisture were not significantly affected by time of MH application. Plant height ranged between 80 and 83 cm, and grain moisture ranged between 18 and 19% for all treatments.

Milling yields were reduced by MH application at heading (Table 2). Brown rice yield was 74.0% in the control and 72.9% for the heading treatment. Brown rice yield ranged between 73.6 and 73.9% for the other timings of MH. Total and whole milling yields were 63.5 and 53.4% for the heading treatment, respectively. For the control, total and whole milling yields were 64.9 and 57.2%, respectively. Ranges for total and whole milling for the MS to PM timings were 64.4 to 64.5% and 56.5 to 57.3%, respectively.

Germination was unaffected by MH treatment (Table 2). Harvested grain was placed on filter paper in petri dishes and germination was evaluated 12 days later. Germination ranged between 14 and 17%, and there were no significant differences between treatments.

Ratoon growth was affected by MH timing (Table 2). Heading (percentage of stems with panicles exserted to any degree) at 37 days after first crop harvest was significantly higher with the HD timing. Heading for the HD timing was 54% compared with a range of from 1 to 5% for the control and other timings. Similar results were noted in shoot growth of the ratoon crop. Weight of ratoon shoots (g/linear meter of row) was 53 g for the HD treatment compared with 12 g for the control. For the MS to PM treatments shoot weight ranged between 11 and 19 g. Straw remaining from the first crop was not affected by MH timing. Straw weight (g/linear meter of row) ranged between 66 and 94 g.

Table 2. The effect of foliar plant growth regulator on first crop milling and ratoon growth in rice. Rice Research Station, Crowley, LA. 1994.

Treatment Name	Fm Ds	Rate	Grow Stg	Brown Rice (%)	Total Milling (%)	Whole Milling (%)	Germinat (plants/ 20 seed)	Ratoon Heading (%)	Straw Fr. Wt. (g)	Ratoon Fr. Wt. (g)
Royal MH 30 SG	df	0		74.0a	64.9a	57.2a	17a	3b	76a	12b
Royal MH 30 SG	df	1.5	ED	72.9b	63.5b	53.4b	16a	54a	94a	53a
Royal MH 30 SG	df	1.5	MS	73.6ab	64.4a	56.5a	14a	5b	85a	19b
Royal MH 30 SG	df	1.5	DS	73.9a	64.7a	56.8a	16a	4b	66a	11b
Royal MH 30 SG	df	1.5	PM	73.8a	64.7a	57.3a	15a	1b	74a	10b
LSD (.05)	=			0.7	0.8	2.1	3	23	33	20
Standard Dev.	=			.47727	.52735	1.3597	1.8973	15.048	21.305	12.818
CV	=			0.65	0.82	2.42	12.36	113.57	26.99	61.78

Means followed by same letter do not significantly differ (Duncan's MRT, P=.05).

RED RICE STUDIES

R.T. Dunand and R.R. Dilly, Jr.

Experiment: Maleic Hydrazide and Red Rice Seedhead Suppression in Rice

Location: Rice Research Station, Crowley, LA (South Unit)

Variety: RT 7015

Seeding Rate: 150 lb/A

Planting Date: 26 May 94

Row Spacing: Water-seeded: seed were soaked in water for 24 hr beginning on 25 May; seed were kept moist for 24 hr following draining before sowing by airplane

Fertilizer: 20-10-10 with 3.5% zinc at 400 lb/A by airplane and preplant incorporated on 24 May

Water Management: Flooded for seeding (1 to 2 inches), 25 May; drained, 27 May; permanent flood (3 to 4 inches), 30 May; drained for harvest, 2 Sept

Plot Size: 400 ft^2 - 8 x 50 ft

Treated Area: 400 ft^2 - 8 x 50 ft

Treatment(s): **Plant Growth Regulator**

Maleic hydrazide - Royal MH 30 SG (0.8, 1.25, 1.7, 2.5 and 5 lb/A)

Timing

Milk stage, 17 Aug
Dough stage, 22 Aug

Sprayer: CO_2-driven, hand-held, 32 psi, 15 GPA, 8002 nozzles

Pertinent Rainfall: No rainfall within 24 hours after application

Herbicide(s): Stam M4 (3 qt/A) by airplane, 21 June;
Londax (2 oz/A) by airplane, 27 June;
Basagran (3 pt/A) by airplane, 1 July

Insecticide(s): Furadan 3G (17 lb/A) by airplane, 27 June and 7 July;
Methyl parathion (1 pt/A) by airplane, 9 Aug;
(0.5 pt/A) by airplane, 23 Aug

Fungicide(s): Benlate (1 lb/A) by airplane, 9 and 23 Aug

Emergence: 27 May

Permanent Flood: 30 May

Harvest Date: 19 Sept

Harvested Area: 400 ft^2 - 8 x 50 ft

Exp. Design: Randomized complete block and four replications

Comments: Evaluations of the effect of maleic hydrazide on red rice development included panicle and stature measurements (Table 1). Normal red rice panicles have filled seeds and the panicles have an arched configuration at maturity. Abnormal panicles as the result of MH application have immature, partially filled and unfilled seeds causing the panicles to be erect at maturity. Measurement of normal panicles showed that less than 1 normal panicle/m^2 was observed in the MH treatments. In the control there were 187 normal panicles/m^2. Total number of panicles/m^2 were relatively constant between treatments ranging from an average of 152 to 214 panicles/m^2. Some incomplete panicle exsertion was also noted in the MH treatments and resulted in reduced red rice mature plant height. In the MH treatments, plant height ranged between 64 and 72 cm. In the control, height was 80 cm. The effects of MH on panicle development and plant stature were significant.

Since there was a high red rice population, the reduction of red rice plant height contributed to a reduction in lodging (Table 1). Lodging was less than 3% (amount of total plot area with lodging) compared with the control which averaged 40% lodging.

The effects of MH on red rice panicle development affected grain moisture and yield (Table 1). In general, grain moisture was higher and grain yield lower in the MH treatments. In the MH treatments grain moisture ranged between 21.4 and 25.6% compared with 18.4% in the control. The presence of immature red rice seed in the harvested grain of the MH treatments contributed to higher moisture content. Grain yields of the MH treatments ranged between 1616 and 2198 lb/A compared with 3382 lb/A in the control. The yield difference was in part due to the reduction in red rice content of the grain in the MH treatments.

In the determination of milling yield and grade, rice is shelled and milled. During the shelling process, hulls and immature grains of rice and red rice are removed. The product is brown rice and the amount of brown rice is expressed as percentage by weight of the original rice sample. The results show the MH treatments reduced brown rice yields by 5 to 10% (Table 2). For the MH treatments brown rice yields ranged between 67.3 and 71.3% compared with 76.2% in the control. The production of immature red rice seed by the application of MH is one of the methods by which MH limits seed production and improves rice grade.

After shelling, rice is milled. The product is composed of whole and broken rice kernels, and the weight of the milled rice determines total milling yield. Total milling yields were reduced by MH (Table 2). For the MH treatments, total milling yields ranged between 52.2 and 60.5% compared with 61.2 for the control. Very immature red rice kernels disintegrate during milling, and this is reflected in the lower total milling yields of the MH treatments.

Whole and broken kernels remaining after milling are screened to remove the brokens, resulting in primarily whole kernels remaining. The weight of the whole kernels determines whole milling yield. Whole milling yields were reduced by MH (Table 2). For MH treatments, whole milling yields ranged between 34.6 and 40.4% compared with 43.2% for the control. Partially mature red rice kernels which do not disintegrate during milling are removed by screening, and the higher percentage of partially mature red rice kernels due to MH treatment results in a reduction in whole milling yield.

Milled rice is evaluated for red rice content, and the amount of red rice can affect grade. By limiting red rice seed production as noted in the panicle density results and by causing the production of immature and partially mature red rice seed, MH treatments reduced the red rice content of the milled rice (Table 2). Red rice content of the MH treatments ranged between 17.5 and 34.8% compared with 45.9% for the control. Rice yields were low due to poor stands, and the ratio of red rice to rice was very high. Because of the excessive amounts of red rice in the milled rice and even though MH reduced red rice content by as much as 28% in one instance, grade was not significantly improved by MH (Table 2). Only MH applied at the 3 lb/A rate had a USDA grade #6. All other MH treatments and the control were sample grade (SG). Grades range from 1 to 6 followed by sample grade.

Table 1. The effects of plant growth regulator foliar treatment timing and rate on mature plant development of red rice in rice. Rice Research Station, Crowley, LA. 1994.

Treatment Name	Fm Ds	Rate	Grow Stg	Red Rice Normal Pan. Den. (pan/ sq m)	Red Rice Total Pan. Den. (pan/ sq m)	Plant Height (cm)	Lodging (%)	Moisture dry (%)	Yield (lb/A)
Control				187a	187ab	80a	40a	18.4c	3382a
Royal MH 30 SG df		1.5	MS	0b	214a	64c	3b	23.4ab	1616b
Royal MH 30 SG df		3	MS	0b	189ab	66bc	0b	21.4bc	1829b
Royal MH 30 SG df Royal MH 30 SG df		.75	MS DS	0b	152b	72ab	3b	25.6a	1976b
Royal MH 30 SG df Royal MH 30 SG df		1 .5	MS DS	1b	179ab	69bc	0b	23.2ab	2198b
LSD (.05) =				47	54	7	21	3.5	698
Standard Dev.=				30.392	35.148	4.8192	13.934	2.2585	452.79
CV =				81.05	19.07	6.89	154.83	10.09	20.58

Means followed by same letter do not significantly differ (Duncan's MRT, P=.05).

Table 2. The effects of plant growth regulator foliar timing and rate on rice quality of rice infested with red rice. Rice Research Station, Crowley, LA. 1994.

Treatment Name	Fm Ds	Rate	Grow Stg	Brown (%)	Total (%)	Whole (%)	Sample content (%)	Grade (r.u.)
Control				76.2a	61.2a	43.2a	45.9a	SGa
Royal MH 30 SG df		1.5	MS	69.8b	54.9abc	37.9ab	31.4abc	SGa
Royal MH 30 SG df		3	MS	71.3b	60.5ab	40.4ab	17.5c	6a
Royal MH 30 SG df Royal MH 30 SG df		.75	MS DS	67.3b	52.2c	34.6b	34.8ab	SGa
Royal MH 30 SG df Royal MH 30 SG df		1 .5	MS DS	69.2b	54.3bc	36.7b	26.1bc	SGa
LSD (.05) =				3.9	6.3	5.6	13.8	1
Standard Dev.=				2.5391	4.1149	3.6175	8.9683	.49159
CV =				3.59	7.27	9.39	28.80	7.28

Means followed by same letter do not significantly differ (Duncan's MRT, P=.05).

WEED CONTROL STUDIES

Michael Braverman

Mannagrass studies

Two studies were conducted to evaluate methods to control mannagrass. The first study compared the herbicides Roundup at 20 and 30 oz., Ignite at 0.5 and 1.0 lb, 24 oz. Fusilade, 3 pt. Gramoxone Extra, 8 and 16 oz. Select, 2.5 pt. Poast Plus, 1 pt. Whip 360, 12 oz. Assure II, 5 pt. Touchdown per acre, and an untreated check. All graminicide treatments were in combination with 2.5% Herbimax, while other herbicides were applied with 0.25% X-77 surfactant. The second study evaluated Roundup from 30 to 15 oz. in combination with 0.25% by volume X-77 surfactant, Quest, or 2% ammonium sulfate.

In the herbicide evaluation study, the 30 oz. rate of Roundup, Gramoxone Extra, and Touchdown provided >80% control of mannagrass at 1 week after application (Figure 1). At 4 weeks after application, Roundup at both rates, Poast Plus, and Touchdown all provided > 90% control of mannagrass (Figure 2). In the Roundup rate study, the 15 oz. rate provided as good control as the 30 oz. rate (Figure 3). There was no difference among surfactants used either.

Figure 1. Mannagrass control at 1 wk.

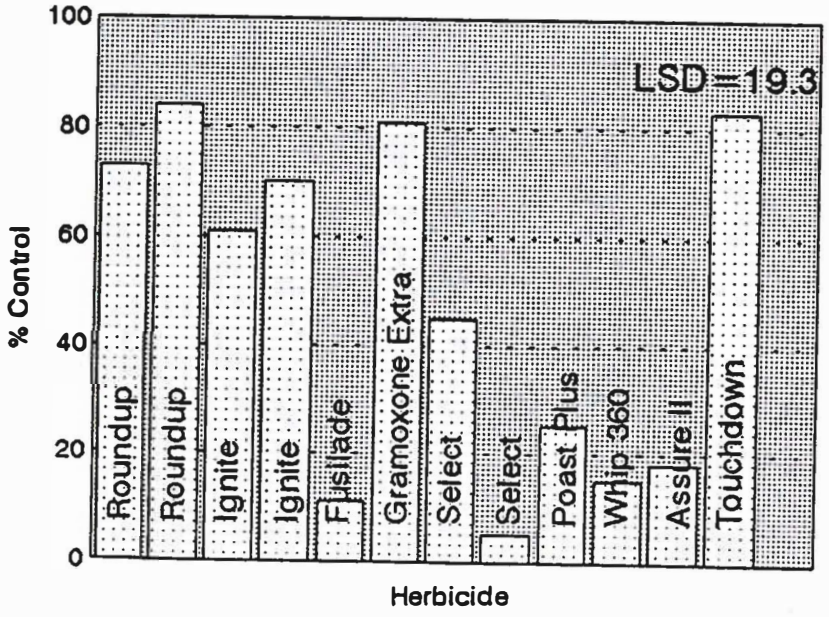


Figure 2. Mannagrass control at 4 wk.

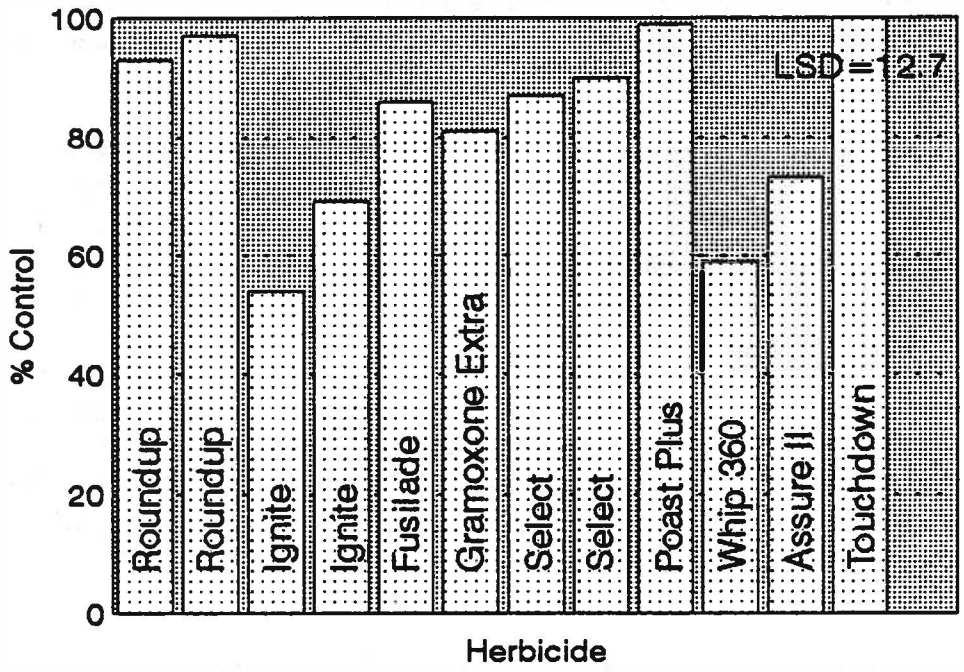
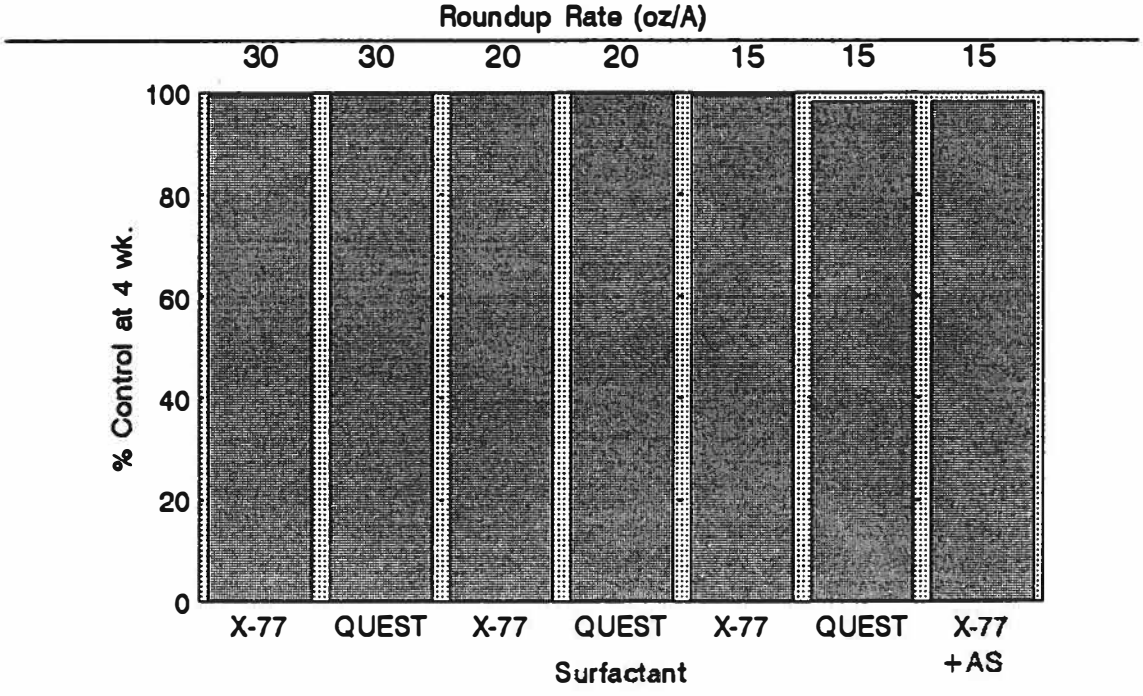


Figure 3. Roundup Rate and Surfactant Study



Stam Formulation-Rainfall-Surfactant Study

There are many formulations of Stam or propanil on the market. While most research has shown that there is not much difference between formulations, most tests have not purposefully included factors such as weed size, cool temperatures, and rainfall. These less than ideal conditions may exist in the field under actual production situations. The purpose of this experiment was to compare three formulations of propanil with unfavorable conditions.

The experimental factors included propanil formulations, including Stam M4, Wham EZ, and Stam 80 EDF. All were applied at 3 lb ai/A on 4-leaf barnyardgrass and 3-leaf spikerush. These were combined with the surfactants X-77, Dynamic, or no surfactant. Treated plants were subjected to 0.25 inches of simulated rainfall at 15, 30, 60, 120, and 240 minutes after application or no rainfall. The temperature at application was 65°.

The interaction of propanil formulation and rainfall on barnyardgrass control is shown in Figure 1. There was a general increase in barnyardgrass control as the time between application and rainfall increased. With the Stam M4 formulation, the increase in control was significant, whereas with the Wham EZ and Stam 80 EDF formulations, the increase in activity was not significant. Under the cool conditions of this experiment, the activity of Stam 80 EDF, which is a dry formulation was significantly less than the liquid formulations, Stam M4 and Wham EZ.

The interaction of propanil formulation and rainfall on spikerush control is shown in Figure 2. The overall effect was very similar to that found on barnyardgrass. With the Stam M4, the increase in spikerush control was significant, whereas with the Wham EZ and Stam 80 EDF formulations, the increase was not significant. The activity of Stam 80 EDF was significantly less than the liquid formulations, Stam M4 and Wham EZ.

Figure 1. Stam-Rainfall & Barnyardgrass Control

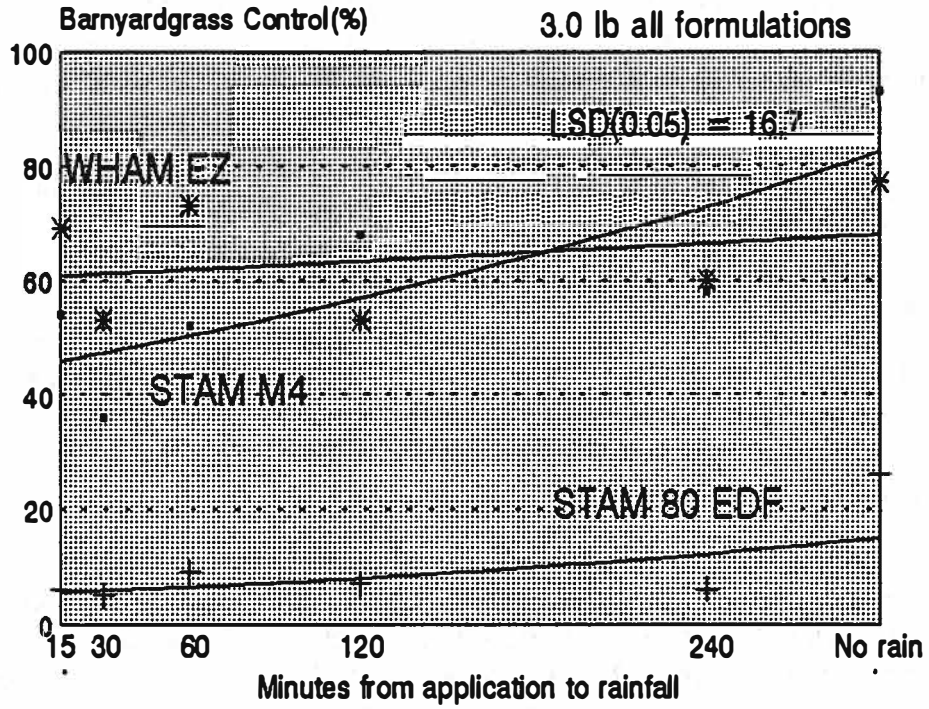
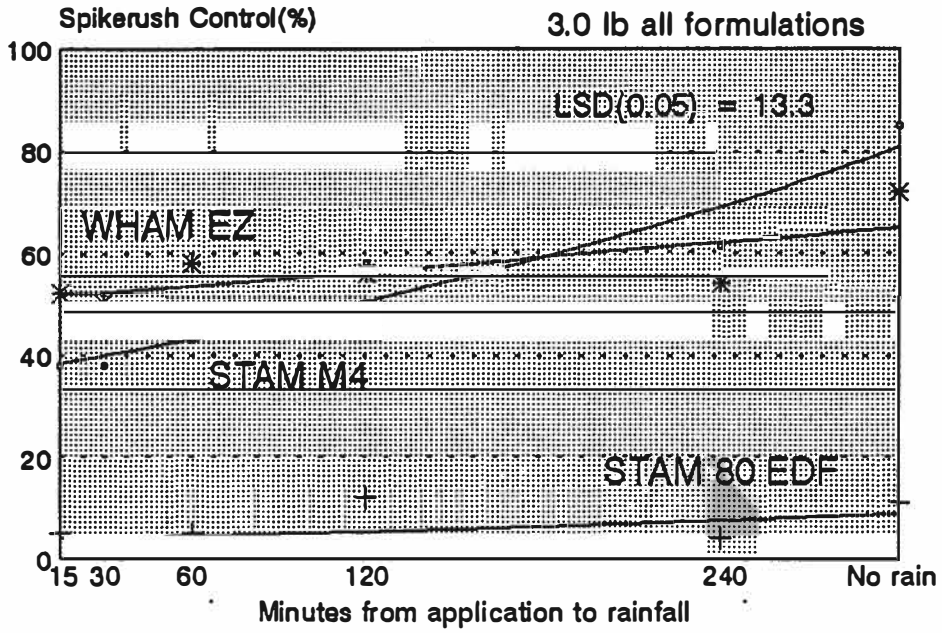


Figure 2. Stam-Rainfall & Spikerush Control



TEMPERATURE RESPONSE STUDY FOR THE ACTIVITY OF BENSULFURON-METHYL

R. O. Wilde and M. P. Braverman

Bensulfuron-methyl (trade name Londax) is a sulfonylurea herbicide used both PRE and POST in rice to control susceptible broadleaf weeds and sedges. Previous research has shown that for every 10°C drop in temperature the rate of sulfonylurea detoxification drops by a factor of 2 to 5. The 1994 Londax label states that expression of herbicide symptoms may be delayed when air or water temperatures are below 70°F. The experimental objective was to develop a temperature response model for the activity of bensulfuron-methyl on alligatorweed.

Bensulfuron-methyl was applied at 0, 0.5, 1, 1.5, and 2 oz. of formulated product per acre. Six application dates were used from late March to mid June so that a wide range of temperatures could be encountered. Herbicide treatments were applied using a CO_2 back pack sprayer. To insure treatment integrity, metal rings were placed in each treatment. Data collected from plots consisted of temperature, visual ratings, and rice yield. Temperature data were converted to hours below 70°F.

The experimental design was randomized complete block design with four replications in a factorial arrangement. The data were analyzed by ANOVA to compare year by application time by Londax rate for interactions. Table Curve was used to model the surface response curve of alligatorweed control, Londax rate, and hours below 70°C. The best fit curve was selected by degree of freedom adjusted r^2.

In general, as Londax rate increased, activity on alligatorweed increased and as cumulative hours below 70°F decreased activity on alligatorweed increased for both 7 and 14 days after treatment as seen in Figures 1 and 2. The range of 60 to 80 cumulative hours at 14 days after treatment is the critical range beyond which Londax activity is reduced.

The effect of Londax rate on alligatorweed control 28 days after treatment is shown in Figure 3. As Londax rate increased, alligatorweed control increased. Application time did not influence activity on alligatorweed control 28 days after treatment (Figure 4).

Londax rate did not appear to influence rice yield (Figure 5). The effect of time of Londax application on rice yield did significantly influence rice yield (Figure 6).

Based on historical weather data (Figure 7), in north Louisiana, applications before the first week in June, and in south Louisiana, applications prior to the second week of May can result in a delay in Londax activity.

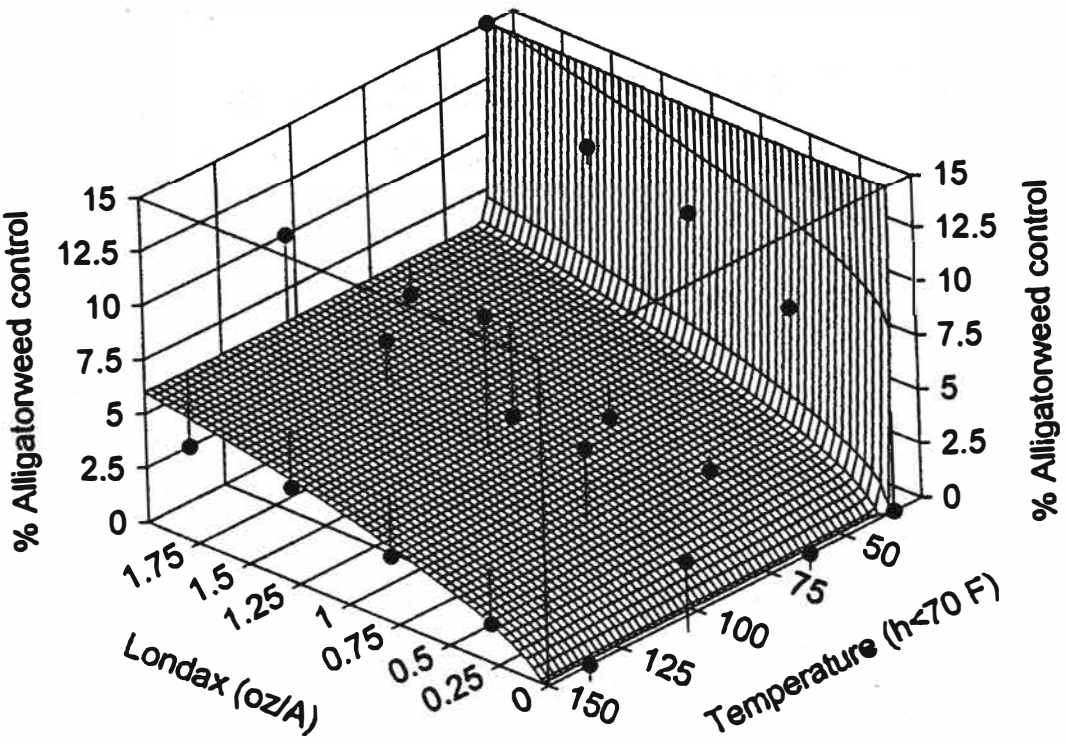


Figure 1. Effect of critical temperature on alligatorweed control with Londax in 1994 seven days after treatment.

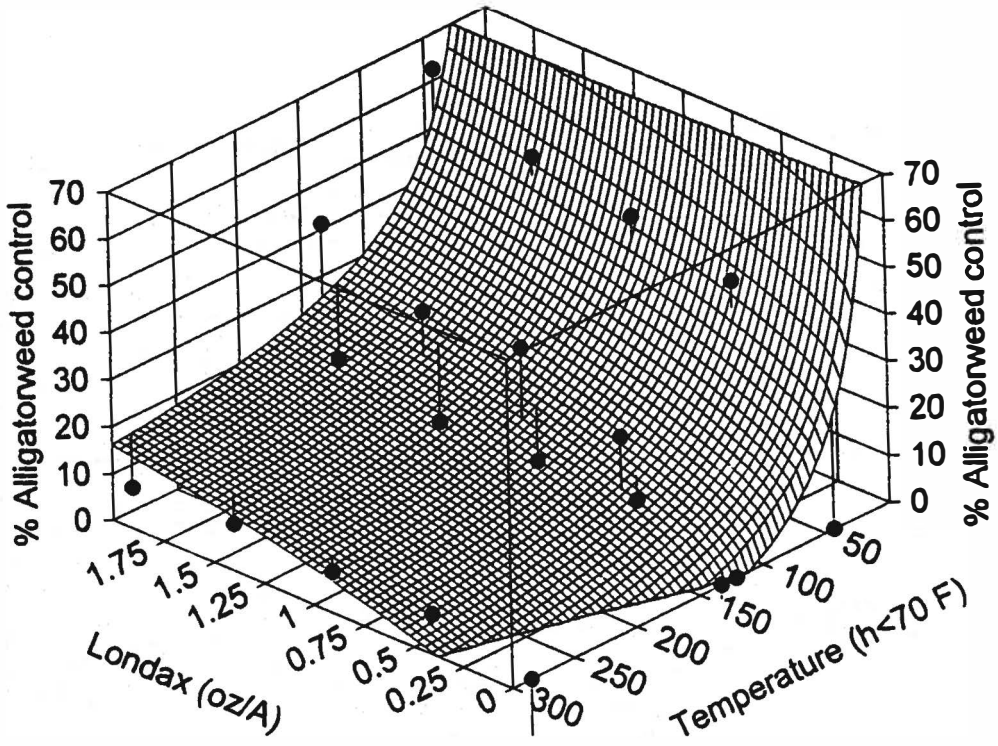


Figure 2. Effect of critical temperature on alligatorweed control with Londax in 1994 fourteen days after treatment.

Figure 3. Effect of Londax rate on alligatorweed control 28 days after treatment.

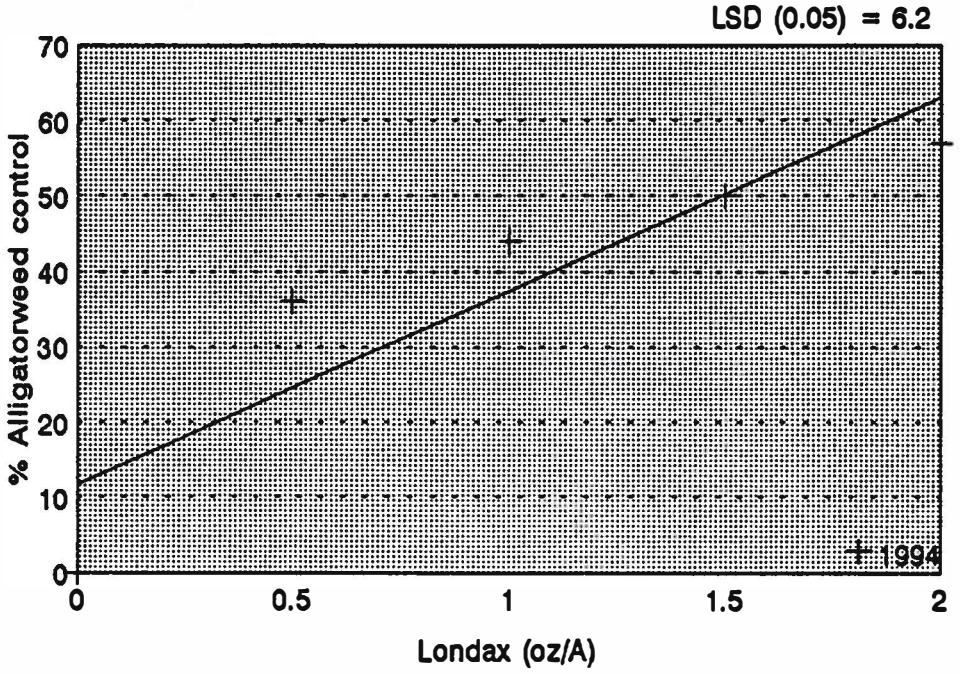


Figure 4. Effect of time of application on alligatorweed control 28 days after treatment.

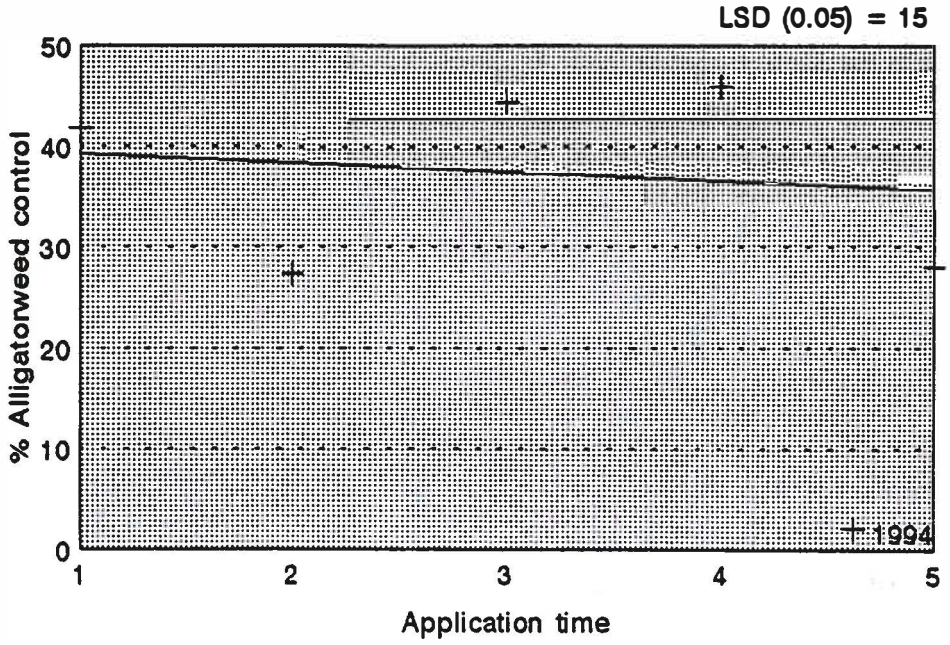


Figure 5. Effect of Londax rate on rice yield.

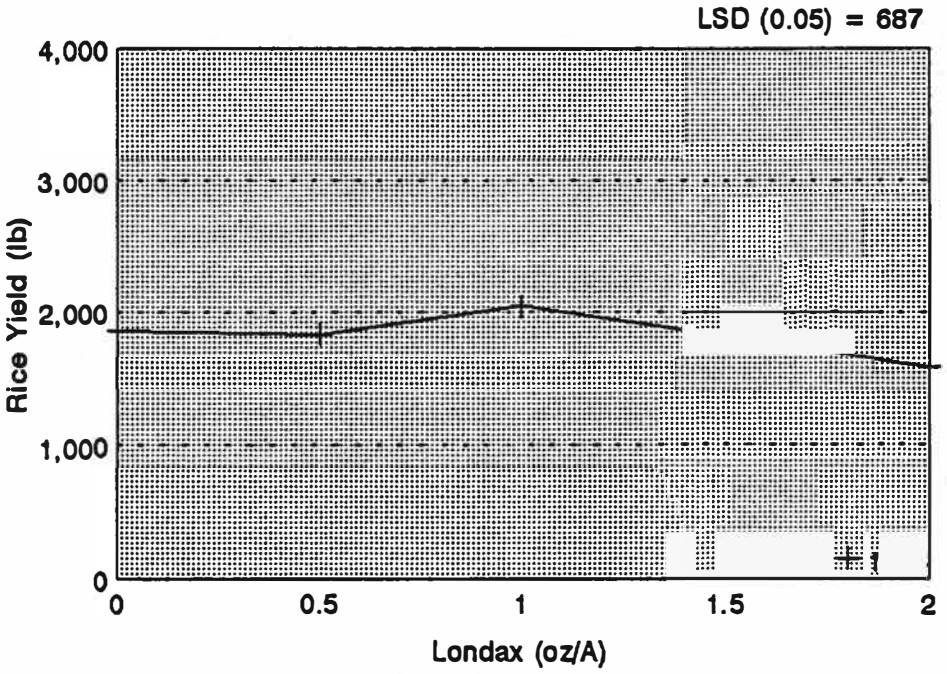


Figure 6. Effect of time of Londax application on rice yield.

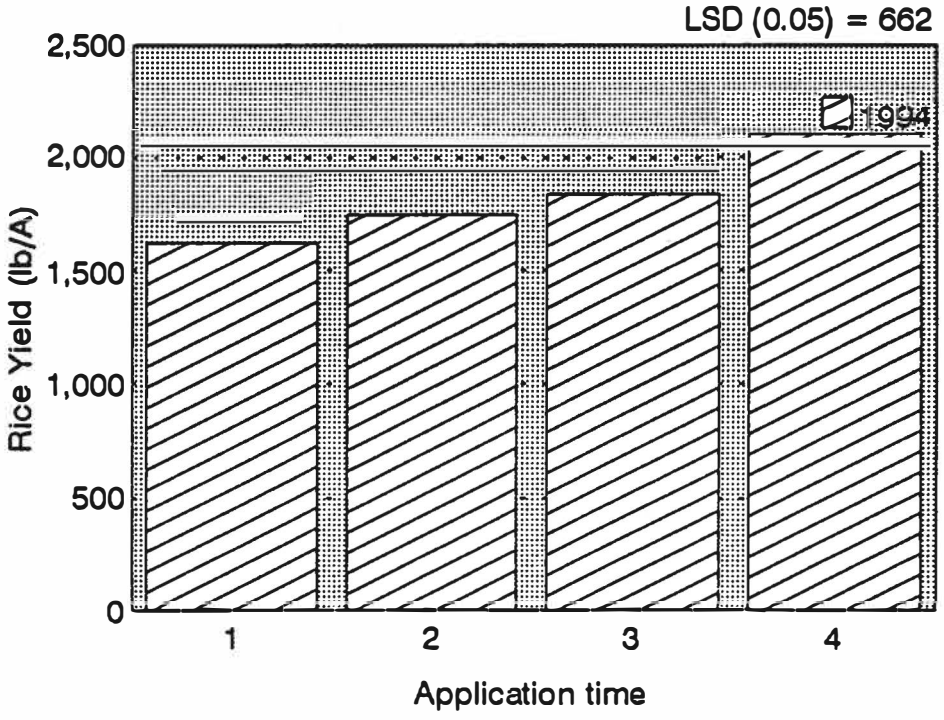


Figure 7. Cumulative hours below 70°F within 14 days following treatment in north and south Louisiana.

NORTH:

March				April				May				June			
1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
304	273	251	285	241	194	149	180	218	176	145	97	33	19	6	10

SOUTH:

March				April				May				June			
1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
297	282	240	257	217	174	138	133	110	67	89	59	6	0	0	0

INFLUENCE OF IGNITE APPLICATION TIME AND TANKMIXES ON IGNITE RESISTANT RICE AND RED RICE

S. Sankula, M.P. Braverman, and S.D. Linscombe

Red rice is the most important weed of all rice growing states of the United States. Effective control of red rice is still a problem because of the inability to selectively discriminate between the members of same genus and species. Ignite, a microbial metabolite, is effective against a wide range of weeds, including red rice. The main problem of using this herbicide in rice is its non-selective broad spectrum activity. But, recently developed genetically engineered Ignite resistant rice offers the possibility of direct application of Ignite in rice for selective control of red rice.

Field experiments were conducted to evaluate the effect of different rates of Ignite on different growth stages of red rice and Ignite resistant rice. The rates of Ignite for red rice were 0, 0.25, 0.38, 0.5, 0.75, and 1.0 lb ai/A as single applications and sequential applications of 0.25, 0.38, and 0.5 lb ai/A applied 1 week apart. The herbicide rates were factorialized with three growth stages, which included 3- to 4-leaf, 0.5- to 1-inch panicle, and boot. Two rates of Ignite were tested on Ignite resistant rice (0 and 2.0 lb ai/A) at the above mentioned growth stages. A parallel study was undertaken to determine the effect of Ignite tankmixed with different contact and residual herbicides on red rice control and resistance of transgenic Gulfmont rice. Prowl (1.0 lb ai/A), Bolero (3.0 lb ai/A), Facet (0.25 lb ai/A), Stam (3.0 lb ai/A), Londax (1.0 oz ai/A), Basagran (1.0 lb ai/A), Blazer (0.5 lb ai/A), and Grandstand (0.38 lb ai/A) were tankmixed with 0.5 and 2.0 lb ai/A of Ignite to evaluate percent control of red rice and resistance of Ignite resistant rice, respectively. The design used was a randomized complete block design. Cross-resistance of Ignite resistant rice to other herbicides was evaluated in the greenhouse in a randomized block design in comparison with commercial Gulfmont rice and red rice. The treatments were Treflan (0.5 and 1.0 lb ai/A), Dual (1.5 and 3.0 lb ai/A), Pursuit (2.0 and 4.0 oz ai/A), Roundup (0.25 and 0.5 lb ai/A), Gramoxone (0.25 and 0.5 lb ai/A), and Touchdown (0.75 and 1.5 lb ai/A).

In the growth stage study, injury of red rice was found to be affected by sequential applications of Ignite , growth stage and year at 14 DAT but not at 7 DAT. As dose of Ignite increased from 0.25 to 1.0 lb ai/A, red rice control increased. In addition, red rice at 3- to 4-leaf stage was more susceptible to Ignite than the boot stage (Figure 1). Panicle initiation was the most difficult stage with only 50% control achieved with 1.0 lb ai/A of Ignite. At all growth stages, sequential applications of Ignite 1 week after first application were more effective than single applications. On the other hand, at all stages of growth, Ignite was more injurious at 1- to 2-leaf followed by PI, 3- to 4-leaf and boot in case of Ignite resistant rice (Figure 2). Application of Ignite on standing flood water reduced the efficiency of Ignite. With application of 1.0 lb ai/A of Ignite, 92% control was achieved with no standing flood water in comparison with only 59% under flooded conditions (Figure 3). The percent reduction in heading of red rice followed the same pattern as the control ratings on the 3- to 4-leaf red rice (Figure 4).

Figure 1. Control of red rice at three growth stages 14 DAT.

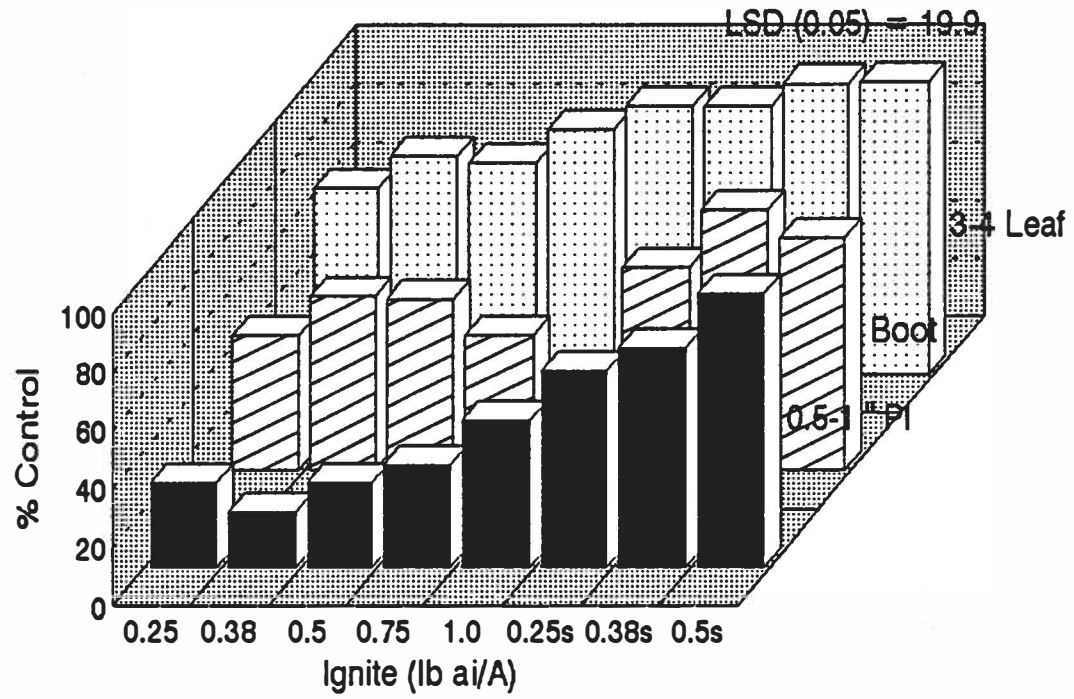


Figure 2. Effect of Ignite on growth stages of Ignite resistant rice 14 DAT.

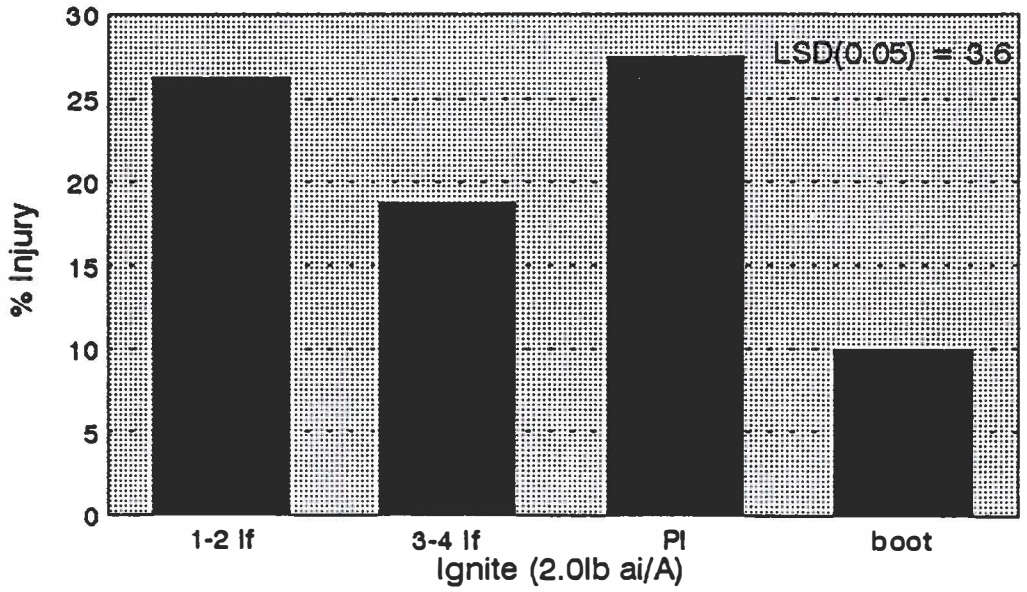


Figure 3. Influence of flood and Ignite rates on red rice control 14 DAT.

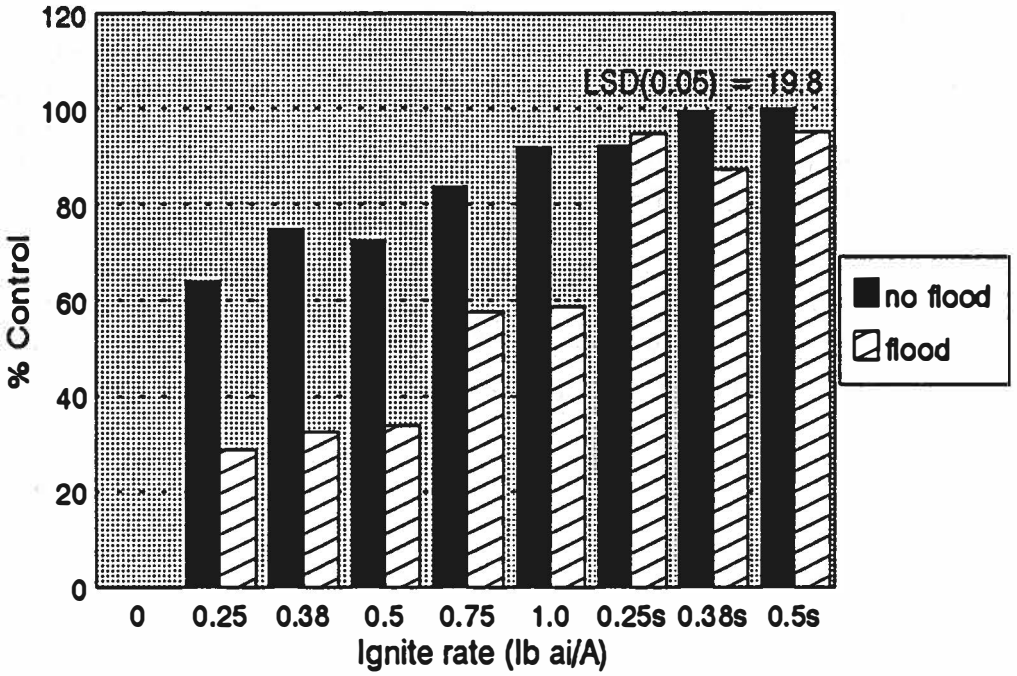
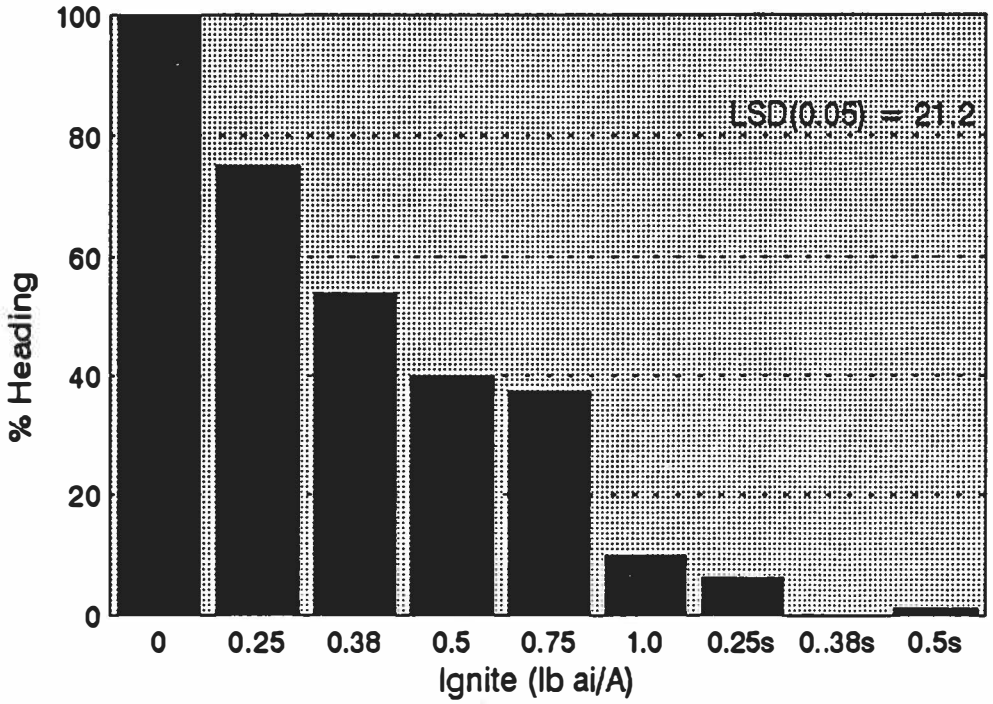


Figure 4. Effect of Ignite on red rice heading.



Among the tankmixes tested for red rice, the Ignite-Blazer combination resulted in greatest control at all ratings. The next best combination was Ignite-Stam, which was superior to Ignite alone (Figure 5). Other combinations were similar to Ignite alone at 21 DAT. The superiority of Blazer and Stam in effective control of red rice was also reflected in reduced test weight, percent heading and percent maturity of red rice (Table 1). At 14 DAT (also at 7 and 21 DAT : data not shown), the Ignite-Grandstand combination was highly injurious (60-69%) to Ignite resistant rice (Figure 5). Other yield parameters, such as harvest maturity, harvest moisture, and yield, also followed the same trend as injury. In general, Blazer and Stam were also found to be injurious to Ignite resistant rice. However, these tests were purposefully conducted at the 2.0 lb ai/A of Ignite, which is approximately four times the rate needed to control red rice.

Red rice is commonly controlled with herbicides used in soybeans. Studies on cross-resistance showed that there was no relation between Ignite resistance and resistance to preplant incorporated applications of Treflan and Dual (Figure 6) and post emergence applications of Pursuit, Roundup, Gramoxone, and Touchdown (Figure 7).

Figure 5. Injury of red rice and Ignite resistant rice as as affected by tankmixes 14 DAT.

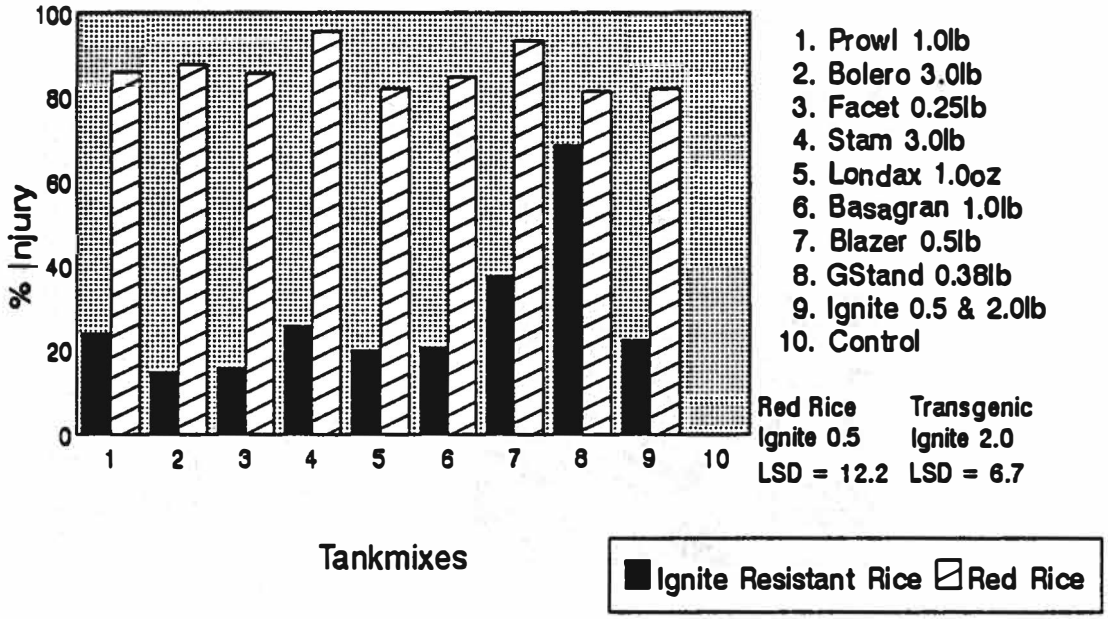


Table 1. Effect of different tankmixes on plant height and yield attributes of red rice.

Tankmixes	Plant ht	% Heading	Test wt	% Maturity
(lb ai/A)	(cm)		(g/100 seed)	
G 0.5 + Prowl 1.0	20.7	13.8	1.81	71
G 0.5 + Bolero 3.0	18.5	13.8	1.30	51
G 0.5 + Facet 0.25	20.2	20.0	1.85	72
G 0.5 + Stam 3.0	15.7	6.3	1.12	44
G 0.5 + Londax 1.0	19.8	18.8	1.66	65
G 0.5 + Basagran1.0	19.5	11.3	1.58	62
G 0.5 + Blazer 0.5	16.2	6.3	1.12	44
G 0.5 + Gstd 0.38	22.1	17.5	1.66	65
G 0.5	19.7	13.8	1.60	63
Untreated check	24.3	65.0	2.14	84
LSD(0.05)	2.7	8.9	0.52	21

Figure 6. Effect of preplant incorporated herbicides on rice 7 DAT.

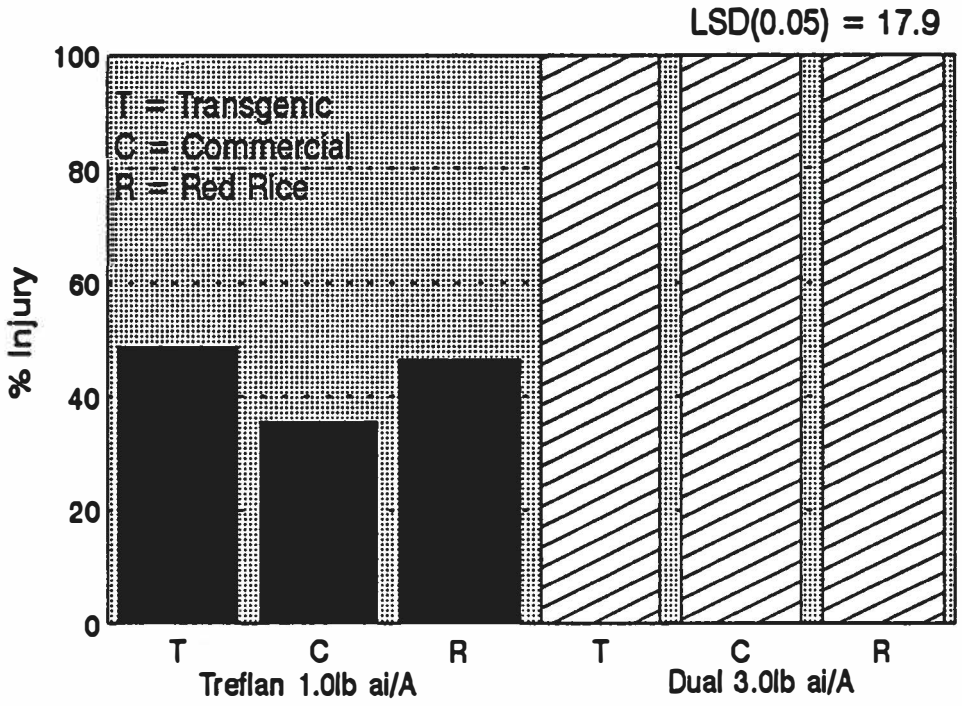
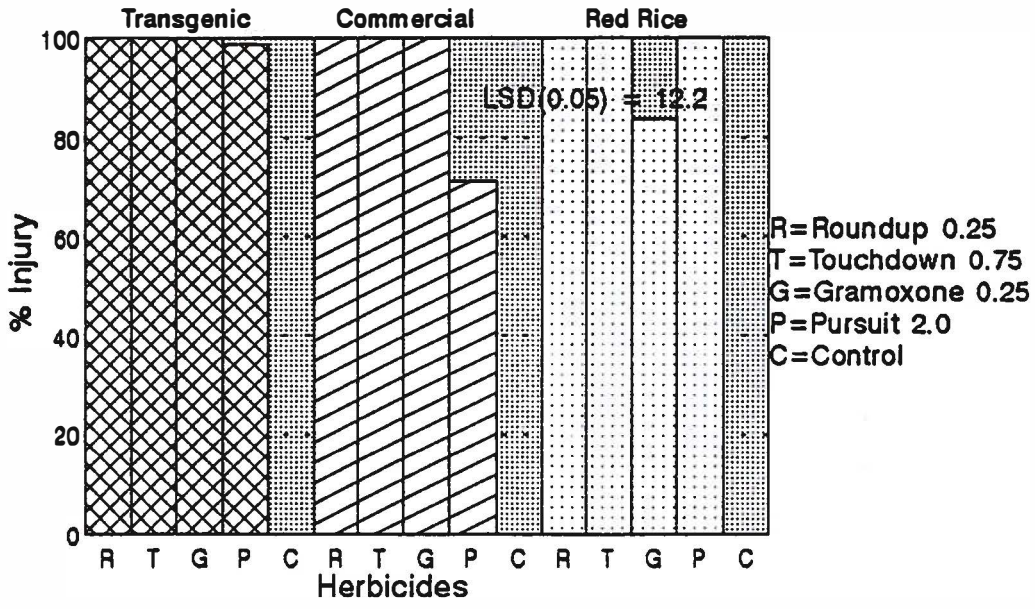


Figure 7. Influence of post emergence herbicides on rice 28 DAT.



RED RICE MANAGEMENT IN NO-TILL WATER-SEEDED RICE

R. Mendt and M. Braverman

The burndown effect of several herbicides [0.53 kg ai/ha glyphosate (Roundup), 2.5 kg ai/ha sulfosate (Touchdown), 1.41 kg ai/ha paraquat (Gramoxone), 1.12 kg ai/ha glufosinate (Ignite)] alone and mixed with 4.48 kg ai/ha thiobencarb (Bolero) applied 3, 7, 14, and 28 days before seeding was evaluated on red rice and other weeds in no-till water-seeded rice.

Red rice control at seeding for 1994 is shown in Figure 1. Symbols in the figures are Gl (glyphosate), S (sulfosate), G (glufosinate), P (paraquat), T (thiobencarb), and C (control). There was a significant interaction between timing of herbicide application before rice seeding and the herbicide treatments. Burndown treatments like paraquat alone and the mixture with thiobencarb significantly increased red rice control when applied 3 days before the seeding period, while treatments like glyphosate, glufosinate, and sulfosate alone or mixed with thiobencarb provided increased control when the days of application before seeding were increased to 7 and 14 days (Figure 1).

Sulfosate and paraquat alone or in combination with thiobencarb decreased the number of red rice plants compared with the control (Figure 2). The herbicide application 7 days before rice seeding also resulted in decreased red rice plants compared with the 3, 14, and 28 day timing periods (Figure 3). One explanation for the increased number of red rice plants in the 3-day treatment was that all of the herbicides being evaluated, except paraquat, take longer time than 3 days to provide an effect. There was an interaction between timing period for herbicide applications before seeding and the herbicide treatments being evaluated (Figure 4). Paraquat alone and in combination with thiobencarb decreased red rice plant height at 3 days before seeding compared with the other treatments and the control, while all the herbicide treatments reduced the height when applied 7 days before seeding (Figure 4). This trend continued for the 14-day timing period except for the glufosinate + thiobencarb treatment, which did not differ from the control. At 28 days before seeding, there were no differences between the treatments and the control for the red rice plant height (Figure 4). The red rice control at 11 weeks after seeding showed a significant interaction between the herbicide treatments and the timing of the herbicide applications (Figure 5). There was an overall trend of decreased red rice control when the number of days between herbicide treatment and seeding was increased (Figure 5). Sulfosate, glufosinate, and paraquat, alone or mixed with thiobencarb, provided increased control of red rice compared with the glyphosate treatments and the control when applied 3 days before rice seeding, while at the 7 days before seeding application with only the mixtures with thiobencarb provided increased red rice control at 11 weeks after seeding (Figure 5).

Number of red rice tillers at 11 weeks after seeding increased when the days between herbicide application and seeding were increased (Figure 6). The 3-day timing decreased tiller number when compared with the other timing periods (Figure 6).

Figure 1. Red rice control at seeding, 1994.

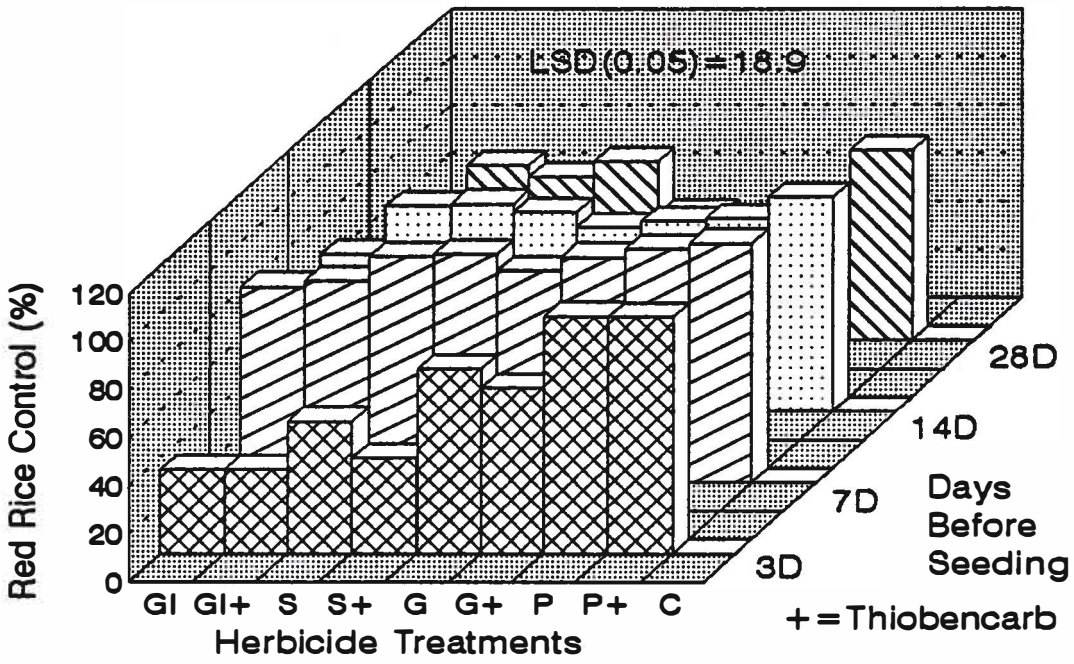


Figure 2. Red rice plants at seeding, 1994.

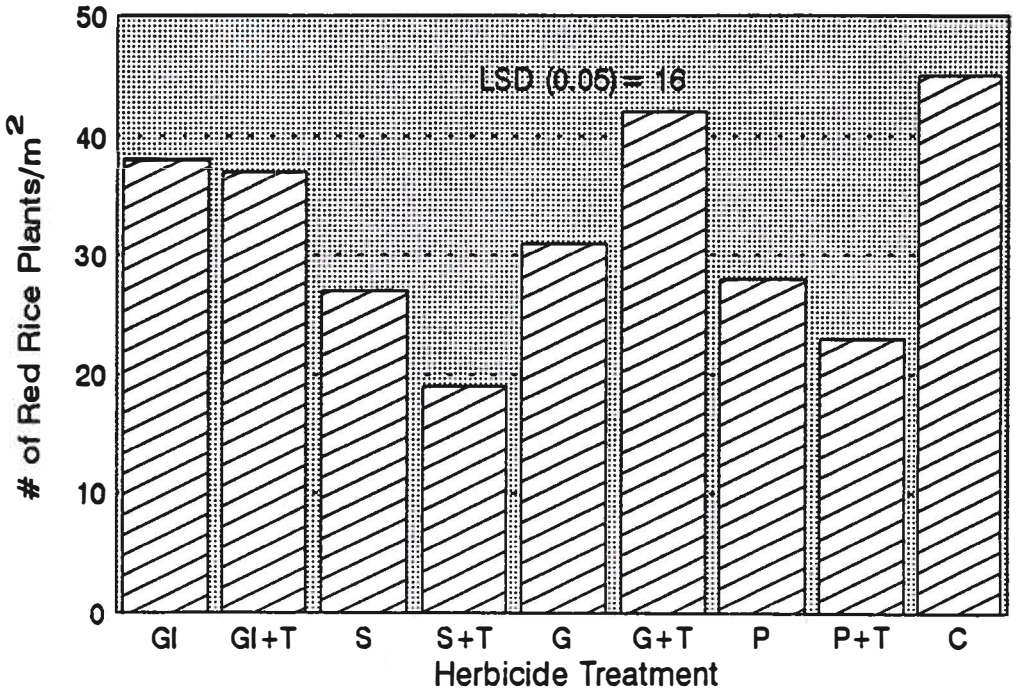


Figure 3. Red rice plants at seeding, 1994.

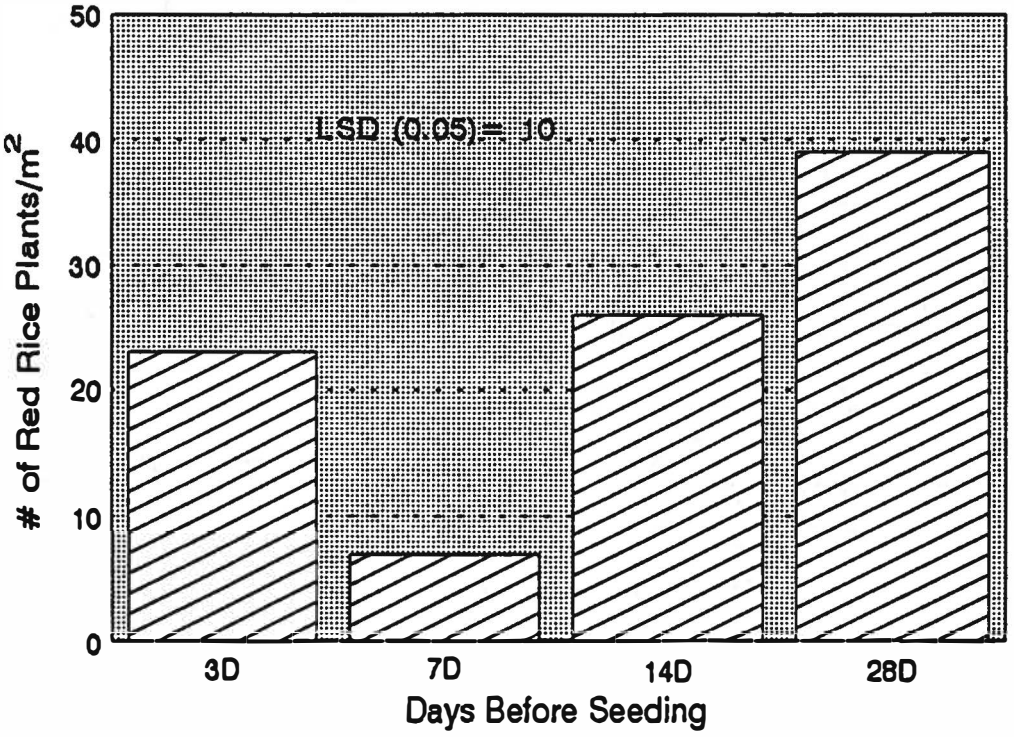


Figure 4. Red rice height at seeding, 1994.

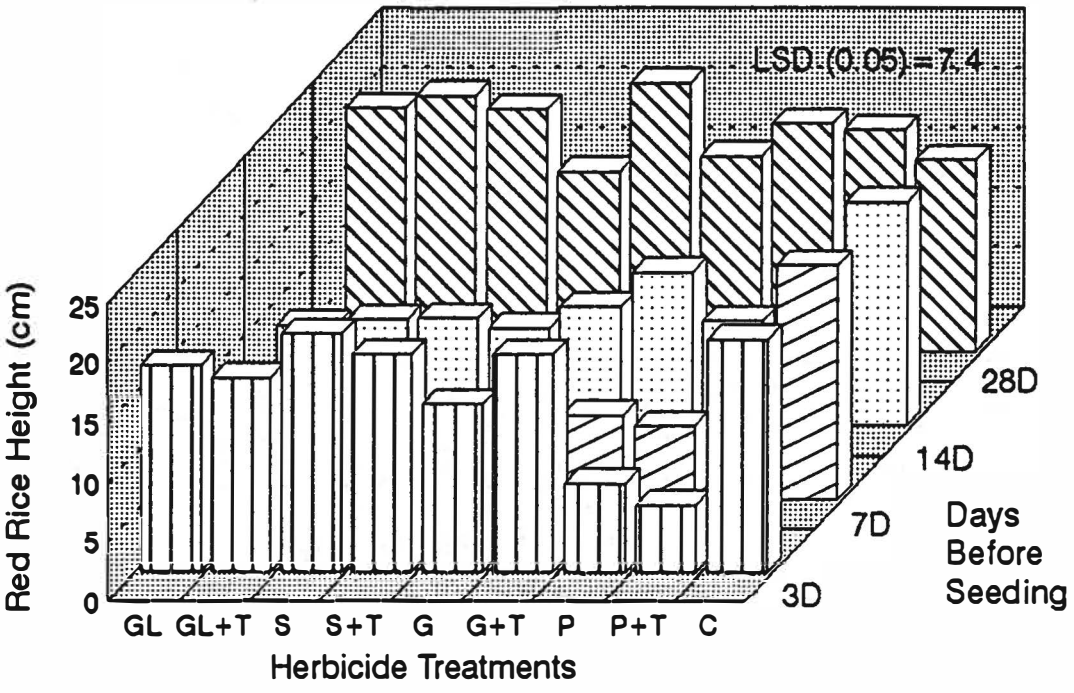


Figure 5. Red rice control 11 WAS, 1994.

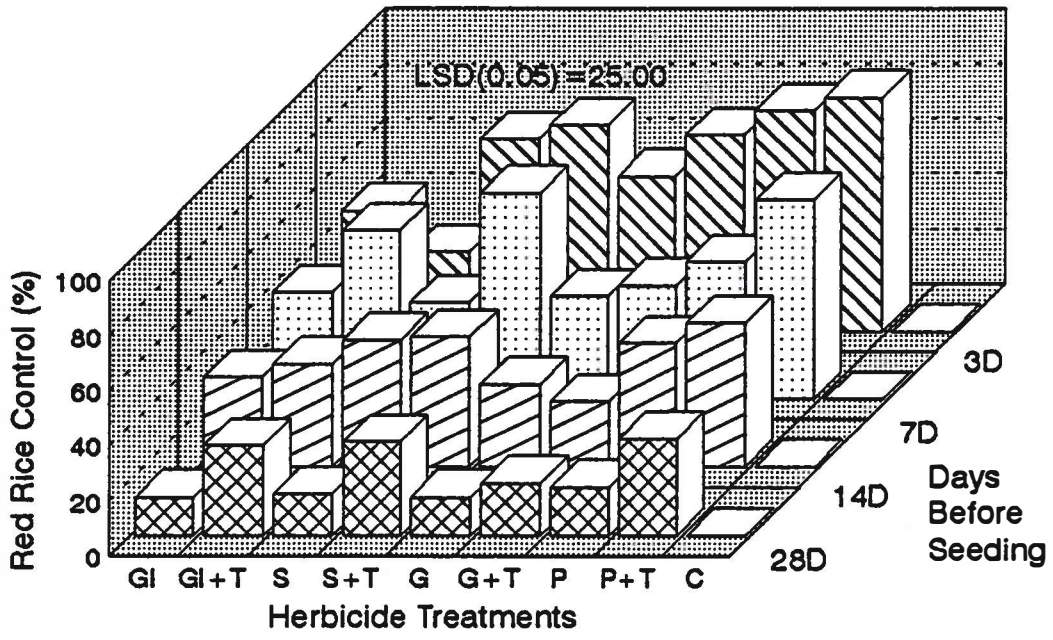
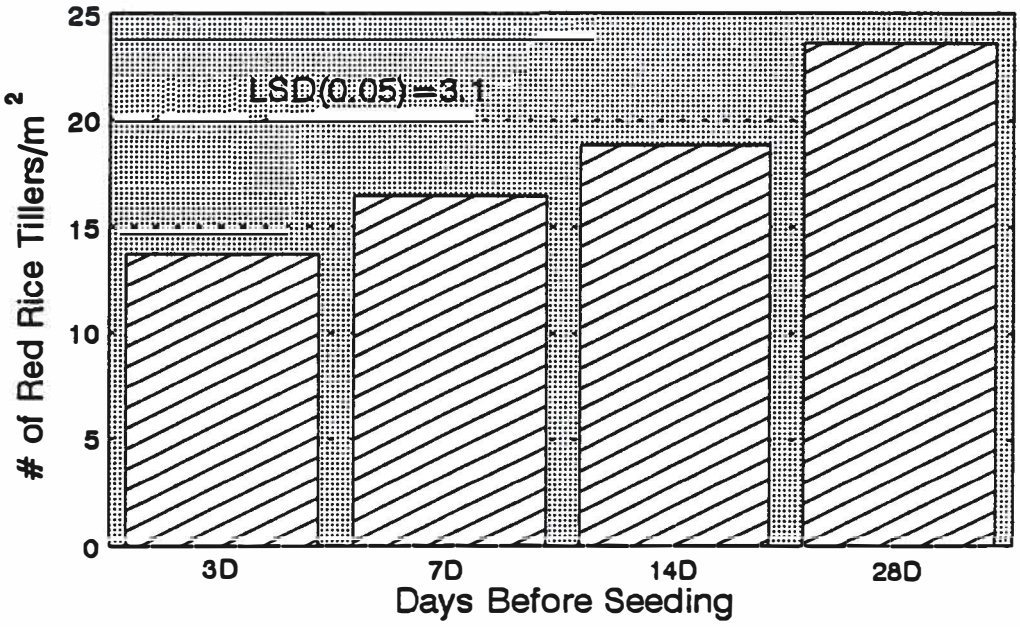


Figure 6. Red rice tillers 11 WAS, 1994.



Red rice tillers at 11 weeks after seeding were decreased compared with the control with all the herbicide treatments being evaluated (Figure 7). There was a trend of decreased overall weed control when the number of days between herbicide treatment and seeding was increased (Figure 8). The 3- and 7-day timing periods of herbicide application provided increased overall weed control compared with the 14- and 28-day treatments (Figure 8). All the herbicide treatments being evaluated provided increased overall weed control compared with the non-sprayed check (Figure 9).

Rice tillers at 11 weeks after seeding showed a decreased trend when the number of days between herbicide treatment and seeding was increased (Figure 10). There was a significant interaction between the herbicide treatments and the timing application of the herbicides (Figure 10). Sulfosate alone, glufosinate, sulfosate, and paraquat mixed with thiobencarb applied 3 days before seeding increased rice tillers compared with the rest of the treatments (Figure 10). The number of rice tillers increased compared with the control when all the herbicide treatments were applied 3 and 7 days before seeding, and also showed the same increasing trend when compared with the 14- and 28-day timing periods (Figure 10). For the 14-day timing period, paraquat alone or sulfosate, glyphosate, and glufosinate mixed with thiobencarb provided an increase in rice tillers compared with the rest of the treatments being evaluated (Figure 10). At 28 days, none of the herbicide treatments were different from the control (Figure 10). The height of rice plants was reduced more than 10% when the herbicide treatments were applied more than 14 days before seeding (Figure 11). There was an interaction between application timing and herbicide treatments for rice kernel maturity (Figure 12). All the herbicide treatments increased rice kernel maturity compared with the control when applied 3 and 7 days before seeding, while there were no differences between the control and most of the herbicide treatments when applied 14 and 28 days before seeding (Figure 12).
The total rice yield is in Figure 13. There was an increase in total yield (rice + red rice) when the herbicide treatments were applied 3, 14, and 28 days before seeding compared with the 7-day treatment (Figure 13). The percent red rice in grain is shown in Figure 14. All the herbicide treatments being evaluated provided a reduction of red rice in grain compared to the non-sprayed check (Figure 14). The 3- and 7-day timing periods of herbicide applications before rice seeding provided a decrease in percent red rice in grain compared with the 14- and 28-day timing periods (Figure 15).

Figure 7. Red rice tillers 11 WAS, 1994.

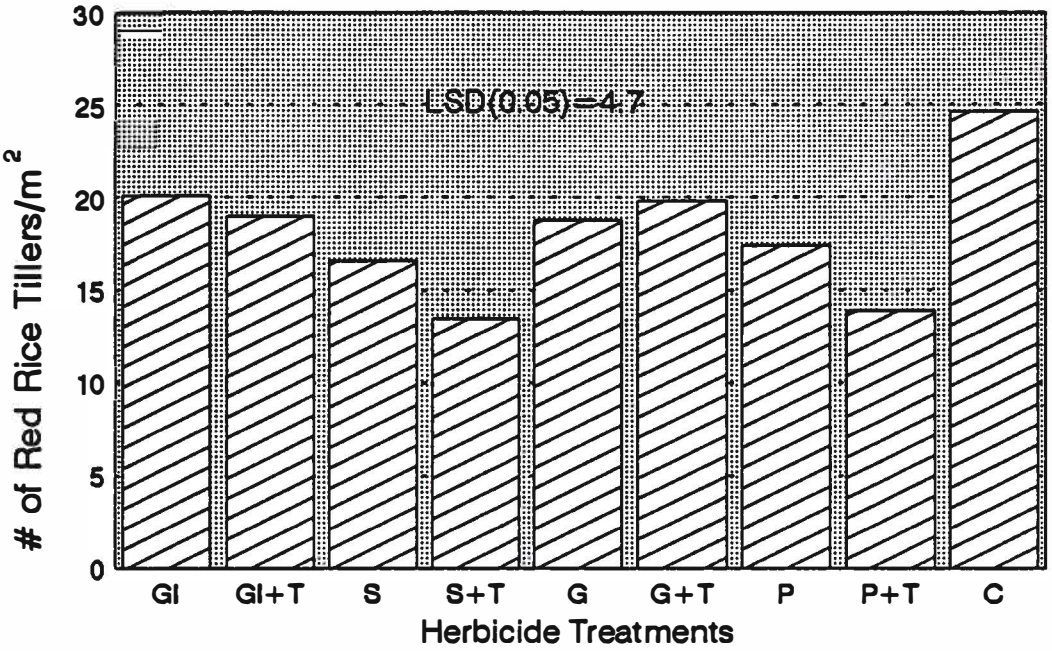


Figure 8. Overall weed control 11 WAS, 1994.

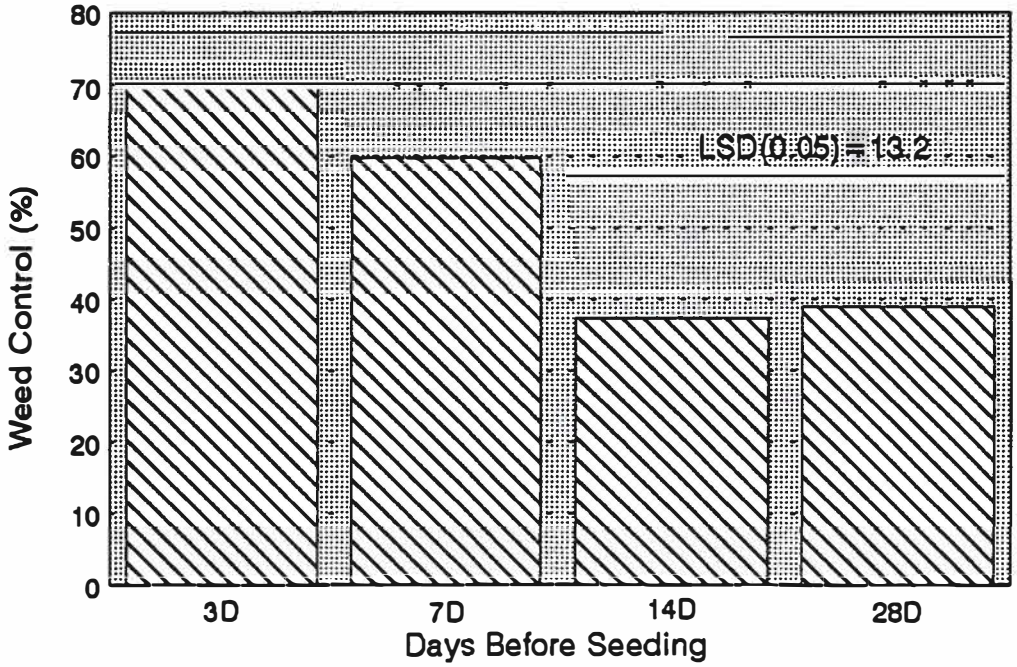


Figure 9. Overall weed control 11 WAS, 1994.

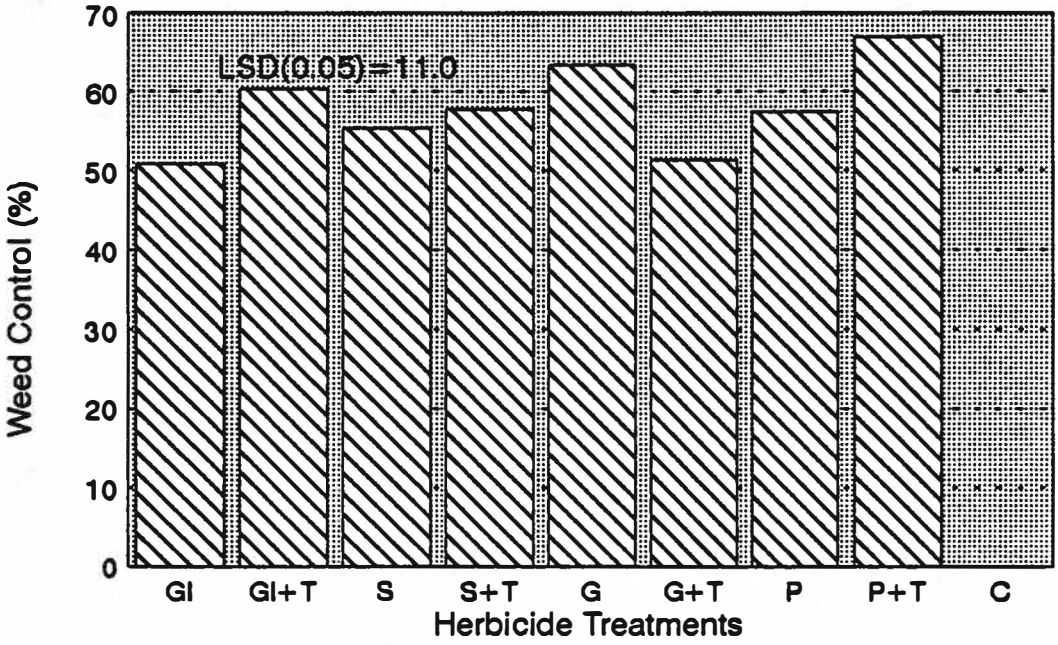


Figure 10. Rice tillers 11 WAS, 1994.

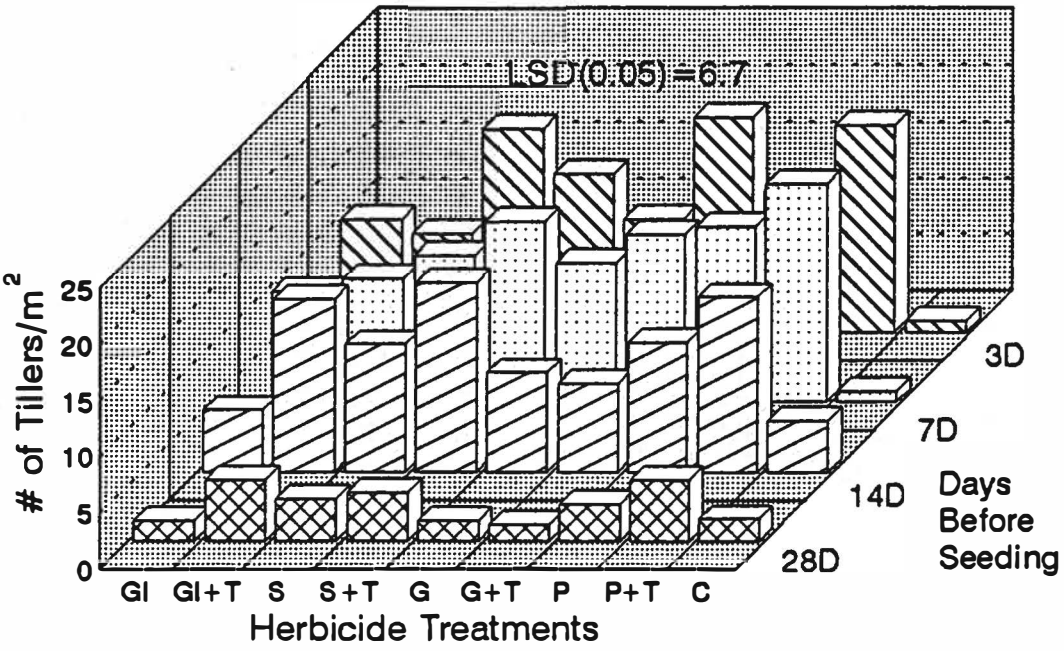


Figure 11. Rice plant height 11 WAS, 1994.

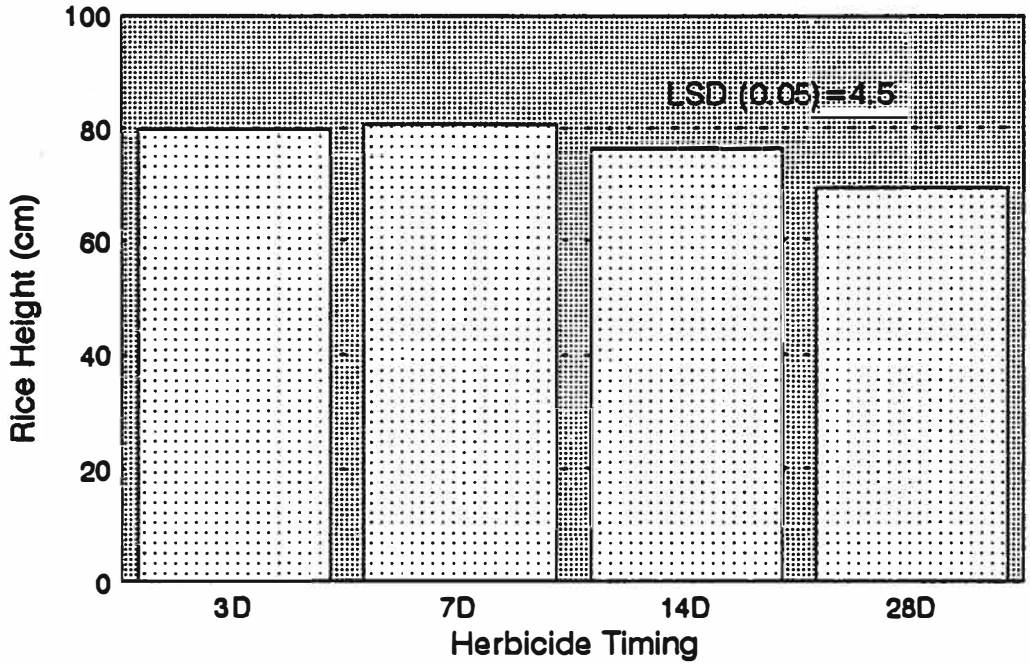


Figure 12. Rice kernel maturity %, 1994.

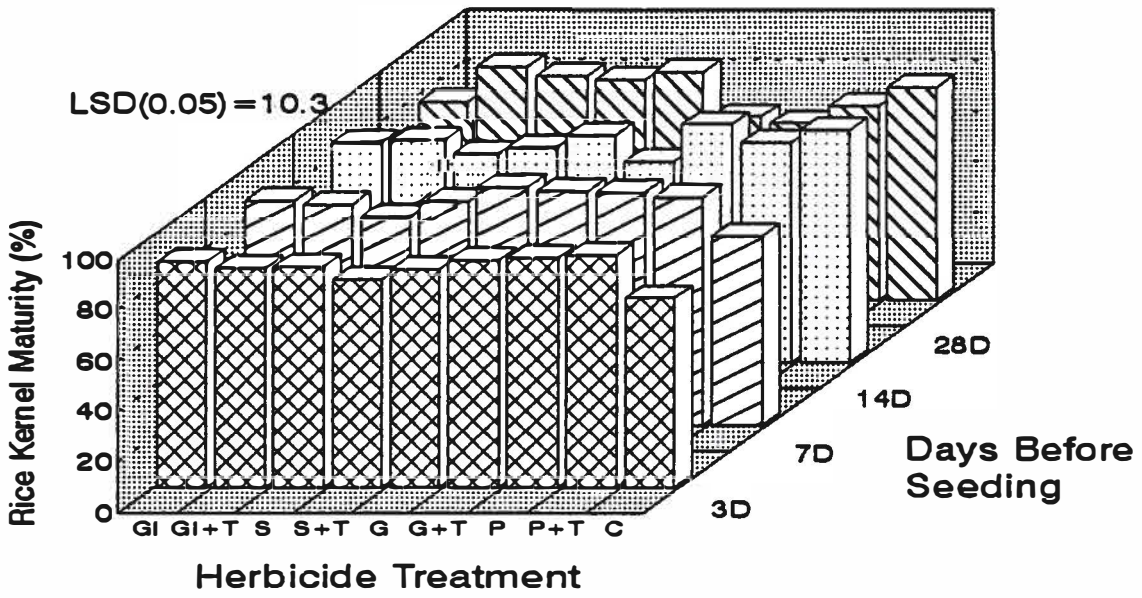


Figure 13. Total yield, 1994.

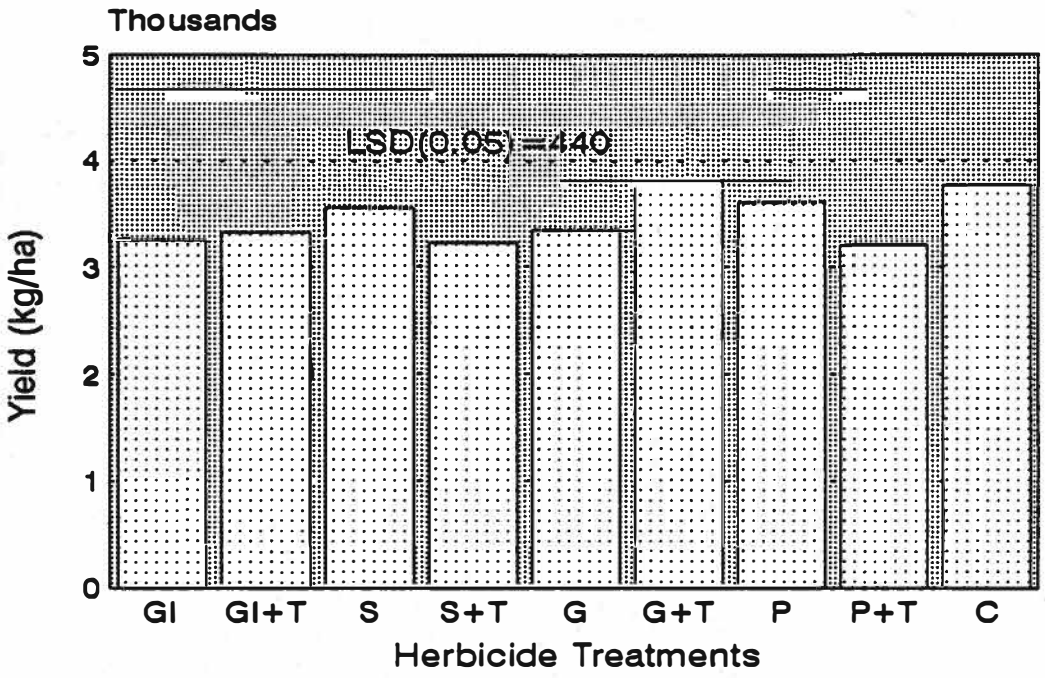


Figure 14. Red rice in grain, 1994.

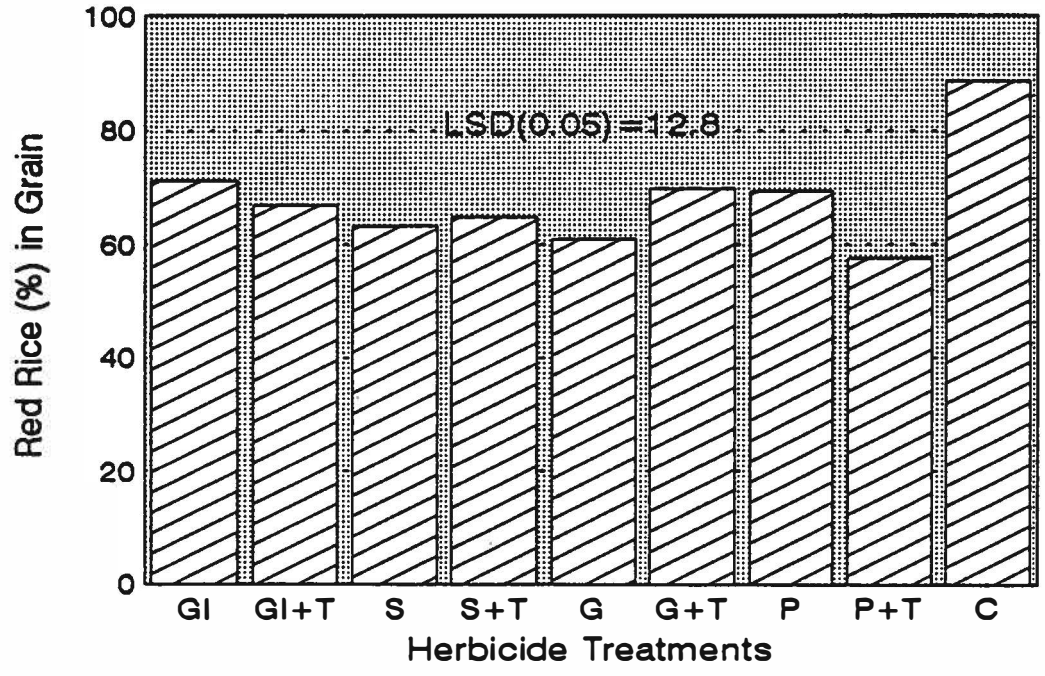
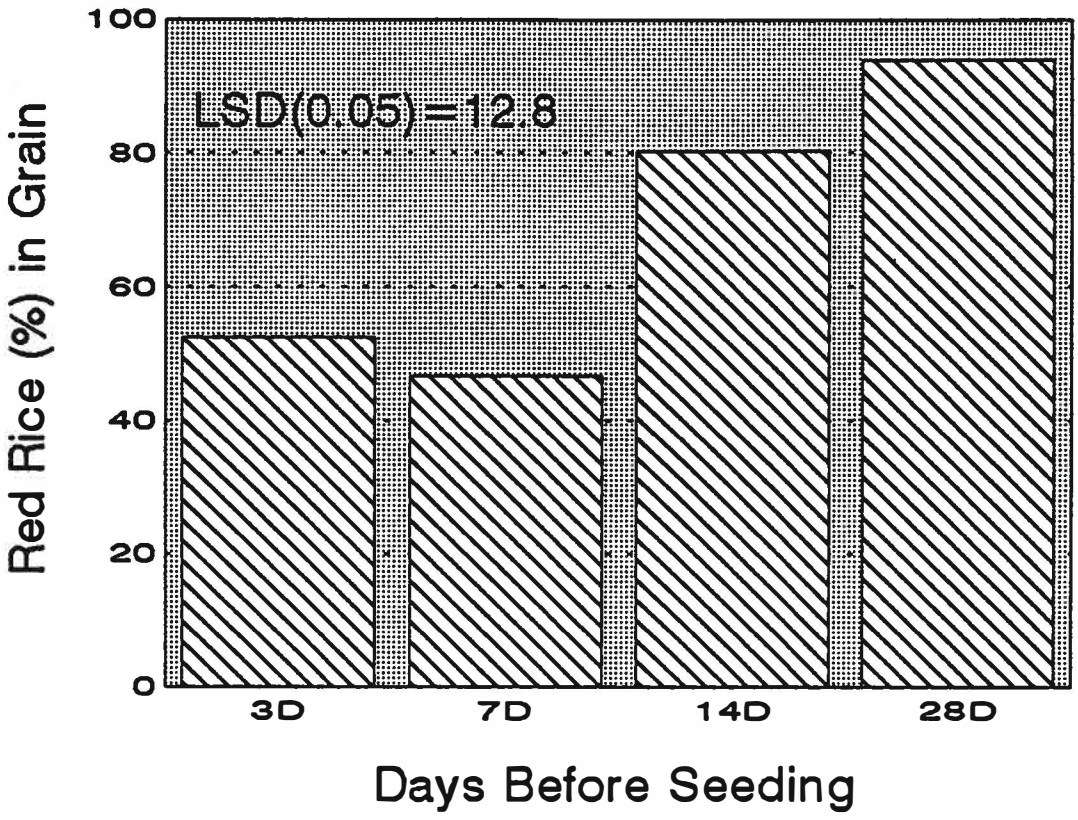


Figure 15. Red rice in grain, 1994.



RICE DISEASE CONTROL STUDIES, 1994[1]

D.E. Groth, M. Frey, J. Nugent, P.K. Bollich, and S.D. Linscombe

Data from research tests suggest that rice diseases annually cause at least an average range of 12 - 15% loss in yield in the South. With present production costs and price of rice, this average yield loss translates into an average 33 - 40% loss in potential net return due to rice diseases. Direct losses to disease include reduction in plant stands, lodging, spotted kernels, fewer and smaller grains per plant, and a general reduction in plant efficiency. Indirect losses include the cost of fungicides used to manage disease, application costs and reduced yields associated with special cultural practices that reduce disease, but may not be conducive to producing maximum yields.

The major diseases of rice in Louisiana are the fungal diseases blast, caused by Pyricularia grisea; sheath blight, caused by Thanatephorus cucumeris (Rhizoctonia solani); stem rot, caused by Magnaporthe salvinii (Sclerotium oryzae); brown spot, caused by Cochiobolus miyabeanus; narrow brown spot, caused by Sphaerulina oryzina (Cercospora janseana); and kernel smut, caused by Neovossia horrida. Seedling diseases caused by species of Achlya and Pythium are also important in water-seeded rice. Minor diseases include crown rot, causal agent unknown; leaf scald, caused by Gerlachia oryzae; leaf smut, caused by Entyloma oryzae; sheath rot, caused by Sarocladium oryzae; stackburn disease, caused by Alternaria padwickii; sheath spot, caused by Rhizoctonia oryzae; crown sheath rot, caused by Gaeumannomyces graminis var. graminis; black kernel, caused by Curvularia lunata; seedling blights, caused by various fungi; false smut, caused by Ustilaginoidea virens; root rots, caused by several fungi; and several miscellaneous leaf, stem, and glume spotting diseases.

Host resistance and fungicides play an important role in limiting these losses. The objective of these studies are to develop disease management practices that economically reduce rice diseases and increase the yield and quality of rice.

This report is on current research evaluating both registered and experimental compounds. It also represents only one year of data and multiple years are needed to effectively evaluate agronomic practices. Therefore, no specific recommendation of a product or practice is implied. For specific recomendations and more information contact your local Cooperative Extension Agent.

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[1] This research is supported in part by funds provided by rice producers through the Louisiana Rice Research Board and various agricultural chemical companies.

1994 WATER MANAGEMENT X SOIL FUNGICIDE X VARIETY STUDY

Location: Rice Research Station, Crowley, LA

Soil Type: Crowley silt loam

Variety/Seed Rate: Cypress, Orion, Bengal, Maybelle, Jodon, and Lemont, 120 lb/A

Planting Method/Date: Water-seeded, Mar 30

Fertilization: Continuous flood and pinpoint flood, preplant 105-54-54, Mar 28; delayed flood, preplant 16-50-50, Mar 28; preflood 90-0-0, Apr 27

Plot Size: 4.75 x 20 ft

Experimental Design: Factorial in a split-split block design with four replications

Water Management: Flooded, Mar 29; pinpoint and delayed flood treatments drained, Apr 4, pinpoint flood reflooded, Apr 7; delayed flood reflooded, Apr 28. Pinpoint and continuous flood drained, Apr 25 (for herbicide application); reflooded, Apr 28

Herbicides: 3 qt Arrosolo/A + 1 qt Basagran, Apr 26; Londax 1.5 oz/A, May 13 and 26

Insecticides: 17 lb/A Furadan, May 24

Fungicides (Soil): Ridomil 1 pt/A, Mar 29

Application Equipment: CO_2 backpack sprayer, 8002 tips, 10 gal/A

Drained: July 15

Harvest: July 27

Disease Ratings: Visual water mold signs were noted Apr 10; seedling counts, Apr 26

Results: See Tables 1, 2, and 3.

Comments: Water mold (Pythium spp. and Achylia spp.) severity was low. Stand densities were in the high range. Other diseases were low in severity.

Table 1. The effect of water management, soil applied fungicide and variety on plant stand densities, agronomic characters, and yield. Rice Research Station, Crowley, LA. 1994.

Variety	Plants/ft^2	Days to heading	Plant Height (cm)	Yield (lb/A)
		Continuous flood		
Untreated soil				
Cypress	30.8	81.3	86.8	6155
Lemont	19.8	85.0	87.8	5329
Orion	27.8	84.3	102.5	6765
Bengal	25.0	86.0	89.0	5402
Maybelle	33.8	73.0	91.5	6508
Jodon	29.5	78.0	85.5	5715
Ridomil treated soil				
Cypress	39.5	81.5	90.5	6392
Lemont	22.3	86.0	89.5	5705
Orion	29.0	84.5	104.0	7066
Bengal	23.5	86.0	85.8	5413
Maybelle	35.8	73.0	93.8	6452
Jodon	25.8	78.5	87.5	5784
		Pinpoint flood		
Untreated soil				
Cypress	17.3	85.0	95.3	6308
Lemont	15.8	87.8	88.5	4888
Orion	19.5	86.5	105.8	6374
Bengal	20.5	87.5	92.8	5011
Maybelle	18.5	75.3	97.8	6345
Jodon	18.8	81.8	93.5	5856

Continued.

Table 1. Continued.

Variety	Plants/ft^2	Days to heading	Plant Height (cm)	Yield (lb/A)
Ridomil treated soil				
Cypress	23.8	84.8	88.5	6367
Lemont	15.5	85.3	95.5	5088
Orion	17.8	87.3	106.8	6308
Bengal	17.0	87.8	93.0	5109
Maybelle	27.3	77.3	95.9	6231
Jodon	21.0	82.8	93.0	6123
		Delayed Flood		
Untreated soil				
Cypress	27.5	83.8	81.0	5450
Lemont	25.3	86.0	76.8	5002
Orion	26.8	85.8	88.8	5766
Bengal	21.0	86.8	84.5	4785
Maybelle	26.8	75.0	85.5	5086
Jodon	22.8	80.5	82.8	5528
Ridomil treated soil				
Cypress	33.3	83.3	80.5	5585
Lemont	18.8	85.0	80.3	5105
Orion	26.8	86.0	95.0	6214
Bengal	20.3	87.0	83.3	4947
Maybelle	33.8	74.0	86.5	5043
Jodon	28.3	79.5	81.8	5539
LSD (P=0.05) =	7.4	2.8	5.5	528
Standard Dev. =	5.3	2.0	3.9	376.7
CV =	21.4	2.4	4.4	6.56

Table 2. Factorial analysis of the effect of water management, soil applied fungicide and variety on plant stand densities, agronomic characters, and rice yield. Rice Research Station, Crowley, LA. 1994.

Factor	Plants/ft^2	Days to heading	Plant Height (cm)	Yield (lb/A)
Replicate				
1	26.0	82.9	91.3	6124
2	26.4	83.0	89.8	5892
3	22.8	82.6	89.1	5512
4	23.2	82.5	90.5	5443
LSD (P=0.05) =	NS	NS	2.5	277
Water management				
Cont. flood	28.5	81.4	91.2	6057
Pinpoint fld.	19.4	84.1	95.4	5834
Delayed fld.	25.9	82.7	83.9	5337
LSD (P=0.05) =	3.1	0.9	2.3	284
Soil Fungicide				
Untreated	23.7	82.7	89.8	5682
Ridomil	25.5	82.7	90.6	5804
LSD (P=0.05) =	ns	ns	ns	ns
Variety				
Cypress	28.7	83.3	87.1	6043
Lemont	19.5	85.8	86.4	5186
Orion	24.6	85.7	100.5	6415
Bengal	21.2	86.8	88.0	5111
Maybelle	29.3	74.6	91.7	5944
Jodon	24.3	80.2	87.3	5757
LSD (P=0.05) =	2.9	1.2	2.2	198

Table 3. Factorial/split plot ANOVA for the effects of water management, soil applied fungicide, variety and interactions on plant stand densities, agronomic characters, and rice yield. Rice Research Station, Crowley, LA. 1994.

Source	df	Plants/ft^2	Days to heading	Plant Height (cm)	Yield (lb/A)
Replication	3	0.1129	0.6389	0.3166	0.0010
Man	2	0.0009	0.0012	0.0001	0.0022
Error A	6				
Fungicide	1	0.1570	0.9627	0.3432	0.1915
Man X Fung	2	0.9868	0.4764	0.6404	0.9216
Error B	9				
Variety	5	0.0001	0.0001	0.0001	0.0001
Man X Var	10	0.2092	0.6887	0.1585	0.0001
Fung X Var	5	0.0064	0.9019	0.0782	0.6830
M X F X V	10	0.4546	0.8495	0.1950	0.9523
Error C	90				

1994 RICE SEED PROTECTANT TEST

Location: Rice Research Station, Crowley, LA

Soil Type: Crowley silt loam

Variety/Seed Rate: Lemont, 100 seeds/plot

Planting Method/Date: Water-planted by hand, Mar 25; drill-seeded with a Hege tray planter, Mar 31; second planting: water-seeded, May 13; drill-seeded, May 11

Fertilization: First planting water-seeded, preplant 90-42-42, Mar 24; drill-seeded, 14-42-42, Mar 30; Second planting water-seeded, preplant 90-42-42, May 13; drill-seeded, 14-42-42, May 10

Plot Size: 2.5 ft dia rings (water seeded); 6 ft rows (drill seeded)

Experimental Design: Randomized complete block design with four replications

Herbicides: N/A

Insecticides: N/A

Fungicides: Applied to seeds (See Table 4 for rates)

Application Equipment: Rolling jar mixer

Harvest: N/A

Stand counts: Apr 22 and June 2

Results: See Table 4.

Comments: Water mold pressure was high in water-seeded rice.

Table 4. Effect of seed-protectant fungicides on percent (%) germination in water- and drill-seeded rice. Rice Research Station, Crowley, LA. 1994.

Treatment	Rate	First planting Germination (%) Water seeded Soaked seed	First planting Germination (%) Water seeded Dry seed	First planting Germination (%) Drill seeded	Second planting Germination (%) Water seeded Soaked seed	Second planting Germination (%) Water seeded Dry seed	Second planting Germination (%) Drill seeded
UNTREATED CHECK		28.5 a-f	34.5 abc	50.3 b	31.8 a	23.5 c	23.3 f
VITAVAX 200	4.0 oz/cwt	30.0 a-f	34.0 abc	56.5 ab	34.0 a	30.0 abc	29.3 c-f
VITAVAX 200 FA 12	4.0 oz/cwt 0.1 oz/cwt	32.3 abc	29.8 bcd	65.3 a	36.8 a	31.3 abc	33.3 a-e
THIRAM 42S	3.3 oz/cwt	31.0 a-e	36.0 abc	59.0 ab	33.3 a	36.0 a	38.3 a
THIRAM 42S GA 12	2.0 oz/cwt 0.1 oz/cwt	32.3 abc	37.8 a	61.5 ab	36.3 a	35.7 a	33.5 a-e
GUS IAM-2	2.0 oz/cwt	32.0 a-d	34.3 abc	61.5 ab	35.8 a	34.5 ab	36.5 abc
BENLATE	4.0 oz/cwt	33.5 ab	31.8 a-d	53.0 ab	33.0 a	29.0 abc	27.3 ef
DITHANE F 45	4.3 oz/cwt	25.3 ef	30.8 a-d	57.8 ab	38.3 a	32.0 abc	32.5 a-e
PCNB	5.25 oz/cwt	24.5 f	37.5 ab	53.3 ab	32.5 a	25.3 bc	27.8 ef
THIRAM 75 WDG	1.33 oz/cwt	28.0 b-f	30.8 a-d	63.3 a	35.5 a	31.5 abc	33.0 a-e
PCNB APRON F1	5.25 oz/cwt 0.1 oz/cwt	26.3 def	25.3 d	58.5 ab	31.3 a	33.8 abc	34.5 a-e
APRON F1 THIRAM 75 WGD	0.1 oz/cwt 3.0 oz/cwt	31.5 a-d	33.3 abc	56.0 ab	37.5 a	34.8 ab	37.5 ab
PCNB WE 0821110	5.25 oz/cwt 1.0 oz/cwt	27.0 c-f	28.5 cd	55.5 ab	28.5 a	32.5 abc	29.0 def
THIRAM 75 WGD WE 0821110	3.0 oz/cwt 1.0 oz/cwt	28.8 a-f	29.8 bcd	57.0 ab	29.3 a	30.5 abc	30.3 b-f
APRON F1 PCNB WE 0821110	0.1 oz/cwt 5.25 oz/cwt 1.0 oz/cwt	27.0 c-f	32.5 a-d	59.3 ab	29.3 a	28.5 abc	34.3 a-e
APRON F1 WE 0821110 THIRAM 75 WGD	0.1 oz/cwt 1.0 oz/cwt 3.0 oz/cwt	34.0 a	32.3 a-d	56.5 ab	35.8 a	35.3 ab	35.5 a-d
LSD (.05) =		5.7	7.4	11.7	9.9	9.7	7.1
Standard Dev. =		3.97	5.21	8.17	6.9	6.8	4.9
CV =		13.46	16.07	14.16	20.5	21.6	15.3

Means followed by same letter do not significantly differ (P=.05, Duncan's MRT).

1994 OFF-STATION SHEATH BLIGHT YIELD LOSS EVALUATION

Location: Errol Lounsberry Farm, Lake Arthur, LA

Soil Type: Crowley silt loam

Variety/Seed Rate: Lemont and 920207X, 150 lb/A

Planting Method/Date: Water-seeded, Mar 29

Emergence Date: Apr 7

Fertilization: 90-0-0 preplant, Mar 25; 0.5 lb/A Zn, Apr 21;
Second crop: 75-0-0, July 29

Plot Size: 8 x 25 ft

Experimental Design: Randomized complete block with four replications

Water Management: Flooded, Mar 26; drained, Apr 3; reflooded, Apr 8

Herbicides: 0.9 oz Londax/A, Mar 28

Insecticides: Furadan 17 lb/A, May 11

Fungicides: Benlate 1.5 lb/A, June 19

Application Equipment: Commercial Aircraft

Inoculation Dates: Inoculated for sheath blight, May 20 (300 ml/plot)

Drained: July 11; Second crop, Oct 8

Harvest: July 28; Second crop, Oct 31

Disease Ratings: Tiller counts, June 9 and Sept 7; sheath blight ratings, July 19

Results: See Table 5.

Comments: Sheath blight severity was high in inoculated plots. Some natural disease developed in uninoculated plots. Plot yields were erratic and masked treatment differences.

Table 5. Evaluation of the sheath blight susceptible line 920207x using inoculated and uninoculated plots as compared to the susceptible variety Lemont. Errol Lounsberry Farm, Lake Arthur, LA. 1994.

Variety/ Inoculation	Sheath blight[1] severity (0-9)	Sheath blight[2] incidence (%)	Yield (lb/A)
Lemont/ Uninoculated	3.5 d	21.0 b	4583 a
Lemont/ Inoculated	7.0 b	81.0 a	4887 a
920207X/ Uninoculated	5.3 c	38.5 b	4891 a
920207X/ Inoculated	8.0 a	98.5 a	4675 a
LSD (.05) =	1.0	23.1	948.0
Standard Dev. =	0.7	14.5	592.4
CV =	10.6	24.2	12.45

Means followed by same letter do not significantly differ (Duncan's MRT, P = .05).

[1] Severity was rated using a 0-9 scale where 0 indicated no disease and 9 indicated plants dead and collapsed.

[2] Sheath blight incidence was the percent tillers infected with sheath blight.

1994 VARIETY TRIAL

Location: Rice Research Station, Crowley, LA

Soil Type: Crowley silt loam

Variety/Seed Rate: Various varieties and breeding lines, 3-4 gm/3 ft row

Planting Method/Date: Hege tray planter (drill-seeded), Apr 29

Emergence Date: May 6

Fertilization: Preplant 16-48-48, Apr 29; 120-0-0 preflood, May 24; 46-0-0, June 20

Plot Size: 3 - 3 ft rows

Experimental Design: Randomized complete block design with four replications

Water Management: Permanent flood, May 24

Herbicides: 4 qt Propanil + 1 qt Basagran/A, May 19;
1.5 oz/A Londax, May 26 and June 7

Insecticides: 17 lb/A Furadan, June 14; 2 pt/A Sevin, July 22

Fungicides: None

Application Equipment: N/A

Inoculation Dates: Inoculated for sheath blight, June 14 (10-15 ml/row) - Broadcast

Drained: Sept 2

Harvest: N/A

Disease Ratings: Sheath blight and foliar disease data taken Aug 26;
blast data taken Aug 29-30

Results: See Table 6.

Comments: Sheath blight and blast severities were very high; other diseases were moderate in severity.

Table 8. Reaction of rice varieties to sheath blight, leaf smut, brown spot, narrow brown spot, and blast. Rice Research Station, Crowley, LA. 1994.

Variety/Experimental line	Sheath blight (0-9)[1]	Leaf smut (0-9)[1]	Brown spot (0-9)[1]	Narrow brown spot (0-9)[1]	Rotten neck blast (%)[2]	Leaf blast (%)[1]
ALAN	5.5 hij	6.0 a-d	3.3 a-e	3.5 b-f	78 a-d	4.3 b-e
JACKSON	6.0 f-i	4.8 c-h	0.8 hij	5.5 a	68 cde	3.3 e-i
TEBONNET	5.5 hij	4.3 e-j	1.5 e-j	4.8 ab	55 efg	3.3 e-i
RT7015	6.3 e-h	3.3 h-l	1.8 d-j	3.5 b-f	83 ab	4.5 bcd
MAYBELLE	8.3 ab	4.3 e-j	2.3 b-i	5.5 a	83 ab	4.5 bcd
MILLIE	5.3 ijk	4.8 c-h	1.5 e-j	2.5 e-h	68 cde	2.8 g-j
L202	6.8 def	3.3 h-l	2.5 b-h	3.3 c-f	88 a	5.3 ab
ROSEMONT	7.8 bc	3.0 i-l	1.8 d-j	4.0 bcd	80 abc	4.0 c-f
TEXMONT	8.0 ab	2.5 kl	1.0 g-j	4.3 a-d	78 a-d	4.8 abc
CYPRESS	6.8 def	5.8 a-e	2.0 c-j	4.0 bcd	38 hij	2.0 j-m
LEMONT	7.5 bcd	5.0 c-g	1.3 f-j	4.3 a-d	55 efg	2.8 g-j
LACASSINE	7.5 bcd	4.3 e-j	1.0 g-j	4.0 bcd	68 cde	3.8 c-g
GULFMONT	8.0 ab	5.5 b-f	1.0 g-j	4.8 ab	78 a-d	3.8 c-g
KATY	5.8 ghi	3.0 i-l	2.5 b-h	3.0 d-g	10 mno	1.0 m-p
NEWBONNET	6.8 def	4.0 f-k	2.8 a-g	3.5 b-f	80 abc	4.3 b-e
RICO 1	4.8 jkl	4.3 e-j	1.0 g-j	0.5 ijk	8 mno	1.3 l-o
BENGAL	5.8 ghi	5.3 c-f	2.3 b-i	0.5 ijk	55 efg	4.0 c-f
ORION	4.5 kl	5.0 c-g	1.3 f-j	1.5 hij	8 mno	0.8 nop
MARS	4.8 jkl	4.0 f-k	2.5 b-h	0.8 ijk	30 ijk	1.5 k-n
MERCURY	5.5 hij	6.3 abc	2.3 b-i	0.8 ijk	68 cde	2.3 i-l
SATURN	6.0 f-i	4.5 d-i	4.5 a	4.0 bcd	25 jkl	1.5 k-n
JASMINE 85	2.8 m	0.0 n	3.3 a-e	0.0 k	0 o	0.0 p
DELLA	5.3 ijk	4.3 e-j	4.0 ab	0.0 k	20 klm	1.3 l-o
DELLMONT	7.0 cde	3.5 g-k	1.5 e-j	4.0 bcd	53 fg	3.0 f-j
LAGRU	6.0 f-i	1.8 lm	3.3 a-e	0.5 ijk	68 cde	4.0 c-f
ADAIR	5.3 ijk	6.3 abc	3.8 abc	1.8 ghi	73 bcd	3.5 d-h
JODON	7.0 cde	4.3 e-j	2.0 c-j	3.8 b-e	65 def	3.8 c-g
KAYBONNET	5.8 ghi	5.0 c-g	3.8 abc	3.3 c-f	10 mno	0.8 nop
AKITAKOMACHI	4.3 l	3.5 g-k	4.5 a	0.0 k	0 o	0.0 p
TORO2	4.8 jkl	2.8 jkl	1.0 g-j	0.0 k	43 ghi	2.0 j-m
9202071	8.8 a	7.3 a	0.3 j	4.3 a-d	90 a	5.8 a
8902192	4.3 l	0.3 mn	3.0 a-f	0.3 jk	0 o	0.0 p
LEMONT QUALITY CHECK	8.0 ab	4.0 f-k	1.3 f-j	4.0 bcd	53 fg	2.8 g-j
9302155	5.3 ijk	2.5 kl	3.5 a-d	4.0 bcd	15 lmn	0.8 nop
9201179	5.8 ghi	4.5 d-i	3.5 a-d	2.3 fgh	5 no	0.3 op
9201176	6.0 f-i	4.0 f-k	3.3 a-e	3.8 b-e	13 l-o	1.0 m-p
9201191	5.3 ijk	3.3 h-l	3.3 a-e	2.3 fgh	8 mno	0.8 nop
9202026	5.8 ghi	5.8 a-e	0.5 ij	4.0 bcd	48 gh	2.5 h-k
9302065	6.5 efg	4.5 d-i	0.5 ij	4.5 abc	20 klm	1.5 k-n
9102085	7.8 bc	7.0 ab	2.8 a-g	3.5 b-f	68 cde	3.3 e-i
LSD (.05) =	0.9	1.5	1.6	1.4	14	1.0
Standard Dev.=	.650444	1.04657	1.17099	.994349	9.69514	.746216
CV =	10.66	25.07	52.48	34.81	21.02	29.26

Means followed by same letter do not significantly differ (P=.05, Duncan's MRT).

[1] Ratings based on 0-9 scale where 0 = no disease (immune) and 9 = maximum disease (very susceptible).

[2] Ratings based on % heads infected with rotten neck blast.

1994 UNIFORM DISEASE NURSERY

Location: Rice Research Station, Crowley, LA

Soil Type: Crowley silt loam

Variety/Seed Rate: Various varieties and breeding lines, 3-4 gm/3 ft row

Planting Method/Date: Hege tray planter (drill-seeded), Apr 29

Emergence Date: May 6

Fertilization: Preplant 16-48-48, Apr 29; 120-0-0 preflood, May 24; 46-0-0, June 20

Plot Size: 3 ft row

Experimental Design: Unrandomized complete block with two replications

Water Management: Permanent flood, May 24

Herbicides: 4 qt Propanil + 1 qt Basagran/A, May 19;
1.5 oz/A Londax, May 26 and June 7

Insecticides: 17 lb/A Furadan, June 14; 2 pt/A Sevin, July 22

Fungicides: None

Application Equipment: N/A

Inoculation Dates: Inoculated for sheath blight, June 10 (10-15 ml/row) - Broadcast

Drained: Sept 2

Harvest: N/A

Disease Ratings: Sheath blight and foliar disease data taken Aug 26;
blast data taken Aug 29-30

Results: See Tables 7-13.

Comments: Sheath blight and blast severities were very high; other diseases were moderate in severity.

Table 7. Disease reactions of 1994 uniform rice nursery (URN), Group 1. Rice Research Station, Crowley, LA. 1994.

URN No.	Sheath Blight (0-9)	Brown Spot (0-9)	Leaf Smut (0-9)	Narrow Brown (0-9)	Leaf Blast (0-9)
1	6.5	0.0	4.0	3.5	2.0
2	7.0	1.0	5.5	5.0	4.0
3	4.0	5.0	2.0	2.0	4.5
4	6.0	0.0	2.0	1.0	4.0
5	7.5	1.5	3.5	4.0	5.0
6	4.5	1.5	5.0	3.0	2.0
7	6.0	2.5	3.5	4.5	1.5
8	6.0	4.0	7.5	1.0	4.0
9	6.0	2.0	6.0	0.5	3.5
10	7.5	3.5	5.0	2.5	6.0
11	6.0	2.5	3.0	1.5	6.0
12	9.0	0.0	3.0	1.5	4.5
13	7.0	0.0	7.0	1.5	4.5
14	7.5	0.0	8.0	2.5	5.0
Alan	7.0	3.5	6.5	3.5	6.0
Adair	7.0	3.0	5.0	1.0	5.0
Maybelle	9.0	0.0	4.0	6.0	5.5
Jodon	6.5	0.0	4.0	4.5	6.0
Millie	4.0	1.0	5.0	3.0	5.5
Jackson	6.5	0.0	3.0	5.0	6.5

Table 8. Disease reactions of 1994 uniform rice nursery (URN), Group 2. Rice Research Station, Crowley, LA. 1994.

URN No.	Sheath Blight (0-9)	Brown Spot (0-9)	Leaf Smut (0-9)	Narrow Brown (0-9)	Leaf Blast (0-9)
21	8.0	0.0	6.5	2.5	5.5
22	5.0	1.0	3.0	2.0	5.0
23	8.5	0.0	2.5	3.5	4.0
24	7.0	1.0	4.5	4.0	2.5
25	6.5	2.5	5.0	0.5	4.5
26	7.5	4.0	5.0	4.5	3.0
27	4.5	0.0	6.5	2.0	6.0
28	---	---	---	---	---
29	5.0	1.5	5.0	0.0	7.0
30	4.5	3.0	3.5	3.0	7.0
31	4.5	1.0	4.5	0.0	5.5
32	6.0	0.0	4.5	0.5	6.0
33	7.5	1.5	5.0	0.0	5.5
34	6.0	2.0	5.5	3.5	5.5
35	7.0	4.0	4.0	3.0	3.0
36	4.5	3.0	3.5	3.0	2.0
Orion	5.0	1.5	4.0	2.0	4.0
Bengal	5.0	0.0	4.5	1.0	6.5
Mars	5.0	1.0	5.0	3.0	7.0
LaGrue	4.5	2.5	1.5	1.5	5.5

Table 9. Disease reactions of 1994 uniform rice nursery (URN), Group 3. Rice Research Station, Crowley, LA. 1994.

URN No.	Sheath Blight (0-9)	Brown Spot (0-9)	Leaf Smut (0-9)	Narrow Brown (0-9)	Leaf Blast (0-9)
41	5.5	1.0	5.0	3.5	3.0
42	6.5	3.0	1.0	2.0	4.0
43	7.0	0.0	2.0	2.5	5.5
44	6.5	0.0	2.5	3.0	2.5
45	5.5	3.5	3.0	2.0	4.5
46	7.5	3.0	2.0	3.0	7.0
47	6.0	2.5	3.5	3.5	4.0
48	6.0	1.0	4.0	3.5	4.5
49	6.5	1.5	2.5	4.5	4.0
50	6.0	2.5	4.5	4.5	3.5
51	6.5	2.0	4.0	4.0	5.0
52	8.0	1.5	5.5	4.0	4.5
53	6.0	0.0	4.0	3.0	2.5
54	5.5	2.0	4.0	0.5	2.5
Lemont	8.0	1.0	5.5	3.0	5.5
Gulfmont	7.0	1.5	5.5	4.5	5.0
Kaybonnet	7.0	3.0	7.0	4.5	2.0
Katy	5.0	1.0	4.5	3.5	2.0
Cypress	7.0	1.0	4.0	3.5	3.5
Newbonnet	6.0	2.0	4.0	4.5	6.5

Table 10. Disease reactions of 1994 uniform rice nursery (URN), Group 4. Rice Research Station, Crowley, LA. 1994.

URN No.	Sheath Blight (0-9)	Brown Spot (0-9)	Leaf Smut (0-9)	Narrow Brown (0-9)	Leaf Blast (0-9)
61	5.0	4.0	3.5	1.0	2.0
62	6.5	2.0	3.5	6.0	4.0
63	7.0	1.5	3.0	3.0	4.5
64	5.5	1.0	4.0	0.0	3.5
65	6.0	3.0	3.0	5.0	2.0
66	7.0	3.0	2.0	1.5	5.0
67	6.0	1.5	0.5	2.0	4.5
68	7.0	3.0	5.0	4.5	4.5
69	5.5	0.0	5.0	3.0	4.0
70	6.5	1.5	5.0	4.0	3.0
71	6.0	5.0	2.0	0.0	1.5
72	7.0	3.5	4.0	4.5	4.5
73	7.5	1.5	1.5	4.5	6.0
74	6.0	3.5	2.5	2.5	4.5
75	7.5	0.0	4.5	4.0	3.5
76	5.0	0.0	6.5	2.0	5.5
77	6.5	0.0	7.0	4.5	5.0
78	7.5	1.0	2.5	4.0	4.0
Rico-1	4.5	2.5	5.0	3.5	3.5
Toro-2	6.5	0.0	4.0	1.0	4.0

Table 11. Disease reactions of 1994 uniform rice nursery (URN), Group 5. Rice Research Station, Crowley, LA. 1994.

URN No.	Sheath Blight (0-9)	Brown Spot (0-9)	Leaf Smut (0-9)	Narrow Brown (0-9)	Leaf Blast (0-9)
81	6.5	3.0	6.5	1.5	6.5
82	6.0	3.5	5.5	0.0	6.5
83	7.0	1.5	6.5	2.5	4.5
84	8.0	0.0	8.0	0.0	5.0
85	5.5	2.5	7.5	3.0	4.5
86	6.5	0.0	2.5	6.0	2.5
87	7.5	4.0	1.5	5.0	2.5
88	4.0	0.5	3.0	4.5	4.0
89	4.5	1.0	3.0	0.0	4.5
90	7.5	2.0	4.5	3.5	2.0
91	7.5	1.5	6.0	1.5	4.5
92	5.5	2.0	3.5	0.5	4.5
93	7.0	4.0	6.5	0.5	6.0
94	7.5	1.0	5.0	5.0	4.0
95	8.0	0.5	4.0	5.5	3.5
96	5.5	4.5	6.0	2.5	2.5
97	6.0	2.0	5.5	6.5	3.0
98	6.5	0.5	1.0	1.0	2.5
99	6.5	3.5	4.5	5.0	6.5
100	7.5	2.5	5.0	5.0	6.5
101	8.0	3.5	3.0	1.5	5.5
102	6.0	3.5	6.5	3.5	5.5
103	7.5	2.5	4.5	4.5	5.0
104	4.0	0.0	5.0	4.0	4.0
105	6.0	1.5	3.0	4.5	2.5
106	6.5	2.5	2.5	3.0	6.0
107	8.0	4.0	2.0	4.0	4.0
108	7.0	0.0	7.0	2.0	3.0
109	5.0	3.0	6.0	0.0	4.0
110	6.0	2.0	2.0	0.0	2.5
111	4.0	2.0	3.0	3.0	1.5
112	6.0	0.0	6.5	1.0	5.0
113	9.0	2.0	6.0	0.0	4.0
114	7.0	1.5	4.5	3.5	6.0
115	5.5	2.5	7.5	0.0	6.0
116	8.0	0.0	6.5	0.0	4.0
Rosemont	7.5	1.0	1.5	2.5	6.0
Labelle	6.0	0.5	6.5	2.5	5.0
L202	6.5	1.5	2.0	2.5	8.0
Tebonnet	6.5	1.5	3.5	4.5	2.0

Table 12. Disease reactions of 1994 uniform rice nursery (URN), Group 6. Rice Research Station, Crowley, LA. 1994.

URN No.	Sheath Blight (0-9)	Brown Spot (0-9)	Leaf Smut (0-9)	Narrow Brown (0-9)	Leaf Blast (0-9)
121	7.5	0.0	6.0	4.5	1.5
122	6.0	3.0	1.5	4.5	4.0
123	8.0	2.5	6.0	3.5	4.5
124	5.5	1.5	6.5	4.0	5.0
125	7.0	2.5	4.5	3.0	8.0
126	7.0	3.0	2.0	3.0	5.0
127	8.0	0.0	6.5	2.0	5.5
128	-	-	-	-	7.0
129	4.0	2.5	2.0	1.5	5.0
130	7.0	1.0	7.0	4.5	3.5
131	5.5	0.5	3.0	1.0	7.0
132	8.0	0.0	5.5	4.5	4.5
133	7.0	1.5	5.0	6.5	2.0
134	3.0	2.0	5.0	6.0	7.0
135	7.0	3.0	5.0	2.5	6.5
136	5.0	3.0	3.5	1.0	1.0
137	4.0	4.0	0.0	0.0	7.0
138	7.0	1.0	2.5	0.5	5.5
139	8.0	1.0	1.0	2.0	3.0
140	6.5	6.0	4.0	0.0	2.0
141	7.0	0.0	4.5	0.0	5.0
142	4.0	1.5	5.0	1.0	5.5
143	3.5	5.5	0.0	0.0	5.5
144	7.5	3.5	5.0	0.0	3.5
145	4.0	3.0	4.0	0.0	3.5
146	5.0	5.5	4.0	0.0	4.0
147	6.0	2.5	5.0	4.0	2.0
148	5.5	2.0	7.0	2.0	6.5
149	5.0	3.0	0.0	0.0	3.0
150	7.0	2.0	0.5	3.0	5.0
151	5.0	3.0	6.5	2.5	7.0
152	4.0	4.0	0.0	0.0	4.0
153	8.0	2.0	7.5	0.0	2.0
154	3.5	2.5	0.5	2.0	5.5
155	3.0	4.0	3.0	0.0	2.5
156	5.0	2.5	3.5	0.0	6.0
Dellmont	7.0	1.0	4.5	4.0	4.0
Rexmont	8.0	2.5	3.5	2.0	5.0
Della	5.0	5.0	4.0	0.5	6.5
Lacasine	8.0	1.0	1.0	5.0	4.5

Table 13. Disease reactions of 1994 uniform rice nursery (URN), Group 7. Rice Research Station, Crowley, LA. 1994.

URN No.	Sheath Blight (0-9)	Brown Spot (0-9)	Leaf Smut (0-9)	Narrow Brown (0-9)	Leaf Blast (0-9)
161	6.0	1.0	2.0	3.0	2.5
162	7.5	0.0	3.0	0.0	5.0
163	4.5	2.5	0.5	0.5	4.0
164	6.5	0.0	4.0	1.0	2.5
165	6.5	0.0	2.0	1.0	3.0
166	5.5	1.0	2.0	4.0	2.0
167	7.5	0.0	4.5	4.0	4.5
168	6.0	0.0	3.0	5.0	1.5
169	4.0	1.0	0.0	0.0	3.0
170	6.5	3.5	4.5	4.5	5.0
171	7.5	2.0	2.0	2.0	5.0
172	7.5	2.0	5.0	.5	3.5
173	6.0	0.0	6.0	3.0	6.0
174	6.0	4.0	4.0	1.0	5.0
175	7.0	0.0	3.0	3.0	5.0
176	6.5	3.0	7.0	2.5	4.0
177	8.0	2.0	5.0	3.5	6.0
178	7.5	2.0	3.5	0.0	3.0
179	5.0	1.5	5.0	3.5	4.5
180	7.5	3.0	4.5	4.5	5.5
181	7.5	0.0	5.0	2.5	5.5
182	8.0	1.0	5.0	4.5	4.5
183	7.0	3.5	6.0	3.0	6.0
184	---	---	---	---	---
185	6.0	3.0	3.5	4.0	5.0
186	6.0	0.0	4.0	0.0	5.0
187	9.0	0.0	3.5	2.5	4.5
188	7.0	4.0	6.0	7.0	2.0
189	4.5	5.0	0.5	0.0	3.5
190	7.5	3.0	0.5	1.0	4.5
191	6.5	0.0	2.5	1.0	2.5
192	5.0	3.5	0.0	0.0	1.5
193	5.5	4.0	0.0	0.0	5.0
194	6.0	1.0	4.0	5.5	6.0
195	5.0	3.0	3.0	0.0	4.0
196	5.0	2.0	0.0	0.5	3.0
Jasmine 85	4.0	40	0.0	0.0	2.5
A-301	6.5	2.5	0.0	0.0	9.0
Gui Chow	3.5	3.5	0.0	0.5	2.5
Teqing	4.5	4.0	0.0	0.0	2.0

1994 MUTATION SELECTION STUDY

Location: Rice Research Station, Crowley, LA

Soil Type: Crowley silt loam

Variety/Seed Rate: Lemont, Lacassine, Cypress and mutation lines, 3-4 gm/6 ft row

Planting Method/Date: Hege tray planter (drill-seeded), Apr 29

Emergence Date: May 11

Fertilization: Preplant 16-48-48, Apr 29; 120-0-0 preflood, May 24; 46-0-0, June 17

Plot Size: Six - 6 ft rows

Experimental Design: Randomized complete block design with four replications

Water Management: Flushed, May 13; permanent flood, May 24

Herbicides: 4 qt Propanil + 2 qt Basagran/A, May 19; 1.5 oz/A Londax, May 26 and June 7

Insecticides: 17 lb/A Furadan, June 14; Sevin 2 pt/A, July 22

Fungicides: None

Application Equipment: N/A

Inoculation Dates: Inoculated for sheath blight, June 14 (10-15 ml/row); June 28 (4-5 ml/rows)

Drained: N/A

Harvest: Sept 16

Disease Ratings: Sheath blight and foliar disease data taken Aug 19

Results: See Table 14.

Comments: Sheath blight severity was very high in inoculated plots; little sheath blight developed in the uninoculated plots. Other diseases were moderate in severity.

Table 14. Effect of severe sheath blight pressure on mutation selections. Rice Research Station, Crowley, LA. 1994.

Variety/Line	Sheath Blight Rating (0-9)	Yield Inoc. (lb/A)	Yield Uninoc. (lb/A)	Yield Difference (Uninoc-Inoc.) (lb/A)
LACASSINE (LC)	6.0 a-e	7434 bcd	7559 de	125 abc
2 LC01	6.0 a-e	8633 a	8923 abc	290 ab
3 LEMONT (LM)	7.0 a	7721 abc	7766 cde	45 abc
4 LM01	5.3 def	7800 abc	7904 b-e	104 abc
5 LM03	6.5 abc	7754 abc	7397 de	-357 bc
6 LM04	6.7 ab	7853 abc	8480 a-d	627 ab
7 LM05	6.3 a-d	7626 bcd	7636 de	10 abc
8 LM06	6.3 a-d	6706 d	6995 e	289 ab
9 LM07	5.8 b-f	7387 bcd	7890 cde	503 ab
10 CYPRESS (CP)	6.3 a-d	7752 abc	9128 a	1376 a
11 CP02	5.5 c-f	7811 abc	8199 a-d	388 ab
12 CP03	5.3 def	7577 bcd	7748 cde	171 abc
13 CP04	5.0 ef	6921 cd	6984 e	63 abc
14 CP05	6.5 abc	7897 abc	9076 ab	1179 a
15 CP07	5.0 ef	7048 cd	7321 de	273 abc
16 CP08	5.5 c-f	7588 bcd	8861 abc	1273 a
17 CP10	6.0 a-e	7223 bcd	8126 a-e	903 ab
18 CP11	6.0 a-e	7771 abc	8826 abc	1055 ab
19 CP12	4.8 fg	7305 bcd	7326 de	21 abc
20 CP13	4.0 g	8189 ab	6999 e	-1189 c
LSD (.05) =	1.0	923	1103	1376
Standard Dev.=	0.68	652.9	780.3	973.1
CV =	11.72	8.59	9.81	272.30

Means followed by same letter do not significantly differ (P=.05, Duncan's MRT).

1994 SHEATH BLIGHT FUNGICIDE TRIAL

Location: Rice Research Station, Crowley, LA

Soil Type: Crowley silt loam

Variety/Seed Rate: Cypress, 120 lb/A

Planting Method/Date: Kincaid cone planter (drill-seeded), Apr 29

Emergence Date: May 11

Fertilization: 16-48-48, Apr 29, preplant; 120-0-0, May 24, preflood; 46-0-0, June 17

Plot Size: 4 x 16 ft

Experimental Design: Randomized complete block design with four replications

Water Management: Flushed, May 11; permanent flood, May 24

Herbicides: 4 qt Propanil + 2 qt Basagran, May 19; 1.5 oz/A Londax, June 7

Insecticides: Furadan 17 lb/A, June 14; Sevin 2 pt/A, July 22

Fungicides: Applied at panicle differentiation (PD), June 28; PD + 14 days, July 11; boot (B), July 6; infected, June 28; and 70% heading (H), July 18

Application Equipment: CO_2 backpack sprayer, 8002 tips, 15 gal/A

Inoculation Dates: Inoculated for sheath blight, June 14 (150 ml/plot)

Drained: Aug 11

Harvest: Aug 22

Disease Ratings: Sheath blight severity (0-9), July 20 (pollination) and Aug 15 (maturity); infestation levels (percent tillers infected), Aug 11

Results: See Table 15.

Comments: Sheath blight severity was moderate; other diseases were low in severity.

Table 15. Effects of rice foliar fungicides on sheath blight control and rice yield and milling. Rice Research Station, Crowley, LA. 1994.

Treatment	Rate	Timing[1]	Sheath blight Severity (0-9)[2] July 20	Sheath blight Severity (0-9)[2] Aug 15	Sheath blight Tillers[3] infected (%)	Yield lb/A	Yield increase lb/A	Milling whole (%)	Milling total (%)
INOCULATED UNSPRAYED			6.0 a	7.3 a	60.0 a	6033.3 c	0.3 c	61.2 bcd	68.8 bc
ROVRAL 4 SC	0.5 lb ai/A	B & H	5.0 b-e	5.8 c-f	11.5 gh	6788.0 ab	755.0 ab	61.9 a-d	68.9 bc
ROVRAL 4 SC LATRON CS-7 8.33 EC	0.5 lb ai/A 0.25 % v/v	B & H B & H	5.3 a-d	6.0 cde	28.3 c-g	6780.3 ab	747.3 ab		
EXP10370A 50 WG LATRON CS-7 8.33 EC	0.5 lb ai/A 0.25 % v/v	B & H B & H	5.5 abc	6.3 bcd	25.8 c-g	6744.7 b	711.7 b	61.8 bcd	69.2 abc
EXP10566A 2.33 SC	0.5 lb ai/A	B & H	5.0 b-e	5.8 c-f	20.8 d-h	6916.7 ab	883.7 ab	61.7 bcd	69.0 bc
ROVRAL 4 SC SYLGARD 309	0.5 lb ai/A 0.063 % v/v	B & H B & H	5.5 abc	6.0 cde	26.5 c-g	7031.0 ab	998.0 ab	62.2 abc	69.5 ab
ROVRAL 4 SC SYLGARD 309	0.5 lb ai/A 0.125 % v/v	B & H B & H	4.8 cde	5.0 f-i	31.3 c-f	6911.3 ab	878.3 ab		
TILT 3.6 EC	6 oz pr/A	PD & PD+14	3.8 fgh	4.5 hi	28.5 c-g	7057.3 ab	1024.3 ab	62.3 abc	69.1 abc
TILT 3.6 EC SYLGARD 309	6 oz pr/A 0.063 % v/v	PD & PD+14 PD & PD+14	3.3 hi	4.8 ghi	18.0 e-h	6796.5 ab	763.5 ab		
TILT 3.6 EC SYLGARD 309	6 oz pr/A 0.125 % v/v	PD & PD+14 PD & PD+14	3.5 ghi	5.3 e-h	15.8 fgh	7324.3 a	1291.3 a	62.6 ab	69.5 ab
TILT 3.6 EC	10 oz pr/A	B	5.3 a-d	6.3 bcd	38.3 bcd	6485.0 bc	452.0 bc	60.7 d	68.6 c
BENLATE 50 WP	0.5 lb ai/A	B & H	5.0 b-e	5.5 d-g	24.5 c-h	6885.8 ab	852.8 ab	63.4 a	69.9 a
TOPSIN M 70 WP	1.4 lb ai/A	B & H	4.5 def	6.3 bcd	20.8 d-h	7010.8 ab	977.8 ab		
TOPSIN M 70 WP	0.7 lb ai/A	B & H	5.5 abc	7.0 ab	41.0 bc	6726.0 b	693.0 b	61.0 cd	68.9 bc
TOPSIN M 70 WP	0.525 lb ai/A	B & H	5.5 abc	6.5 abc	24.0 c-h	6622.8 b	589.8 b		
MONCUT/NA211 50 WP	0.35 lb ai/A	INFECT	3.3 hi	5.3 e-h	35.0 cde	6599.3 b	566.3 b	61.8 bcd	69.0 bc
MONCUT/NA211 50 WP	0.35 lb ai/A	PD & PD+14	2.8 i	4.3 i	7.3 h	6910.3 ab	877.3 ab	62.2 abc	69.4 ab
KASUMIN	3.5 pt pr/A	B & H	5.8 ab	7.0 ab	55.5 ab	6582.3 bc	549.3 bc		
TILT 3.6 EC BENLATE 50 WP	10 oz pr/A 0.5 lb ai/A	B H	4.3 efg	5.3 e-h	17.0 fgh	6687.5 b	654.5 b		
LSD (.05) =			0.9	0.9	16.8	546.1	546.1	1.4	NS
Standard Dev.=			0.63	0.63	11.88	382.15	382.15	0.97	0.53
CV =			13.45	10.90	42.64	5.63	50.90	1.56	0.77

[1] PD = Panicle Differentiation, B = Boot, H = Heading, PD+14 = 14 days after PD, and INFECT = sheath blight exceeded threshold.
[2] Severity was rated using a 0-9 scale where 0 indicated no disease and 9 indicated plants dead and collapsed.
[3] Tillers infected was the percent tillers infected with sheath blight.

1994 SHEATH BLIGHT FUNGICIDE FORMULATION TRIAL

Location: Rice Research Station, Crowley, LA

Soil Type: Crowley silt loam

Variety/Seed Rate: Cypress, 120 lb/A

Planting Method/Date: Kincaid cone planter (drill-seeded), Apr 29

Emergence Date: May 11

Fertilization: 16-48-48, Apr 29, preplant; 120-0-0, May 24, preflood; 46-0-0, June 17

Plot Size: 4 x 16 ft

Experimental Design: Randomized block design with four replications

Water Management: Flushed, May 11; permanent flood, May 24

Herbicides: 4 qt Propanil + 2 qt Basagran, May 19; 1.5 oz/A Londax, June 7

Insecticides: Furadan 17 lb/A, June 14; Sevin 2 pt/A, July 22

Fungicides: Applied at panicle differentiation (PD), June 28; PD + 14 days, July 11; boot (B), July 6; infected, June 28; and 70% heading (H), July 18

Application Equipment: CO_2 backpack sprayer, 8002 tips, 15 gal/A

Inoculation Dates: Inoculated for sheath blight, June 14 (150 ml/plot)

Drained: Aug 11

Harvest: Aug 22

Disease Ratings: Sheath blight severity (0-9), July 20 (pollination) and Aug 15 (maturity); infestation levels (percent tillers infected), Aug 11

Results: See Table 16.

Comments: Sheath blight severity was moderate; other diseases were low in severity.

Table 16. Effects of rice foliar fungicides on sheath blight control and rice yield and milling. Rice Research Station, Crowley, LA. 1994.

Treatment	Rate	Timing[1]	Sheath blight Severity (0-9)[2] July 20	Sheath blight Severity (0-9)[2] Aug 15	Tillers[3] infected (%)	Yield lb/A	Yield increase lb/A	Milling whole (%)	Milling total (%)
UNSPRAYED INOC CK			5.8 ab	7.0 ab	38.3 bc	6688.0 bcd	0.0 bcd	60.5 d	68.9 b
ROVRAL 4 SC	0.50 lb ai/A	B & H	4.8 bcd	5.5 d-h	24.0 c-g	7024.5 abc	336.5 abc	62.6 abc	70.3 a
TILT 3.6 EC	10 oz pr/A	B	4.3 def	5.3 e-h	21.5 d-h	7065.0 abc	377.0 abc	62.9 abc	69.7 ab
BENLATE 50 WP	0.50 lb ai/A	B & H	5.3 a-d	5.5 d-h	38.0 bc	6935.5 bc	247.5 bc	62.3 abc	69.4 ab
BENLATE 50 WP ROVRAL 4 SC	0.25 lb ai/A 0.25 lb ai/A	B & H B & H	5.3 a-d	6.3 b-e	30.0 bcd	7170.3 abc	482.3 abc	63.5 ab	70.2 a
BENLATE 50 WP ROVRAL 4 SC	0.50 lb ai/A 0.25 lb ai/A	B & H B & H	5.3 a-d	6.0 b-f	13.8 e-h	7049.3 abc	361.3 abc		
MONCUT NA 211 50 WP	0.35 lb ai/A	PD &PD+14	3.3 fg	5.0 fgh	13.3 e-h	7227.3 abc	539.3 abc	62.5 abc	69.6 ab
MONCUT NA 304/01 70 WP	0.35 lb ai/A	PD &PD+14	3.3 fg	4.8 ghi	8.3 gh	7403.5 ab	715.5 ab	61.8 bcd	69.3 ab
MONCUT NA 314/2 70 DF	0.35 lb ai/A	PD &PD+14	3.5 efg	5.0 fgh	24.5 c-f	6842.0 bc	154.0 bc	62.6 abc	69.8 ab
MONCUT NA 333/01 70 WP	0.35 lb ai/A	PD &PD+14	3.3 fg	5.3 e-h	14.8 d-h	6928.5 bc	240.5 bc		
MONCUT NA 334/01 70 WP	0.35 lb ai/A	PD &PD+14	2.8 g	4.5 hi	8.8 fgh	6831.8 bc	143.8 bc		
BENLATE 50 WP	0.50 lb ai/A	H	5.8 ab	6.8 abc	43.0 ab	6858.8 bc	170.8 bc		
BENLATE 50 WP	0.75 lb ai/A	H	5.3 a-d	6.0 b-f	21.3 d-h	7085.0 abc	397.0 abc		
BENLATE 50 WP	1.00 lb ai/A	H	5.5 abc	6.0 b-f	26.0 cde	6592.0 cd	-96.0 cd		
TILT 3.6 EC BENLATE 50 WP	10 oz pr/A 0.50 lb ai/A	B H	4.5 cde	5.0 fgh	25.5 cde	7714.5 a	1026.5 a		
ICIA5504 80 WG	0.25 lb ai/A	B & H	3.0 g	3.8 i	7.5 h	7710.5 a	1022.5 a	63.8 a	70.3 a
ROVRAL 4 SC	0.50 lb ai/A	H	5.0 bcd	5.8 c-g	16.0 d-h	7097.5 abc	409.5 abc		
ROVRAL 4 SC	0.75 lb ai/A	H	6.3 a	6.5 bcd	55.0 a	6695.0 bcd	7.0 bcd		
HALT 1 EC	16 oz pr/A	PD & B	6.3 a	7.8 a	56.5 a	6041.5 d	-646.5 d	61.5 cd	69.1 b
LSD (.05) =			1.0	1.0	15.1	682.6	682.6	1.8	0.9
Standard Dev.=			0.69	0.73	10.67	482.69		1.24	0.63
CV =			14.96	12.98	41.74	6.90		1.99	0.91

Means followed by same letter do not significantly differ (P=.05, Duncan's MRT).
[1] PD = Panicle Differentiation, PD+14 = 14 days after PD, B = Boot, and H = Heading.
[2] Severity was rated using a 0-9 scale where 0 indicated no disease and 9 indicated plants dead and collapsed.
[3] Tillers infected was the percent tillers infected with sheath blight.

1994 ICIA5504 SHEATH BLIGHT FUNGICIDE TRIAL

Location: Rice Research Station, Crowley, LA

Soil Type: Crowley silt loam

Variety/Seed Rate: Cypress, 120 lb/A

Planting Method/Date: Kincaid cone planter (drill-seeded), Apr 29

Emergence Date: May 11

Fertilization: 16-48-48, Apr 29, preplant; 120-0-0, May 24, preflood; 46-0-0, June 17

Plot Size: 4 x 16 ft

Experimental Design: Randomized complete block design with four replications

Water Management: Flushed, May 11; permanent flood, May 24

Herbicides: 4 qt Propanil + 2 qt Basagran, May 19; 1.5 oz/A Londax, June 7

Insecticides: Furadan 17 lb/A, June 14; Sevin 2 pt/A, July 22

Fungicides: Applied at panicle initiation (PI), June 22; PI + 7 days, June 29; PI + 14 days, July 6; PI + 21 days, July 14; boot (B), July 6; and 70% heading (H), July 18

Application Equipment: CO_2 backpack sprayer, 8002 tips, 15 gal/A

Inoculation Dates: Inoculated for sheath blight, June 14 (150 ml/plot)

Drained: Aug 11

Harvest: Aug 22

Disease Ratings: Sheath blight severity (0-9), July 20 (pollination) and Aug 15 (maturity); infestation levels (percent tillers infected), Aug 11

Results: See Table 17.

Comments: Sheath blight severity was moderate; other diseases were low in severity. Sheath blight severity was lower in the check plots in this trial as compared with other trials this year due to drift of ICIA5504 onto these plots.

Table 17. Effects of rice foliar fungicides on sheath blight control and rice yield and milling. Rice Research Station, Crowley, LA. 1994.

Treatment	Rate	Timing[1]	Sheath blight Severity (0-9)[2] July 20	Sheath blight Severity (0-9)[2] Aug 15	Tillers[3] infected (%)	Yield lb/A	Yield increase lb/A	Milling whole (%)	Milling total (%)
INOCUL-UNSPRAYED CK			5.5 a	6.8 a	38.0 a	6795.8 e	-0.2 e	59.9 b	68.2 b
ICIA5504 80 WG	0.05 lb ai/A	PI & PI+14	2.8 bc	4.8 bc	7.5 cd	7569.0 a-d	773.0 a-d	61.4 ab	69.2 ab
ICIA5504 80 WG	0.1 lb ai/A	PI	3.5 b	4.8 bc	16.0 bc	7383.8 a-e	587.8 a-e	61.9 ab	69.3 ab
ICIA5504 80 WG	0.1 lb ai/A	PI & PI+7	2.3 bc	4.0 cde	10.3 bcd	7603.3 abc	807.3 abc		
ICIA5504 80 WG	0.1 lb ai/A	PI & PI+14	2.8 bc	4.0 cde	12.8 bcd	7305.5 a-e	509.5 a-e	62.9 a	69.5 a
ICIA5504 80 WG	0.1 lb ai/A	PI & PI+21	2.5 bc	3.5 de	8.5 bcd	7357.8 a-e	561.8 a-e		
ICIA5504 80 WG	0.1 lb ai/A	PI & H	3.0 bc	3.8 cde	7.0 cd	7314.0 a-e	518.0 a-e		
ICIA5504 80 WG	0.2 lb ai/A	PI	2.3 bc	3.5 de	6.8 cd	7050.0 b-e	254.0 b-e	62.1 ab	69.6 a
ICIA5504 80 WG	0.2 lb ai/A	PI & PI+7	2.5 bc	3.5 de	8.0 bcd	7250.8 a-e	454.8 a-e		
ICIA5504 80 WG	0.2 lb ai/A	PI & PI+14	2.5 bc	3.5 de	7.3 cd	7074.0 a-e	278.0 a-e	63.1 a	69.7 a
ICIA5504 80 WG	0.2 lb ai/A	PI & PI+21	2.3 bc	3.8 cde	3.3 d	7232.0 a-e	436.0 a-e		
ICIA5504 80 WG	0.2 lb ai/A	PI & H	2.8 bc	3.0 e	5.0 d	7614.0 ab	818.0 ab		
ICIA5504 80 WG	0.3 lb ai/A	PI	2.0 c	3.0 e	8.3 bcd	7296.3 a-e	500.3 a-e	62.4 a	69.3 ab
ICIA5504 80 WG	0.3 lb ai/A	PI & PI+7	2.8 bc	4.0 cde	6.0 d	7324.3 a-e	528.3 a-e		
ICIA5504 80 WG	0.3 lb ai/A	PI & PI+14	2.8 bc	3.5 de	5.3 d	7015.3 b-e	219.3 b-e	62.0 ab	68.9 ab
ICIA5504 80 WG	0.3 lb ai/A	PI & PI+21	3.0 bc	4.3 bcd	11.0 bcd	7690.5 a	894.5 a		
ICIA5504 80 WG	0.3 lb ai/A	PI & H	3.0 bc	3.5 de	5.8 d	7498.8 a-d	702.8 a-d	62.5 a	69.7 a
ICIA5504 80 WG	0.3 lb ai/A	B	3.5 b	4.0 cde	10.0 bcd	6987.0 cde	191.0 cde		
ROVRAL 4 SC	0.5 lb ai/A	B & H	4.8 a	5.3 b	17.3 b	6972.5 de	176.5 de	61.9 ab	69.3 ab
LSD (.05) =			1.2	1.1	8.9	587.6	587.6	NS	NS
Standard Dev.=			0.83	0.76	6.31	415.51		1.50	0.76
CV =			28.13	18.94	61.92	5.71		2.39	1.09

Means followed by same letter do not significantly differ (P=.05, Duncan's MRT).
[1] PI = Panicle initiation, PI+# = # days after PI, B = Boot, and H = Heading.
[2] Severity was rated using a 0-9 scale where 0 indicated no disease and 9 indicated plants dead and collapsed.
[3] Tillers infected was the percent tillers infected with sheath blight.

1994 BLAST FUNGICIDE TRIAL

Location: Rice Research Station, Crowley, LA

Soil Type: Crowley silt loam

Variety/Seed Rate: M201, 120 lb/A

Planting Method/Date: Kincaid cone planter (drill-seeded), Apr 29

Emergence Date: May 11

Fertilization: Preplant 16-48-48, Apr 29; Preflood 120-0-0, May 24

Plot Size: 4 x 16 ft

Experimental Design: Randomized block design with four replications

Water Management: Flushed, May 11; permanent flood, May 24

Herbicides: 4 qt Propanil/A, May 26; 3 qt Arrosolo + 1 qt Basagran, June 3; 1.5 oz/A Londax, June 17

Insecticides: Furadan 17 lb/A, June 14; Sevin 2 pt/A, July 22

Fungicides: Boot (B), June 27; 5% Heading (EH), July 1; 75% heading (H), July 7; EH+10 days, July 11

Application Equipment: CO_2 backpack sprayer, 8002 tips, 15 gal/A

Drained: July 27

Harvest: Aug 12

Disease Ratings: Blast data taken, Aug 11

Results: See Table 18.

Comments: Blast severity was extremely high; other diseases were low. Leaf blast killed some rice plants before any fungicides were applied. Yield potential was low due to severe blast. Kasumin performed the best due to curative activity.

Table 18. Effect of fungicides on rotten neck blast control, rice yield, and milling rice yield on the variety M201.

Treatment	Rate	Timing[1]	Sterility[2] (0-9)	Rotten neck blast[3] (%)	Blast Severity[4] (0-9)	Yield (lb/A)	Change from Check (lb/A)	Milling Whole (%)	Milling Total (%)
Unsprayed check			7.3 ab	99.8 a	7.5 a	755.3 i	0.3 i	23.7 g	50.4 g
BENLATE 50 WP	0.5 lb ai/A	B & H	6.0 b-e	99.3 a	7.3 ab	957.8 e-i	202.8 e-i	32.8 cd	55.3 cde
BENLATE 50 WP SYLGARD 309	0.5 lb ai/A 0.063 % v/v	B & H B & H	4.5 f	100.0 a	7.0 abc	1005.5 d-i	250.5 d-i		
BENLATE 50 WP SYLGARD 309	0.5 lb ai/A 0.125 % v/v	B & H B & H	5.0 def	97.5 ab	6.5 a-d	1156.3 c-h	401.3 c-h	36.6 bc	56.7 bc
TOPSIN M 70 WP	1.4 lb ai/A	B & H	5.3 c-f	99.5 a	6.5 a-d	1183.3 c-g	428.3 c-g		
TOPSIN M 70 WP	0.7 lb ai/A	B & H	5.8 c-f	99.3 a	7.0 abc	929.0 f-i	174.0 f-i	27.6 efg	52.6 efg
TOPSIN M 70 WP	0.53 lb ai/A	B & H	6.3 bcd	99.8 a	6.5 a-d	1136.5 c-h	381.5 c-h		
KASUMIN 1 EC TOPSIN 70 WP	2.6 pt pr/A 0.7 lb ai/A	B & H B & H	4.8 ef	99.0 a	5.8 de	1309.8 b-e	554.8 b-e		
HALT 1 EC	16.0 oz pr/A	B & H	7.8 a	100.0 a	6.8 a-d	863.3 ghi	108.3 ghi	26.5 fg	51.7 fg
KASUMIN 1 EC	3.6 pt pr/A	EH & EH+10	6.0 b-e	95.3 b	6.3 bcd	1622.5 ab	867.5 ab		
KASUMIN 1 EC	2.6 pt pr/A	EH & EH+10	6.3 bcd	96.5 ab	5.0 e	1690.0 a	935.0 a	39.6 ab	58.8 ab
BEAM 75 WP	0.25 lb ai/A	B & H	4.8 ef	98.0 ab	6.3 bcd	1435.3 abc	680.3 abc	40.8 a	60.0 a
BENLATE 50 WP	0.5 lb ai/A	B	6.5 abc	99.8 a	6.5 a-d	929.3 f-i	174.3 f-i		
BENLATE 50 WP	0.5 lb ai/A	LATE BOOT	6.5 abc	99.8 a	7.0 abc	801.8 hi	46.8 hi		
BENLATE 50 WP	0.5 lb ai/A	EH & EH+10	6.0 b-e	91.0 c	6.5 a-d	1322.5 bcd	567.5 bcd		
BENLATE 50 WP	0.5 lb ai/A	B & H	5.3 c-f	98.3 ab	6.0 cde	1203.5 c-g	448.5 c-g		
BENLATE 50 WP	0.5 lb ai/A	H	6.5 abc	99.5 a	6.5 a-d	1127.8 c-h	372.8 c-h	29.0 def	53.8 def
BENLATE 50 WP	0.75 lb ai/A	H	5.8 c-f	99.8 a	6.5 a-d	1315.8 b-e	560.8 b-e	32.8 cd	55.2 cde
BENLATE 50 WP	1.0 lb ai/A	H	5.8 c-f	99.0 a	6.8 a-d	1251.8 c-f	496.8 c-f	31.3 de	55.7 cd
LSD (.05) =			1.3	3.4	1.0	339.2	339.2	4.0	2.7
Standard Dev. =			0.94	2.43	0.74	239.83		2.72	1.88
CV =			15.94	2.47	11.32	20.72		8.48	3.42

Means followed by same letter do not significantly differ (P=.05, Duncan's MRT). Treatment 1 is the standard/comparison treatment.

[1] B = Boot, H = 75% Heading, EH = Early (5%) Heading and EH+10 = 10 days after EH.

[2] Sterility was rated using a 0-9 scale where 0 indicated no sterile seeds and 9 indicated 90-100% of the seeds sterile.

[3] Rotten neck blast was the percent of the heads with rotten neck blast.

[4] Severity was rated using a 0-9 scale where 0 indicated no blast and 9 indicated 90-100% of the plant tissues in the plots completely was dead.

1994 BLAST FOLIAR TRIAL

Location: Rice Research Station, Crowley, LA

Soil Type: Crowley silt loam

Variety/Seed Rate: M201, 120 lb/A

Planting Method/Date: Kincaid cone planter (drill-seeded), Apr 29

Emergence Date: May 11

Fertilization: Preplant 16-48-48, Apr 29; preflood 120-0-0, May 24

Plot Size: 4 x 16 ft

Experimental Design: Randomized block design with four replications

Water Management: Flushed, May 11; permanent flood, May 24

Herbicides: 4 qt Propanil/A, May 26; 3 qt Arrosolo + 1 qt Basagran, June 3; 1.5 oz/A Londax, June 17

Insecticides: Furadan 17 lb/A, June 14; Sevin 2 pt/A, July 22

Fungicides: Panicle differentiation (PD), June 22; boot (B), June 27; 50% heading (50%H), July 6; 75% heading (H), July 7; 100% headed (100% H), July 11; 100% H + 5 days, July 15; 100% H + 10 days, July 21; 100% H + 15 days, July 26

Application Equipment: CO_2 backpack sprayer, 8002 tips, 15 gal/A

Drained: July 27

Harvest: Aug 12

Disease Ratings: Blast data taken, Aug 11

Results: See Table 19.

Comments: Blast severity was extremely high; other diseases were low. Leaf blast killed some rice plants before any fungicides were applied. Yield potential was low due to severe blast.

Table 19. Effect of fungicides on rotten neck blast control and rice yield on the variety M201.

Treatment	Rate	Timing[1]	Sterility[2] (0-9)	Rotten neck blast[3] (%)	Blast Severity[4] (0-9)	Yield (lb/A)	Change from Check (lb/A)	Milling Whole (%)	Milling Total (%)
Unsprayed check			7.3 a	100.0 a	7.3 a	1146.0 f	0.0 f	25.8 e	50.7 e
BENLATE 50 WP	0.5 lb ai/A	B & H	3.8 gh	98.8 ab	5.0 e	1908.8 a	762.8 a	35.1 bc	57.0 abc
BENLATE 50 WP	0.5 lb ai/A	B	5.5 cde	100.0 a	7.5 a	1400.8 c-f	254.8 c-f		
BENLATE 50 WP	0.5 lb ai/A	75% H	5.0 def	99.8 a	6.8 abc	1389.3 c-f	243.3 c-f	28.9 de	52.8 de
BENLATE 50 WP	0.5 lb ai/A	PD	6.5 abc	100.0 a	6.5 a-d	1358.3 def	212.3 def		
BENLATE 50 WP	0.5 lb ai/A	PD & B & 75% H	4.3 fg	98.5 ab	5.8 b-e	1763.8 abc	617.8 abc	34.9 bc	56.8 abc
BENLATE 50 WP	0.5 lb ai/A	PD & 75% H	4.3 fg	74.8 c	5.3 de	1762.5 abc	616.5 abc		
BENLATE 50 WP	0.5 lb ai/A	50% H	5.0 def	98.0 ab	5.5 cde	1688.3 a-e	542.3 a-e	30.5 d	54.8 cd
BENLATE 50 WP	D.5 lb ai/A	100% H	5.8 bcd	98.0 ab	7.0 ab	2033.3 a	887.3 a	41.0 a	58.8 a
BENLATE 50 WP	0.75 lb ai/A	75% H	4.5 efg	99.0 ab	5.8 b-e	1654.3 a-e	508.3 a-e	32.6 cd	55.9 bc
BENLATE 50 WP	1.00 lb ai/A	75% H	4.5 efg	98.0 ab	5.8 b-e	1880.3 ab	734.3 ab	37.3 ab	57.8 ab
BENLATE 50 WP	1.00 lb ai/A	B & 75% H	3.0 h	97.5 ab	5.5 cde	2043.0 a	897.0 a		
BENLATE 50 WP	0.50 lb ai/A	100% H+5 DAYS 1TR	6.5 abc	96.3 abc	7.0 ab	1297.8 ef	151.8 ef		
BENLATE 50 WP	0.50 lb ai/A	100% H+10 DAYS 1T	6.8 ab	99.0 ab	7.0 ab	1173.8 f	27.8 f		
BENLATE 50 WP	0.50 lb ai/A	100% H+15 DAYS 1T	6.3 abc	100.0 a	6.5 a-d	1504.0 b-f	358.0 b-f		
BENLATE 50 WP	0.50 lb ai/A	PD & 50% H	4.5 efg	99.3 a	6.8 abc	1738.8 a-d	592.8 a-d	34.8 bc	56.1 abc
BENLATE 50 WP	0.25 lb ai/A	PD & B & H	4.0 fgh	99.8 a	5.5 cde	1831.3 ab	685.3 ab		
BEAM 75 WP	0.25 lb ai/A	B & 75% H	3.5 gh	76.8 bc	6.3 a-e	1746.8 a-d	600.8 a-d	38.3 ab	58.4 ab
LSD (.05) =			1.2	21.3	1.2	371.3	371.3	4.3	2.6
Standard Dev.=			0.81	14.90	0.87	259.81		2.96	1.82
CV =			16.17	15.47	13.94	15.95		8.73	3.26

Means followed by same letter do not significantly differ (P=.05, Duncan's MRT). Treatment 1 is the standard/comparison treatment.

[1] PD = Panicle Differentiation = Boot, H = 75% Heading, EH = Early (5%) Heading, #%H = percent heading, and EH+10 = 10 days after EH.

[2] Sterility was rated using a 0-9 scale where 0 indicated no sterile seeds and 9 indicated 90-100% of the seeds sterile.

[3] Rotten neck blast was the percent of the heads with rotten neck blast.

[4] Severity was rated using a 0-9 scale where 0 indicated no blast and 9 indicated 90-100% of the plant tissues in the plots completely was dead.

1994 ICIA5504 BLAST TRIAL

Location: Rice Research Station, Crowley, LA

Soil Type: Crowley silt loam

Variety/Seed Rate: M201, 120 lb/A

Planting Method/Date: Kincaid cone planter (drill-seeded), Apr 29

Emergence Date: May 11

Fertilization: Preplant 16-48-48, Apr 29; preflood 120-0-0, May 24

Plot Size: 4 x 16 ft

Experimental Design: Randomized block design with four replications

Water Management: Flushed, May 11; permanent flood, May 24

Herbicides: 4 qt Propanil/A, May 26; 3 qt Arrosolo + 1 qt Basagran, June 3; 1.5 oz/A Londax, June 17

Insecticides: Furadan 17 lb/A, June 14; Sevin 2 pt/A, July 22

Fungicides: Boot (B), June 27; 5% heading (5% H), July 1; 50% heading (50% H), July 6; 75% heading (75% H), July 7; 95% headed (95% H), July 9

Application Equipment: CO_2 backpack sprayer, 8002 tips, 15 gal/A

Drained: July 27

Harvest: Aug 12

Disease Ratings: Blast data taken, Aug 11

Results: See Table 20.

Comments: Blast severity was extremely high; other diseases were low. Leaf blast killed some rice plants before any fungicides were applied. Yield potential was low due to severe blast. Rain occurred 1 hr after the 95% heading treatments were applied.

Table 20. Effect of ICIA5504 fungicide on rotten neck blast control, rice yield, and milling on the variety M201.

Treatment	Rate	Timing[1]	Sterility[2] (0-9)	Neck blast[3] (%)	Blast Severity[4] (0-9)	Yield (lb/A)	Change Check (lb/A)	Milling Whole (%)	Milling Total (%)
UNSPRAYED CHECK			6.3 a	100.0 a	6.8 a	1208.3 g	0.3 g	28.0 g	52.4 e
ICIA5504 80 WG	0.4 lb ai/A	5% H	3.5 b-e	99.0 ab	6.8 a	1449.5 fg	241.5 fg	34.2 f	56.7 d
ICIA5504 80 WG	0.4 lb ai/A	50% H	3.8 bcd	97.0 abc	6.5 ab	1557.5 efg	349.5 efg	45.1 cd	62.0 ab
ICIA5504 80 WG	0.4 lb ai/A	95% H	4.8 b	89.8 de	5.5 abc	2013.5 a-e	805.5 a-e	46.8 bc	62.8 ab
ICIA5504 80 WG	0.1 lb ai/A	5% H + 95% H	4.0 bc	96.3 abc	5.0 abc	1926.5 a-e	718.5 a-e	41.8 de	60.9 bc
ICIA5504 80 WG	0.15 lb ai/A	5% H + 95% H	1.8 f	93.5 bcd	4.8 bc	2019.5 a-d	811.5 a-d		
ICIA5504 80 WG	0.20 lb ai/A	5% H + 95% H	3.0 c-f	91.8 cde	5.5 abc	2154.0 ab	946.0 ab	46.8 abc	62.3 ab
ICIA5504 80 WG	0.25 lb ai/A	5% H + 95% H	2.0 f	91.8 cde	5.5 abc	1963.3 a-e	755.3 a-e		
ICIA5504 80 WG	0.30 lb ai/A	5% H + 95% H	1.8 f	81.8 f	4.8 bc	2207.3 a	999.3 a	49.6 ab	63.7 a
ICIA5504 80 WG ICIA5504 80 WG	0.2 lb ai/A 0.1 lb ai/A	5% H 95% H	2.3 ef	95.0 a-d	5.0 abc	2068.8 abc	860.8 abc		
ICIA5504 80 WG ICIA5504 80 WG	0.25 lb ai/A 0.15 lb ai/A	5% H 95% H	3.0 c-f	94.8 a-d	6.3 abc	1704.8 b-f	496.8 b-f		
ICIA5504 80 WG ICIA5504 80 WG	0.3 lb ai/A 0.15 lb ai/A	5% H 95% H	2.0 f	91.3 cde	5.5 abc	2119.3 ab	911.3 ab		
ICIA5504 80 WG ICIA5504 80 WG	0.3 lb ai/A 0.2 lb ai/A	5% H 95% H	2.5 def	90.0 de	5.0 abc	2071.0 abc	863.0 abc		
ICIA5504 80 WG ICIA5504 80 WG	0.1 lb ai/A 0.2 lb ai/A	5% H 95% H	2.5 def	91.5 cde	6.0 abc	1954.5 a-e	746.5 a-e		
ICIA5504 80 WG ICIA5504 80 WG	0.2 lb ai/A 0.3 lb ai/A	5% H 95% H	3.0 c-f	86.3 ef	4.8 bc	2358.8 a	1150.8 a	51.0 a	64.1 a
ICIA5504 80 WG	0.25 lb ai/A	B + 75% H	2.5 def	96.8 abc	5.0 abc	2075.5 abc	867.5 abc	41.2 de	60.7 bc
BENLATE 50 WP	0.5 lb ai/A	B + 75% H	3.0 c-f	99.3 ab	5.0 abc	1590.3 d-g	382.3 d-g	38.6 e	58.7 cd
BENLATE 50 WP	1.0 lb ai/A	B + 95% H	2.3 ef	96.5 abc	4.5 c	2185.5 a	977.5 a		
BENLATE 50 WP	1.0 lb ai/A	95% H	4.5 b	98.8 ab	5.5 abc	1646.0 c-g	438.0 c-g		
LSD (.05) =			1.2	5.5	1.8	431.2	431.2	4.3	2.5
Standard Dev.=			0.86	3.88	1.30	304.938		2.92	1.69
CV =			27.92	4.14	23.81	15.97		6.90	2.80

[1] B = Boot, and #% H = Percent Heading growth stages.
[2] Sterility was rated using a 0-9 scale where 0 indicated no sterile seeds and 9 indicated 90-100% of seeds were sterile.
[3] Rotten neck blast was the percent of heads with rotten neck blast.
[4] Severity was rated using a 0-9 scale where 0 indicated no blast and 9 indicated plant tissue in the plots was completely dead.

1994 ICIA5504 TIMING AND RATE TRIAL FOR SHEATH BLIGHT AND BLAST CONTROL

Location: Rice Research Station, Crowley, LA

Soil Type: Crowley silt loam

Variety/Seed Rate: Lemont, 120 lb/A

Planting Method/Date: Kincaid cone planter (drill-seeded), May 11

Emergence Date: May 18

Fertilization: Preplant 31-94-94, May 11; preflood 120-0-0, June 26; 46-0-0, July 7

Plot Size: 4 x 16 ft

Water Management: Flushed, May 24; permanent flood, June 7

Herbicides: 4 qt Propanil, May 19; 3 qt Arrosolo + 1 qt Basagran/A, June 3; 1.5 oz/A Londax, June 17

Insecticides: Furadan 17 lb/A, June 14; Sevin 2 pt/A, July 22

Fungicides: Applied at panicle initiation (PI), July 6; PI + 14 days, July 19; PI + 21 days, July 26; PI + 28 days, Aug 3; late boot (B), July 27; and 50% heading (H), Aug 8

Application Equipment: CO_2 backpack sprayer, 8002 tips, 15 gal/A

Inoculation Dates: Inoculated for sheath blight, June 20 (125 ml/plot)

Drained: Aug 29

Harvest: Sep 13

Experimental Design: Randomized block design with four replications

Disease Ratings: Sheath blight severity (0-9), July 21 (about PD) and Sept 9 (maturity); infestation levels (% tillers infected), Sept 7; Blast % rotten neck blast (RNB), Sept 9; leaf smut and narrow brown leaf spot (0-9), Sept 9

Results: See Table 21.

Comments: Sheath blight severity was high, especially early in the season, with rapid development just after PI. Blast was very severe, with over 75% of the heads with rotten neck blast in the unsprayed check. Narrow brown spot and leaf smut were both moderate in severity.

Table 21a. Effects of rice foliar fungicides on sheath blight, leaf smut, narrow brown leaf spot and rotten neck blast control. Rice Research Station, Crowley, LA. 1994.

Treatment	Rate	Timing[1]	Sheath blight Severity (0-9)[2] Aug 6	Sheath blight Severity (0-9)[2] Aug 20	Sheath blight Tillers[3] infected (%)	Leaf[2] smut (0-9)	Narrow[2] Brown Spot (0-9)	Neck[4] Blast (%)
INOCUL-UNSPRAYED CK			6.8 ab	7.3 a	95.3 a	5.5 ab	5.8 a	76.5 abc
ROVRAL 4 SC	0.5 lb ai/A	B & H	6.5 ab	5.8 bc	67.5 bcd	5.3 abc	5.3 ab	86.0 a
ICIA5504 80 WG	0.1 lb ai/A	PI	3.8 cd	7.3 a	69.5 bc	5.3 abc	5.3 ab	74.0 abc
ICIA5504 80 WG	0.1 lb ai/A	PI+14	6.0 b	6.0 b	70.0 bc	5.8 a	5.3 ab	80.5 ab
ICIA5504 80 WG	0.1 lb ai/A	PI+21	6.5 ab	5.5 bc	64.8 b-e	3.8 efg	5.3 ab	63.0 bcd
ICIA5504 80 WG	0.1 lb ai/A	PI+28	6.8 ab	5.3 bc	71.3 b	3.0 ghi	4.3 b	43.5 de
ICIA5504 80 WG	0.1 lb ai/A	PI & PI+14	3.8 cd	5.0 bc	55.8 b-f	4.8 a-e	5.0 ab	81.0 ab
ICIA5504 80 WG	0.2 lb ai/A	PI	3.3 d	6.0 b	41.3 f	5.0 a-d	5.0 ab	63.0 bcd
ICIA5504 80 WG	0.2 lb ai/A	PI+14	6.8 ab	5.3 bc	58.5 b-e	4.5 b-f	5.5 ab	76.5 abc
ICIA5504 80 WG	0.2 lb ai/A	PI+21	6.0 b	5.3 bc	60.8 b-e	2.0 i	4.3 b	46.5 de
ICIA5504 80 WG	0.2 lb ai/A	PI+28	6.5 ab	5.3 bc	67.8 bcd	3.5 fgh	4.5 ab	32.0 e
ICIA5504 80 WG	0.2 lb ai/A	PI & PI+14	4.5 c	4.8 c	49.0 ef	4.0 d-g	5.0 ab	76.0 abc
ICIA5504 80 WG	0.3 lb ai/A	PI	3.5 cd	6.0 b	52.8 def	5.3 abc	5.5 ab	76.5 abc
ICIA5504 80 WG	0.3 lb ai/A	PI+14	6.5 ab	5.0 bc	51.8 def	4.3 c-f	5.5 ab	72.0 abc
ICIA5504 80 WG	0.3 lb ai/A	PI+21	6.8 ab	5.0 bc	54.5 c-f	2.5 hi	4.5 ab	56.0 cd
ICIA5504 80 WG	0.3 lb ai/A	PI+28	7.3 a	4.8 c	57.8 b-f	3.0 ghi	5.0 ab	34.0 e
LSD (.05) =			1.0	1.1	15.7	1.2	1.2	21.4
Standard Dev.=			0.69	0.80	10.96	0.81	0.85	14.95
CV =			12.19	14.29	17.75	19.17	16.76	23.06

Means followed by same letter do not significantly differ (P=.05, Duncan's MRT).
Treatment 1 is the standard/comparison treatment.
[1] PI = Panicle Initiation, PI+# = # days after PI, B = Boot, and H = Heading growth stages.
[2] Severity was rated using a 0-9 scale where 0 indicated no disease and 9 indicated plants dead and collapsed.
[3] Tillers infected was the percent tillers infected with sheath blight.
[4] Neck blast was the percent of heads infected with rotten neck blast.

Table 21b. Effects of rice foliar fungicides on rice yield and milling. Rice Research Station, Crowley, LA. 1994.

Treatment	Rate	Timing[1]	Yield (lb/A)	Yield Increase (lb/A)	Milling Whole (%)	Milling Total (%)
INOCUL-UNSPRAYED CK			3855.3 i	0.3 i	46.7 fgh	63.6 cde
ROVRAL 4 SC	0.5 lb ai/A	B & H	4091.8 hi	236.8 hi	45.1 b	63.5 cde
ICIA5504 80 WG	0.1 lb ai/A	PI	4269.0 ghi	414.0 ghi	44.7 h	62.9 e
ICIA5504 80 WG	0.1 lb ai/A	PI+14	4420.0 fgh	565.0 fgh	47.5 e-h	64.0 cde
ICIA5504 80 WG	0.1 lb ai/A	PI+21	4702.5 c-g	847.5 c-g	49.7 def	64.8 bcd
ICIA5504 80 WG	0.1 lb ai/A	PI+28	4857.5 b-f	1002.5 b-f	53.3 abc	65.9 ab
ICIA5504 80 WG	0.1 lb ai/A	PI & PI+14	4561.8 efg	706.8 efg	45.5 gh	63.4 cde
ICIA5504 80 WG	0.2 lb ai/A	PI	4673.8 d-g	818.8 d-g	45.3 h	63.5 cde
ICIA5504 80 WG	0.2 lb ai/A	PI+14	4749.5 c-f	894.5 c-f	47.3 e-h	63.9 cde
ICIA5504 80 WG	0.2 lb ai/A	PI+21	5002.8 b-e	1147.8 b-e	52.2 cd	64.9 bc
ICIA5504 80 WG	0.2 lb ai/A	PI+28	5226.5 ab	1371.5 ab	55.2 ab	66.4 a
ICIA5504 80 WG	0.2 lb ai/A	PI & PI+14	5044.5 bcd	1189.5 bcd	49.9 de	64.6 bcd
ICIA5504 80 WG	0.3 lb ai/A	PI	4467.8 fgh	612.8 fgh	47.0 g-h	63.4 de
ICIA5504 80 WG	0.3 lb ai/A	PI+14	4689.0 c-g	834.0 c-g	48.5 efg	64.0 cde
ICIA5504 80 WG	0.3 lb ai/A	PI+21	5127.0 bc	1272.0 bc	52.9 bc	66.0 ab
ICIA5504 80 WG	0.3 lb ai/A	PI+28	5559.8 a	1704.8 a	55.9 a	67.1 a
LSD (.05) =			421.3	421.3	2.8	1.5
Standard Dev.=			294.83		1.99	1.02
CV =			6.26		4.05	1.58

Means followed by same letter do not significantly differ (P=.05, Duncan's MRT).
Treatment 1 is the standard/comparison treatment.

1994 OFF-STATION MONCUT FORMULATION EVALUATION

Location: Errol Lounsberry Farm, Lake Arthur, LA

Soil Type: Crowley silt loam

Variety/Seed Rate: Cypress, 150 lb/A

Planting Method/Date: Water-seeded, Mar 29

Emergence Date: Apr 7

Fertilization: 90-0-0 preplant, Mar 25; second crop 75-0-0, July 29

Plot Size: 8 x 25 ft

Water Management: Flooded, Mar 26; drained, Apr 3; reflooded, Apr 8

Herbicides: 1.8 oz Londax/A, Apr 28

Insecticides: Furadan 17 lb/A, May 11

Fungicides: See Table 22.

Application Equipment: CO_2 pressurized backpack sprayer

Inoculation Dates: Inoculated for sheath blight, May 20 (300 ml/plot)

Drained: July 11; second crop, Oct 8

Harvest: July 28; second crop, Oct 31

Experimental Design: Randomized block with four replications

Disease Ratings: Sheath blight severity (0-9) and incidence (%), July 19; tiller counts, June 9 and Sept 7; sheath blight ratings, July 19

Results: See Table 22.

Comments: Sheath blight severity was high in inoculated plots.

Table 22. Evaluation of Moncut formulations for sheath blight control and effects on first and second crop yields. Errol Lounsberry Farm, Lake Arthur, LA. 1994.

	Sheath blight[1] severity (0-9)	Sheath blight[2] incidence (%)	First crop Yield (lb/A)	Second crop Stand	Second crop Yield (lb/A)
Unsprayed Check	7.0 a	70.0	4740 a	10.8 b	2057 a
Moncut 50 WP	5.8 b	43.5	5017 a	13.5 a	1942 a
Moncut 70 WP	4.8 b	22.0	5153 a	14.8 a	1906 a
Moncut 70 DF	5.5 b	49.0	5182 a	14.0 a	2020 a
LSD (0.05) =	1.3	29.5	NS	2.3	NS
Standard Dev. =	0.8	18.4	381	114	113
CV =	13.6	39.9	7.6	10.7	5.7

[1] Severity was rated using a 0-9 scale where 0 indicated no disease and 9 indicated plants dead and collapsed.
[2] Tillers infected was the percent tillers infected with sheath blight.

1994 FUNGUS X HERBICIDE INTERACTION

Location: Rice Research Station, Crowley, LA

Soil Type: Crowley silt loam

Variety/Seed Rate: Mars, 120 lb/A

Planting Method/Date: Water-seeded, May 27

Fertilization: Preplant 92-48-48, May 24

Plot Size: 6 x 20 ft

Water Management: Flooded, May 26

Herbicides: Londax 1.5 oz/A June 7; See Table 25

Application Equipment: CO_2 backpack sprayer, 8002 tips, 15 gal/A

Insecticides: 17 lb/A Furadan, June 14; Sevin 2 pt/A, July 22

Fungicides: None

Drained: Oct 1

Harvest: Oct 13

Experimental Design: Factorial with four replications

Data Collected: Plant heights, Aug 1; plant stands, Oct 5

Results: See Table 25.

Comments: Stands were very thin due to hot weather during seedling establishment. Most damage was confined to the center of the plots. Some drift of the fungus was evident. Many of the plants that showed "fish-hook" tillering died and were not included in percent stunted plants and average plant heights.

Table 25. The effect of Bolero herbicide and soil applied fungus on plant stand densities, agronomic characters and yield. Rice Research Station, Crowley, LA. 1994.

Treatment	Stand (pl/ft^2)	Plant height (cm)	Percent stunted plants	Yield (lb/A)
Untreated Check	6.5 ab	72 a	1.3 b	2315 a
Fungus Applied to soil	7.0 a	74 a	2.5 b	2716 a
Bolero 8 EC 2 qt/A	5.8 ab	72 a	7.5 ab	1556 b
Bolero 8 EC + Fungus	4.3 b	70 a	16.3 a	1679 b
LSD (0.05) =	1.9	NS	10.4	630
Standard Dev. =	1.2	4.7	6.5	394.1
CV =	20.7	6.5	94.7	19.1

DEVELOPMENT OF SHEATH BLIGHT RESISTANCE IN RICE[1]

M.C. Rush, Q.J. Xie, S.D. Linscombe, X.B. Pan, J.H. Oard, and S.R. Erwin

SUMMARY

New procedures were established that have proven highly successful for transitory transformation with the GUS gene. Transformation experiments for Ignite and hygromycin resistance are continuing. Materials from our program that have disease resistance and promising agronomic characteristics have been used as parents in crosses made by the rice breeding program. In 1994, the rice breeding program planted three of our lines in the Uniform Yield Nursery, six lines in the Preliminary Yield Nursery, and 23 lines in the Single Plot Nursery. We planted 10,000 panicle rows or bulked-seed rows at the Rice Research Station in Crowley. Planted were 3582 F_3 panicle rows from collections in 28 F_2 populations in 1993; 2204 F_2 rows from F_1 seeds produced in the greenhouse from 101 crosses made during the summer and fall of 1993; 1800 panicle rows of F_{7-9} lines from crosses of Lemont or Labelle with LSBR-5 or LSBR-33, our sheath blight resistant somaclones; and the rest of the rows were check varieties, new sources of sheath blight resistance, and miscellaneous germplasms for use in future crosses. Panicles (12,000) were collected from the F_2 populations and F_3 panicle rows to plant and test F_3 and F_4 panicle rows in 1995 for disease resistance (sheath blight and blast) and agronomic suitability. More than 300 crosses were made in 1994 as part of a modified recurrent selection scheme to incorporate sheath blight and blast resistance from several sources into a set of lines with desirable agronomic characteristics.

INTRODUCTION

The sheath blight resistant somaclone derived elite lines LSBR-5 and LSBR-33 were used in crosses with the long-grain cultivars Labelle and Lemont in the late 1980s (4). Panicle rows from these crosses were evaluated through the F_8 generation for sheath blight resistance, agronomic acceptability, and yield potential. Selected lines were passed on to the rice breeding program at the Rice Research Station for yield testing and further selection. Selected lines from these crosses were also used in crosses with commercial varieties and other sources of sheath blight resistance (2). In 1993, crosses included several other variety sources of high levels of partial resistance to sheath blight (3). The intent of the current program is to determine the inheritance of high levels of partial resistance to sheath blight in selected varieties and lines, to transfer genes conferring partial resistance to lines typical of American long-grain types; and where major genes giving additive effects are involved, to combine through a modified recurrent selection program these resistance genes into lines with acceptable quality and yield potential. These lines will be further tested in the rice breeding program for use as resistance sources.

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[1] This research was supported in part by funds provided by rice producers through the Louisiana Rice Research Board.

Additional research under this project includes transformation of resistance sources with marker genes to make transfer of resistance more efficient and development of a red rice source of resistance to narrow brown leaf spot through use of direct *in vivo* screening of progeny with the toxin cercosporin.

All lines field-tested have also been screened for rice blast resistance through the use of blast spreader rows throughout the plot area.

METHODS

Sheath Blight Resistance Studies

The resistance sources presently being used include those listed in Table 1 and numerous lines derived from past crosses with LSBR-5 and LSBR-33.

The sheath blight reactions of selected resistance sources and commercial varieties are given in Table 2.

In 1994, segregating F_2 populations from the crosses MBLE/JSMN 85, JSMN 85/TQNG, TQNG/CPRS, and MBLE/TQNG were inoculated with *Rhizoctonia solani*, and 200 to 400 individual plants from each population were rated for sheath blight using the standard 0-9 rating scale (1). Panicles from apparently resistant plants were collected for planting F_3 panicle rows in 1995.

About 350 additional crosses were made in 1994 with various resistance sources and commercial varieties (Table 3). These crosses were made as part of the recurrent selection program and for inheritance studies.

1994 Panicle Rows

About 10,000 panicle rows were planted in 1994 at the Rice Research Station. Planted were 3,582 F_3 rows from collections in 28 F_2 populations grown in 1993; 2,204 F_2 rows from F_1 seeds produced in the greenhouse from 101 crosses made during the summer and fall of 1993; 1,800 panicle rows of F_{7-8} lines from crosses of Lemont or Labelle with LSBR-5 or LSBR-33, our sheath blight resistant somaclones; and the rest of the rows were check varieties, sheath blight resistance sources, and miscellaneous germplasms for use in future studies.

Transformation Studies

New procedures were established for transformation with the BioRad PDS-1000/He gun. Procedures included modifying the helium pressure, sample distance, DNA precipitation methods and DNA load, and improvement of the calli used for transformation. Transformation experiments for Ignite and hygromycin resistance were continued.

Table 1. Sources of partial resistance to the rice sheath blight disease.

Source	Inheritance of Resistance
Tetep	quantitative
Taducan	?
LSBR-5	single recessive gene
LSBR-33	two recessive genes
RXCL	?
Rice-grass	?
H_4/CODF	?
Jasmine-85	single dominant gene (?)
Tequing	single dominant gene plus modifying genes (?)
LBSC: 86-30344 (resistant Labelle somaclone)	?

Table 2. Disease reactions of major cultivars and resistance sources.

Source	Disease Rating (0-9)	Infection Cushions per cm^2	Lobate Appressoria per cm^2
LMNT	7.8 ab	45 a	697 a
MBLE	7.5 ab	31 abc	239 f
CPRS	7.3 ab	25 bc	594 c
JODN	7.0 b	47 a	537 d
KATY	5.0 c	23 c	492 e
BNGL	4.5 cd	---	---
RXCL	4.0 cde	17 cd	188 g
TQNG	3.8 de	3 d	53 i
LSBR-5	3.3 e	18 cd	100 h
JSMN 85	3.0 f	4 d	36 i
TDCN*	1.6	0	54
TTEP*	1.7	0	52

* Data from tests conducted 1978-79 (Marshall, D.S. and M.C. Rush. 1980. Relation between infection by *Rhizoctonia solani* and *R. oryzae* and disease severity in rice. Phytopathology 70:941-946.

Table 3. Crosses among sheath blight resistance sources and commercial varieties made in 1994.

Cross No.	Parent Female	Parent Male	Date of Cross	Number of Seeds
I. CROSSES WITH F_3 LINES:				
152	BNGL	94-0492	7-19-94	1
153	BNGL	94-2307	7-19-94	9
154	BNGL	94-2518	7-19-94	8
155	CPRS	94-0337	7-19-94	9
156	CPRS	94-0481	7-05-94	3
157	CPRS	94-0492	7-19-94	14
158	CPRS	94-0507	7-19-94	11
159	CPRS	94-0538	7-05-94	4
160	CPRS	94-0987	7-04-94	30
161	CPRS	94-1139	7-04-94	20
162	CPRS	94-1278	7-05-94	8
163	CPRS	94-1383	7-04-94	9
164	CPRS	94-1402	7-05-94	17
165	CPRS	94-1868	7-05-94	10
166	CPRS	94-2307	7-19-94	8
167	CPRS	94-2518	7-19-94	8
168	CPRS	94-3446	7-05-94	10
169	CPRS	94-3602	7-04-94	22
170	CPRS	94-3643	7-04-94	15
171	CPRS	94-3663	7-04-94	7
172	CPRS	94-3773	7-05-94	17
173	GCHW	94-0004	7-11-94	12
174	GCHW	94-0414	7-11-94	17
175	GCHW	94-2008	7-11-94	21
176	GCHW	94-2515	7-11-94	14
177	GCHW	94-3172	7-11-94	9
178	GCHW	94-3174	7-11-94	13
179	GCHW	94-3469	7-11-94	24
180	JODN	94-0481	7-04-94	29
181	JODN	94-0987	6-30-94	5
182	JODN	94-1073	6-30-94	23
183	JODN	94-1139	6-30-94	24
184	JODN	94-3602	6-30-94	17
185	JODN	94-3656	6-30-94	9
186	KATY	94-0004	7-08-94	10

Continued.

Table 3. Continued.

Cross No.	Parent Female	Parent Male	Date of Cross	Number of Seeds
187	KATY	94-0044	7-05-94	9
188	KATY	94-0408	7-08-94	22
189	KATY	94-0987	7-05-94	12
190	KATY	94-1017	7-05-94	14
191	KATY	94-1278	7-05-94	25
192	KATY	94-1337	7-05-94	15
193	KATY	94-1383	7-05-94	16
194	KATY	94-2008	7-05-94	22
195	KATY	94-2106	7-08-94	3
196	KATY	94-3172	7-08-94	9
197	KATY	94-3446	7-05-94	14
198	KATY	94-3773	7-05-94	15
199	KATY	94-3789	7-05-94	9
200	LEAH	94-0044	7-05-94	20
201	LEAH	94-0278	7-05-94	13
202	LEAH	94-0481	7-05-94	24
203	LEAH	94-0863	7-05-94	21
204	LEAH	94-0987	7-05-94	20
205	LEAH	94-1383	7-05-94	28
206	LEAH	94-1402	7-05-94	13
207	LEAH	94-1868	7-05-94	18
208	LEAH	94-3602	7-05-94	28
209	LEAH	94-3773	7-05-94	24
210	LEAH	94-3789	7-05-94	17
211	LEAH	94-3799	7-05-94	24
212	LMNT	94-0004	7-08-94	4
213	LMNT	94-0016	7-13-94	12
214	LMNT	94-0414	7-13-94	17
215	LMNT	94-0519	7-13-94	21
216	LMNT	94-0532	7-08-94	8
217	LMNT	94-1017	7-04-94	11
218	LMNT	94-1139	7-04-94	16
219	LMNT	94-1284	7-04-94	13
220	LMNT	94-1337	7-13-94	16
221	LMNT	94-1383	7-04-94	15
222	LMNT	94-2008	7-08-94	22
223	LMNT	94-2106	7-08-94	18

Continued.

Table 3. Continued.

Cross No.	Parent Female	Parent Male	Date of Cross	Number of Seeds
224	LMNT	94-2515	7-08-94	7
225	LMNT	94-2747	7-13-94	19
226	LMNT	94-3172	7-08-94	20
227	LMNT	94-3446	7-08-94	16
228	LMNT	94-3551	7-13-94	3
229	LMNT	94-3602	7-04-94	14
230	LMNT	94-3643	7-04-94	14
231	LMNT	94-3644	7-04-94	11
232	LMNT	94-3656	7-04-94	17
233	LMNT	94-3663	7-04-94	7
234	LMNT	94-3743	7-08-94	5
235	MBLE	94-0278	7-07-94	11
236	MBLE	94-0481	7-07-94	14
237	MBLE	94-0532	7-07-94	16
238	MBLE	94-1379	7-07-94	18
239	MBLE	94-1383	6-30-94	2
240	MBLE	94-1402	7-07-94	10
241	MBLE	94-1797	7-07-94	1
242	MBLE	94-1852	7-07-94	2
243	MBLE	94-2591	7-07-94	3
244	MBLE	94-3789	7-07-94	3
245	RXCL	94-0004	7-08-94	12
246	RXCL	94-0096	7-08-94	11
247	RXCL	94-0378	7-13-94	4
248	RXCL	94-0408	7-13-94	4
249	RXCL	94-1017	7-04-94	5
250	RXCL	94-1383	7-04-94	17
251	RXCL	94-2008	7-08-94	16
252	RXCL	94-2106	7-08-94	21
253	RXCL	94-2591	7-07-94	12
254	RXCL	94-2747	7-13-94	6
255	RXCL	94-3172	7-08-94	13
256	RXCL	94-3446	7-07-94	8
257	RXCL	94-3469	7-07-94	8
258	RXCL	94-3602	7-04-94	18
259	RXCL	94-3643	7-04-94	18
260	TQNG	94-0004	7-11-94	5

Continued.

Table 3. Continued.

Cross No.	Parent Female	Parent Male	Date of Cross	Number of Seeds
261	TQNG	94-0378	7-13-94	48
262	TQNG	94-0408	7-13-94	38
263	TQNG	94-0414	7-13-94	42
264	TQNG	94-1284	7-13-94	30
265	TQNG	94-2008	7-11-94	32
266	TQNG	94-2033	7-11-94	24
267	TQNG	94-2515	7-13-94	56
268	TQNG	94-2747	7-13-94	30
269	TQNG	94-3172	7-13-94	50
270	TQNG	94-3469	7-11-94	28
271	TQNG	94-3551	7-13-94	19
II CROSSES WITH F_2 PLANTS:				
1. Cultivars with F_2 plants:				
272	CPRS	93-C-058-1	7-30-94	13
273	CPRS	93-C-058-2	7-29-94	15
274	CPRS	93-C-058-3	7-30-94	14
275	CPRS	93-C-058-4	7-30-94	3
276	CPRS	93-C-057-1	7-29-94	14
277	CPRS	93-C-057-2	7-29-94	19
278	CPRS	93-C-057-3	7-29-94	16+31
279	CPRS	93-C-057-5	7-29-94	11
280	CPRS	93-C-071-1	7-27-94	19
281	CPRS	93-C-071-2	7-27-94	14
282	CPRS	93-C-071-3	7-27-94	21
283	CPRS	93-C-071-5	7-27-94	22
284	CPRS	93-C-071-7	7-30-94	2
285	CPRS	93-C-071-8	7-27-94	19
286	CPRS	93-C-071-9	7-27-94	10
287	CPRS	93-C-071-10	7-29-94	15
288	CPRS	93-C-093-1	7-29-94	25+10
289	CPRS	93-C-093-2	7-29-94	17
290	CPRS	93-C-093-3	7-29-94	23
291	CPRS	93-C-093-4	7-29-94	9
292	CPRS	93-C-093-5	7-29-94	20

Continued.

Table 3. Continued.

Cross No.	Parent Female	Parent Male	Date of Cross	Number of Seeds
293	CPRS	93-C-094-2	7-30-94	17
294	CPRS	93-C-094-3	7-30-94	1
295	CPRS	93-C-094-4	7-30-94	14
296	CPRS	93-C-094-5	7-29-94	22
297	CPRS	93-C-105-1	7-29-94	6
298	CPRS	93-C-105-2	7-29-94	14
299	CPRS	93-C-105-3	7-27-94	16+6
300	CPRS	93-C-105-4	7-27-94	13
301	CPRS	93-C-105-5	7-27-94	16
302	CPRS	93-C-117-1	7-29-94	17
303	CPRS	93-C-117-2	7-27-94	12
304	CPRS	93-C-117-3	7-29-94	10
305	CPRS	93-C-117-4	7-27-94	11
			7-30-94	7
306	CPRS	93-C-117-5	7-27-94	21
307	CPRS	93-C-118-2	7-27-94	22
308	CPRS	93-C-118-3	7-30-94	7
309	CPRS	93-C-118-4	7-29-94	15+11
310	CPRS	93-C-118-5	7-30-94	15+3
311	CPRS	93-C-118-7	7-29-94	7
312	CPRS	93-C-118-9	7-29-94	7
313	CPRS	93-C-118-10	7-29-94	15
314	CPRS	93-C-120-1	7-27-94	14+5
315	CPRS	93-C-120-2	7-27-94	7+18
316	CPRS	93-C-120-4	7-29-94	14
317	CPRS	93-C-120-5	7-29-94	6
318	CPRS	93-C-120-6	7-29-94	8
319	CPRS	93-C-120-7	7-29-94	12
320	CPRS	93-C-120-8	7-29-94	10
321	CPRS	93-C-120-9	8-03-94	21+20
322	CPRS	93-C-120-10	7-29-94	6
323	CPRS	93-C-123-1	7-27-94	14
324	CPRS	93-C-123-2	7-27-94	11
325	CPRS	93-C-123-3	7-27-94	9
326	CPRS	93-C-123-4	7-27-94	12
327	CPRS	93-C-123-5	7-27-94	12
328	CPRS	93-C-123-6	7-27-94	16

Continued.

Table 3. Continued.

Cross No.	Parent Female	Parent Male	Date of Cross	Number of Seeds
329	CPRS	93-C-123-7	7-27-94	7
330	CPRS	93-C-123-8	7-27-94	19
			7-30-94	2
331	CPRS	93-C-123-9	7-27-94	12
332	CPRS	93-C-123-10	7-27-94	13
333	CPRS	93-C-129-4	8-08-94	9
334	CPRS	93-C-131-1	8-08-94	12
335	CPRS	93-C-131-3	8-08-94	9
336	CPRS	93-C-131-4	8-08-94	26
337	CPRS	93-C-132-1	8-08-94	18
338	CPRS	93-C-132-2	8-08-94	12
339	CPRS	93-C-132-5	8-08-94	6
340	CPRS	93-C-137-1	8-08-94	18
341	CPRS	93-C-137-2	8-08-94	24
342	CPRS	93-C-137-3	8-08-94	15
343	CPRS	93-C-137-5	8-08-94	5
344	LMNT	93-C-057-1	7-30-94	6
345	LMNT	93-C-057-2	7-30-94	5
346	LMNT	93-C-057-5	7-30-94	13
347	LMNT	93-C-071-1	7-30-94	2
348	LMNT	93-C-071-3	7-30-94	13
349	LMNT	93-C-093-1	7-30-94	14
350	LMNT	93-C-093-2	7-30-94	15
351	LMNT	93-C-093-3	7-30-94	28
352	LMNT	93-C-094-5	7-30-94	17
353	LMNT	93-C-094-6	8-03-94	7
354	LMNT	93-C-094-7	8-03-94	10
355	LMNT	93-C-094-8	8-03-94	12
356	LMNT	93-C-094-9	8-03-94	7
357	LMNT	93-C-105-1	7-30-94	6
358	LMNT	93-C-105-5	7-30-94	2
359	LMNT	93-C-117-1	7-30-94	12
360	LMNT	93-C-117-2	7-30-94	14
361	LMNT	93-C-117-3	7-30-94	9
362	LMNT	93-C-117-5	7-30-94	13
363	LMNT	93-C-118-1	8-03-94	11
364	LMNT	93-C-118-3	8-03-94	14

Continued.

Table 3. Continued.

Cross No.	Parent Female	Parent Male	Date of Cross	Number of Seeds
365	LMNT	93-C-118-7	7-30-94	8
366	LMNT	93-C-118-9	7-30-94	19
367	LMNT	93-C-120-2	8-03-94	15
368	LMNT	93-C-120-10	7-30-94	12
369	LMNT	93-C-129-3	8-03-94	7
370	LMNT	93-C-129-5	8-03-94	11
371	LMNT	93-C-130-2	8-03-94	10
372	LMNT	93-C-130-3	8-03-94	11
373	LMNT	93-C-130-4	8-03-94	6
374	LMNT	93-C-130-5	8-03-94	13
375	LMNT	93-C-132-1	8-03-94	7
376	LMNT	93-C-132-2	8-03-94	7
377	LMNT	93-C-132-5	8-03-94	14
378	LMNT	93-C-137-2	8-03-94	15+19
379	LMNT	93-C-137-3	8-03-94	6
380	LMNT	93-C-137-4	8-03-94	13
381	LMNT	93-C-137-5	8-03-94	10
382	LMNT	93-C-139-1	8-03-94	5
383	LMNT	93-C-139-5	8-03-94	5
384	LMNT	93-C-141-1	8-03-94	9
385	LMNT	93-C-141-4	8-03-94	9
386	RXCL	93-C-094-9	8-07-94	3
387	RXCL	93-C-131-1	8-05-94	25
388	RXCL	93-C-132-1	8-05-94	15
389	RXCL	93-C-132-2	8-05-94	22
390	RXCL	93-C-132-4	8-05-94	25
391	RXCL	93-C-137-1	8-05-94	29
392	RXCL	93-C-137-2	8-05-94	35
393	RXCL	93-C-137-3	8-05-94	30
394	RXCL	93-C-139-3	8-05-94	10
395	TQNG	93-C-129-5	8-07-94	27
396	URN149	93-C-129-1	8-05-94	27
397	URN149	93-C-129-5	8-07-94	24
398	URN149	93-C-131-1	8-05-94	30
399	URN149	93-C-131-2	8-05-94	36
400	URN149	93-C-131-3	8-05-94	27
401	URN149	93-C-131-5	8-05-94	26

Continued.

Table 3. Continued.

Cross No.	Parent Female	Parent Male	Date of Cross	Number of Seeds
402	URN149	93-C-132-2	8-05-94	20
403	URN149	93-C-132-3	8-05-94	20
404	URN149	93-C-132-4	8-05-94	20
405	URN149	93-C-137-1	8-05-94	23
406	URN149	93-C-137-2	8-05-94	16
407	URN149	93-C-137-3	8-05-94	14
408	URN149	93-C-137-5	8-05-94	29
409	URN149	93-C-141-4	8-05-94	19
2. F_2 plants with F_2 plants:				
410	93-C-057-24	93-C-073-24	8-12-94	4
411	93-C-057-24	93-C-117-22	8-12-94	1
412	93-C-057-24	93-C-117-23	8-12-94	10
413	93-C-057-24	93-C-118-21	8-12-94	21
414	93-C-057-24	93-C-120-22	8-12-94	1
415	93-C-071-22	93-C-118-24	8-12-94	40
416	93-C-073-21	93-C-071-23	8-10-94	11
417	93-C-073-21	93-C-094-24	8-10-94	16
418	93-C-073-21	93-C-117-22	8-10-94	10
419	93-C-073-21	93-C-129-21	8-10-94	7
420	93-C-079-24	93-C-057-23	8-10-94	18
421	93-C-079-24	93-C-071-23	8-10-94	13
422	93-C-079-24	93-C-073-23	8-10-94	19
423	93-C-079-24	93-C-094-24	8-10-94	14
424	93-C-079-24	93-C-117-22	8-10-94	3
425	93-C-079-24	93-C-129-21	8-10-94	10
426	93-C-094-23	93-C-057-22	8-10-94	2
427	93-C-094-23	93-C-071-23	8-10-94	29
428	93-C-094-23	93-C-073-23	8-10-94	20
429	93-C-094-23	93-C-079-22	8-10-94	8
430	93-C-094-23	93-C-129-21	8-10-94	1
431	93-C-094-23	93-C-129-23	8-10-94	18
432	93-C-094-23	93-C-129-24	8-10-94	1
433	93-C-117-21	93-C-071-23	8-10-94	24
434	93-C-117-21	93-C-071-24	8-10-94	12
435	93-C-117-21	93-C-073-24	8-10-94	23

Continued.

Table 3. Continued.

Cross No.	Parent Female	Parent Male	Date of Cross	Number of Seeds
436	93-C-117-21	93-C-079-21	8-10-94	10
437	93-C-117-21	93-C-129-21	8-10-94	22
438	93-C-117-21	93-C-129-23	8-10-94	41
439	93-C-118-22	93-C-057-22	8-12-94	5
440	93-C-118-22	93-C-057-23	8-12-94	24
441	93-C-118-22	93-C-071-23	8-12-94	36
442	93-C-118-22	93-C-073-24	8-12-94	30
443	93-C-118-22	93-C-094-24	8-12-94	26
444	93-C-118-22	93-C-117-22	8-12-94	36
445	93-C-118-22	93-C-117-24	8-12-94	35
446	93-C-118-22	93-C-129-21	8-12-94	23
447	93-C-118-22	93-C-129-24	8-12-94	35
448	93-C-120-21	93-C-057-23	8-12-94	29
449	93-C-120-21	93-C-094-24	8-12-94	25
450	93-C-120-21	93-C-117-24	8-12-94	10
III. MISCELLANEOUS CROSSES:				
451	BNGL	GCHW	7-19-94	23
452	BNGL	TQNG	7-19-94	9
453	CPRS	GCHW	7-19-94	18
454	CPRS	URN149	8-08-94	9
455	GCHW	94-HB63	7-11-94	17
456	JODN	94-HB72	7-04-94	32
457	JODN	KATY	7-04-94	11
458	KATY	94-HB63	7-08-94	21
459	KATY	LMNT	7-08-94	14
460	LMNT	94-HB63	7-08-94	21
461	RXCL	94-HB63	7-07-94	18
			7-08-94	9
462	TQNG	94-HB63	7-11-94	19
463	URN149	GCHW	8-07-94	20
464	URN149	LMNT	8-07-94	10
465	URN149	RXCL	8-15-94	10
			8-07-94	53
466	URN149	TQNG	8-15-94	8

Continued.

Table 3. Continued.

Cross No.	Parent Female	Parent Male	Date of Cross	Number of Seeds
467	94-HB72	94-0006	7-06-94	33
468	94-HB72	94-0622	7-06-94	39
469	94-HB72	94-0863	7-06-94	18
470	94-HB72	94-0941	7-06-94	12
471	94-HB72	94-0987	7-06-94	9
472	94-HB72	94-1337	7-06-94	13
473	94-HB72	94-1402	7-06-94	20
474	94-HB72	94-3656	7-06-94	21
475	94-HB72	94-3663	7-06-94	20
476	94-HB72	CPRS	7-06-94	16
477	94-HB72	JODN	7-06-94	17
478	94-HB72	KATY	7-06-94	20
479	94-HB72	LSBR-5	7-06-94	35
480	TP309	TQNG	8-12-94	15
481	TQNG	TP309	8-12-94	60
V. CROSSES FOR GENETIC STUDIES:				
482	GCHW	JSMN 85	8-12-94	10
483	JSMN 85	GCHW	8-12-94	19
484	GCHW	LMNT	7-11-94	26
485	LMNT	GCHW	7-13-94	19
			7-14-94	52
			8-13-94	16
486	GCHW	RXCL	8-07-94	30
			8-12-94	20
487	RXCL	GCHW	8-07-94	20
488	GCHW	TQNG	8-07-94	25
489	TQNG	GCHW	8-07-94	53
490	JSMN 85	LMNT	8-12-94	13
491	LMNT	JSMN 85	8-13-94	27+15
492	JSMN 85	RXCL	8-12-94	23
493	RXCL	JSMN 85	8-12-94	19
494	JSMN 85	TQNG	8-12-94	42
495	TQNG	JSMN 85	8-12-94	47
496	LMNT	RXCL	7-14-94	57

Continued.

Table 3. Continued.

Cross No.	Parent Female	Parent Male	Date of Cross	Number of Seeds
497	RXCL	LMNT	7-07-94	25
			7-08-94	21
498	LMNT	TQNG	8-13-94	15
			7-14-94	34
			7-13-94	31
499	TQNG	LMNT	7-11-94	43
			7-13-94	49
500	LMNT	86-30344	8-15-94	13
			8-16-94	22
501	86-30344	LMNT	8-16-94	16
502	RXCL	TQNG	8-07-94	23
503	TQNG	RXCL	8-07-94	75
			8-12-94	51
504	86-30344	JSMN 85	8-15-94	50
505	86-3-344	TQNG	8-15-94	6

*94HB63 = Entry #63 in Steve Linscombe's hybridization block.
94HB72 = Entry #72 in Steve Linscombe's hybridization block.
86-30344 = The second sheath blight resistant somaclone from Labelle. We are just beginning to study its resistance. The third resistant somaclone from Labelle was mostly sterile and it has been lost.

F_2 plants used in crosses were indicated by giving the cross number and plant number from that cross -- example: 93-C-058-2, this means 1993 cross #58, plant (F_2) #2 from 1994 F_2 population. Please refer to 1993 list of crosses for the parents of cross 93-58.

Cercosporin Studies

Cercosporin purification procedures were improved. Research was conducted in cooperation with Dr. John Russin and Ms. X.L. Liu to demonstrate the purity of the cercosporin isolated and to determine cercosporin concentrations toxic to rice, red rice, tomato, sorghum, corn, soybean, and radish. Isolates of *Cercospora* species from crops other than rice were obtained from the American Type Culture Collection for comparison of toxin production with *C. oryzae*.

Cooperation with the Rice Breeding Program

Most of the 1994 plots were planted by breeding program members and they assisted in maintaining the plots.

Three lines from our program with the URN numbers 71, 149, and 152 were planted in the 1994 URN and other advanced yield tests.

Seed from 1993 progeny rows were used to plant 23 entries in the 1994 breeding program single-plot yield test.

Forty-three progeny rows were harvested in 1994 for consideration for planting in the 1995 breeding program yield tests. These included 17 F_3 rows.

RESULTS AND DISCUSSION

Sheath Blight Resistance Studies

Rated F_2 plants from the cross MBLE/JSMN 85 gave a ratio of three resistant plants (0-5 rating) to one susceptible plant (6-9 rating) with a significant χ^2 ($P=0.25$-0.50) (Figure 1). This suggests that most of the partial resistance of JSMN 85 was controlled by a single dominant gene.

Rated F_2 plants from the cross MBLE/TQNG gave a significant ratio of three resistant to one susceptible plant (Figure 2). The cross TQNG/CPRS also gave a significant ratio of 3:1, resistant to susceptible, for sheath blight (Figure 3). These results suggest that most of the partial resistance of TQNG were controlled by a single dominant gene.

Rated F_2 plants from the cross JSMN 85/TQNG gave a ratio of 15 resistant to one susceptible plant with a significant χ^2 value of $P=0.10$-0.25 (Figure 4). This suggests that the dominant genes controlling sheath blight resistance in JSMN 85 and TQNG were not allelic. Many of the F_2 plants in this population had resistance levels higher than either parent. This suggests the gene effects were additive.

Crosses made in 1994 for inheritance studies are listed in Table 3.

Figure 1. Sheath blight reaction of 400 F_2 plants from the cross MBLE/JSMN 85.

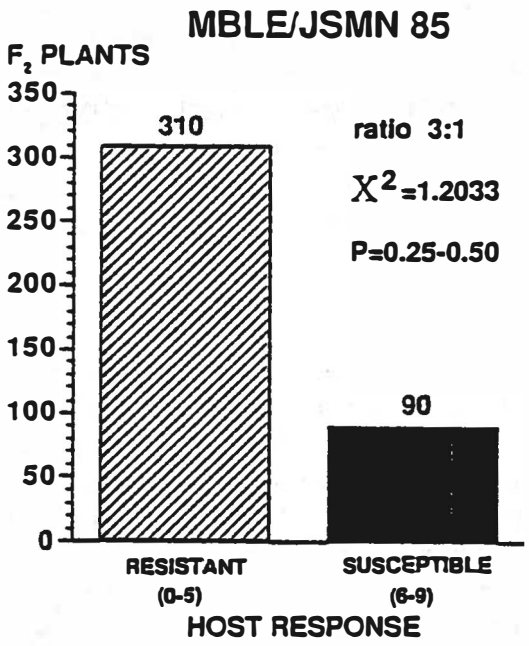


Figure 2. Sheath blight reaction of 400 F_2 plants from the cross MBLE/TQNG.

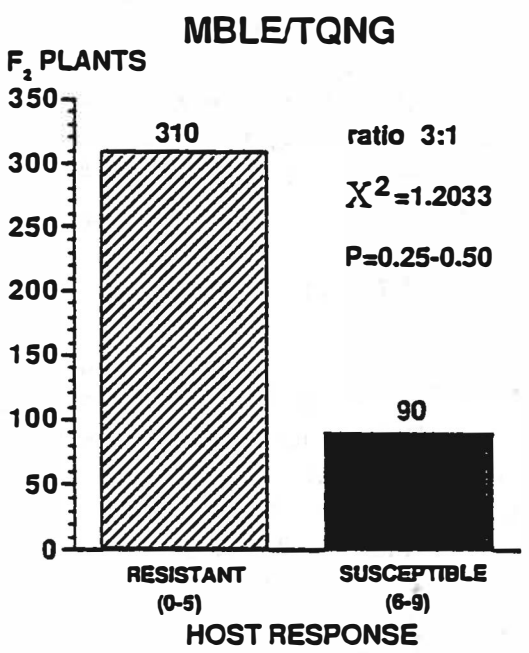


Figure 3. Sheath blight reaction of 399 F_2 plants from the cross TQNG/CPRS.

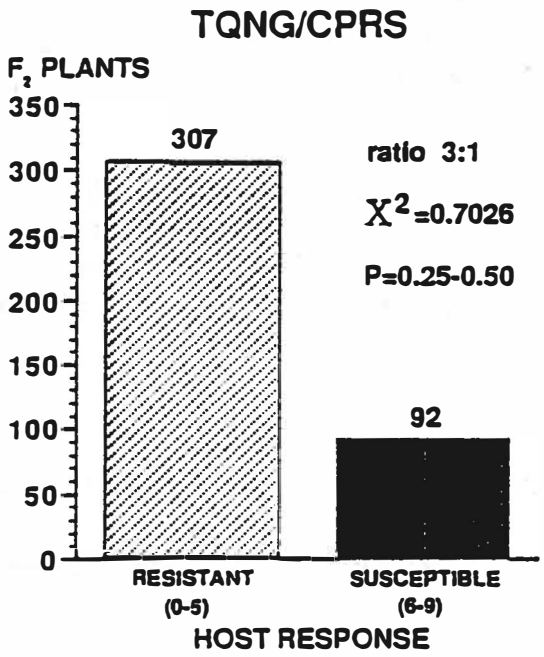
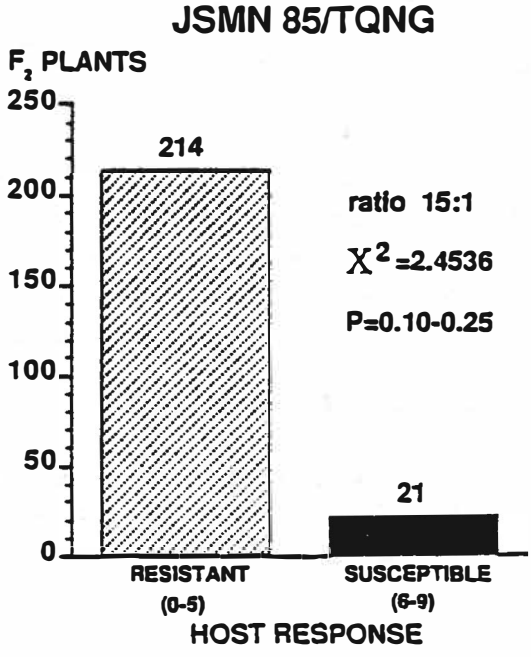


Figure 4. Sheath blight reaction of 235 F_2 plants from the cross JSMN 85/TQNG.



1994 Panicle Rows

About 12,000 panicles were harvested in 1994 for planting as progeny rows in 1995. Panicles from the 1994 F_3 rows were bulk harvested within each cross based on resistance and agronomic characteristics of F_3 rows and sometimes single plants within rows. Panicles were bulk harvested from F_2 populations based on apparent resistance of single plants. Single panicles were harvested from each of the 200 to 400 plants rated in the inheritance studies with the crosses MBLE/JSMN 85, MBLE/TQNG, TQNG/CPRS, and JSMN 85/TQNG. These panicles will be planted to screen the F_3 rows for sheath blight resistance so that the F_2 plant-F_3 row reactions can be compared. Additional panicles were collected from all of these crosses to generate long-grain, resistant F_3 lines.

Transformation Studies

Improvement in techniques associate with the use of biolistic transformation using the helium-driven PDS-1000/He system gave us an increase of efficiency in the transitory transformation test system using the GUS gene. More than 400 blue spots per callus plate were obtained. Using the improved techniques and rigorous screening for hygromycin resistance, more than 30 hygromycin resistant Taipei 309 plants were regenerated on medium containing 50 ppm hygromycin. Five of these plants were also resistant to Ignite in greenhouse tests. Seeds are being produced to test progeny for hygromycin and Ignite resistance. Plants resistant to Ignite in the greenhouse in 1993 did not pass the characteristic on to their progeny. If we can prove that we are transforming rice for resistance to either hygromycin or Ignite (bar gene), we can begin to transform our sheath blight resistance sources to try and mark major genes for resistance.

Cercosporin Studies

Initial screening of plants sprayed with cercosporin was only partially successful as the cercosporin was crystallizing out in the spray solutions and not taken up by the test plants. Tomato and cotton were especially sensitive to cercosporin. Further testing with different solvents is underway.

We have produced several hundred milligrams of cercosporin. We are trying to develop an assay that would allow us to select resistant progeny from the segregating population from a red rice x Labelle or red rice x Lemont cross. This would allow us to screen for resistance to narrow brown leaf spot in the greenhouse and to study the inheritance of the red rice resistance.

Cooperation with the Rice Breeding Program

In 1994, the rice breeding program planted three lines in the Uniform Yield Nursery, six lines in the Preliminary Yield Nursery, and 23 lines in the Single Plot Nursery from our program. In general, the sheath blight resistant test lines yielded with the check varieties.

Several lines generated by the rice breeding program, using the LSBR-5 source of resistance, were in the 1994 yield tests where they competed well with the commercial check varieties.

Two lines previously selected for sheath blight resistance, URN 71 and URN 149, were field tested by the breeding program in several advanced yield tests. In one test, these lines had excellent total yields (first crop plus ratoon crop) of 10,197 lb/A (URN 71) and 12,033 lb/A (URN 149). Lines with the LSBR-5 or LSBR-33 sources of sheath blight resistance show excellent ratooning ability.

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ROTATIONAL CROPS[1]

R.J. Habetz

INTRODUCTION

In 1994, soybean [Glycine max (L.) Merr.] acreage showed a slight decline but yields almost had a record increase in southwest Louisiana. Conditions for a good stand were poor, but with adequate stands, growing conditions were ideal. Many farmers showed record yields due to timely amounts of rainfall. Aerial blight again was a major disease problem in some fields but some progress is shown with less susceptible varieties. Research is needed to identify these varieties, along with research in better production practices to minimize its yield loss.

Weed control in soybeans is a major factor in soybean production. Weed research is ongoing in the areas of herbicide-resistant varieties, reduced rates, cultivation, and planting methods.

Grain sorghum [Sorghum bicolor (L.) Moench] is an alternative crop to soybeans in rotation with rice. A statewide variety evaluation of these two crops is conducted in cooperation with the Louisiana Agricultural Experiment Station.

All pertinent data from these crops are presented in the following pages.

[1] This research is partially supported by funds provided by the Louisiana Soybean and Grain Research and Promotion Board.

SOYBEAN VARIETY TEST

R.J. Habetz, B.G. Harville, and W. Hall

Location: Rice Research Station South Unit

Soil Type: Crowley silt loam

Seeding Rate: 10 seed/row ft

Planting Date: Group IV, May 11, 1994; Groups V, VI, VII, May 12, 1994

Row Spacing: 32 inches

Fertilizer: 0-80-80 (N-P_2O_5-K_2O) banded at planting

Plot Size: 4 rows x 30 ft

Herbicide: 2.0 pt/A Dual + .66 pt/A Scepter broadcast at planting

Rainfall: Adequate

Harvested: At maturity for each variety

Experimental Design: Randomized complete block with four replications

Comments: The 1994 soybean variety test was almost perfect as far as research is concerned. Good stand, adequate moisture, and large amounts of aerial blight gave data that were of the utmost importance for each variety. Although the Group IV varieties were planted a little later than ideal, yields were very high (Table 1). Aerial blight did not seem to affect these varieties due to the fact that most pods had already set before the disease hit, which is an advantage of planting Group IV's. Groups V, VI, and VII all showed excellent yields (Table 2). There was a significant correlation between aerial blight rating and yield for Groups V and VI.

Table 1. Performance of commercial soybean varieties grown on a Crowley silt loam soil at the Rice Research Station South Unit, Crowley, LA. 1994.

Maturity group and variety/brand	Yield				Plant height	Maturity date	A.B.[1] rating
	1994	1993	1992	1992 + 1994			
	----------(bu/A)----------				-(in)-		
Group IV							
Pioneer® variety 9501	72.3	----	60.2	66.3	43	09/19	1.5
Deltapine DP 3478	69.3	----	----	----	35	09/26	2.0
Riverside RVS 499	64.8	----	64.2	64.5	47	09/26	3.0
Deltapine DP 3499	64.8	----	----	----	44	09/29	2.5
Deltapine DP 3456	64.7	----	49.5	57.1	33	09/15	3.0
Hornbeck HBK 49	64.5	----	55.1	59.8	49	09/19	5.0
HyPerformer HY 498	64.4	----	60.7	62.3	40	09/26	2.0
Dyna-Gro 3495	63.3	----	68.2	65.8	46	09/18	4.5
Buckshot 44	63.2	----	66.6	64.9	46	09/26	4.0
Eagle LS4L	63.0	----	----	----	47	09/30	2.5
Northrup King S48-84	62.8	----	48.6	55.7	39	09/19	4.0
Pioneer® variety 9442	60.1	----	37.5	48.8	30	09/15	2.5
Hartz variety H4464	59.8	----	41.5	50.7	41	09/16	2.5
Eagle 480	59.0	----	64.1	61.2	49	09/19	5.0
Riverside RVS 91-46	58.7	----	52.5	55.6	44	09/26	4.5
Vernal	58.6	----	----	----	36	10/11	1.0
Eagle LS4E	58.2	----	----	----	44	09/28	4.5
Northrup King RA 452	57.8	----	61.0	59.4	42	09/25	4.0
Hartz variety H4994	56.7	----	----	----	25	09/29	5.0
Pioneer® variety 9472	56.5	----	----	----	32	09/26	2.0
Terral TVX 4990	52.9	----	----	----	38	09/24	2.5
DeKalb CX469c	52.4	----	----	----	30	09/25	3.0
Terral TVX 4452	49.2	----	----	----	26	09/27	3.0
Mean[2]	60.7	----	56.1	59.4	39.2	09/25	3.3
L.S.D. (0.1)	6.3	----	----	----	----	-----	---
C.V. (%)	8.8	----	----	----	----	-----	---

[1] Aerial blight ratings: 0 = no A.B. observed; 5 = all plants affected, including pod loss.
[2] Represents only means of entries in this table, not means of all entries grown that year.

Table 2. Performance of commercial soybean varieties grown on a Crowley silt loam soil at the Rice Research Station South Unit, Crowley, LA. 1994.

Maturity group and variety/brand	Yield				Plant height	Maturity date	A.B.[1] rating
	1994	1993	1992	1992 + 1994			
	(bu/A)				-(in)-		
Group V							
Pioneer® variety 9592	66.0	----	52.4	59.2	31	09/30	2.0
Deltapine DP 3589	64.3	----	52.1	58.2	36	09/30	3.0
Deltapine DPX 3588	61.9	----	----	----	39	09/30	3.5
Pioneer® variety 9593	61.5	----	55.9	58.7	34	09/30	2.0
Pioneer® variety 9584	61.3	----	----	----	28	10/03	4.0
LA88-25723	61.0	----	----	----	35	10/15	4.5
Hartz variety H5088	59.7	----	52.4	56.1	26	10/07	3.5
Hartz variety HX510151	58.8	----	----	----	36	10/05	5.0
Hartz variety H5566	58.5	----	55.1	56.8	27	09/30	2.0
Buckshot 55	58.5	----	54.5	56.5	29	10/03	4.5
HyPerformer HSC 574	57.9	----	54.4	56.2	28	10/13	5.0
Riverside RVS 93-40	57.7	----	----	----	30	10/15	5.0
Deltapine 105	57.7	----	49.6	53.7	29	10/02	5.0
Northrup King S59-60	57.1	----	51.4	54.3	25	10/07	4.0
Hutcheson	55.2	----	58.0	56.6	23	10/07	4.0
Clifford	54.8	----	----	----	25	09/30	5.0
Asgrow A5843	54.7	----	----	----	24	10/04	4.5
Hartz variety H5454	54.6	----	----	----	26	09/29	5.0
HyPerformer HSC 591	54.2	----	53.2	53.7	28	10/15	4.5
Buckshot 507	53.7	----	54.3	54.0	27	10/07	4.5
Buckshot EK58	53.6	----	----	----	25	09/28	4.0
Deltapine DPX 3561	53.4	----	----	----	28	09/28	4.5
Dyna-Gro 3576	52.8	----	54.2	53.5	26	10/01	5.0
Holladay	52.4	----	----	----	20	10/03	5.0
Delta King 5475	52.0	----	----	----	21	09/30	5.0
Kunkle KSC 517	52.0	----	----	----	24	10/07	5.0
Riverside RVS 577	51.7	----	50.5	51.1	24	10/03	4.0
Hornbeck HBK 54	51.7	----	----	----	26	10/10	5.0
Delta King 5850	51.2	----	----	----	20	10/03	5.0
Asgrow A5885	50.3	----	55.3	52.8	25	10/03	5.0
HyPerformer HB4-X524	50.3	----	----	----	30	09/29	5.0
Kunkle KSC 515	50.0	----	55.4	52.7	21	09/30	4.5
Deltapine 415	49.8	----	51.7	50.8	21	10/04	4.0
HyPerformer HB4-X521	49.6	----	----	----	23	09/27	5.0
Terral TVX9401	49.5	----	----	----	26	09/30	5.0
LA88-22718	49.5	----	----	----	23	10/16	4.5
Riverside RVS 90-94	49.4	----	51.8	50.6	24	09/30	5.0
Riverside RVS 93-43	49.0	----	----	----	29	10/04	5.0
Terra-Vig 5452	48.9	----	49.2	49.1	30	09/29	5.0
Riverside RVS Robin 5	48.4	----	----	----	25	09/29	5.0
Northrup King S57-11	48.3	----	----	----	22	10/07	5.0
Terra-Vig 5555	48.2	----	----	----	33	10/01	4.5
HyPerformer HB4-X563	47.7	----	----	----	27	09/30	5.0
Hartz variety H5218	47.4	----	----	----	29	10/04	5.0
HyPerformer HSC 557	47.3	----	50.0	48.7	36	09/29	4.0
Hornbeck HBK 58	46.9	----	----	----	24	10/03	5.0
Riverside RVS 77	46.7	----	54.4	50.6	26	10/07	5.0
Terra-Vig 5693	46.6	----	48.6	47.6	22	10/07	5.0
AgraTech AT 555	45.7	----	53.0	49.5	22	09/30	5.0
Hartz variety H5545	45.2	----	----	----	22	10/03	3.5
HyPerformer HSC 579	44.1	----	54.4	49.3	25	10/04	5.0
Hartz variety H5350	42.9	----	45.2	44.1	21	10/03	5.0
Deltapine DPX 3570	41.4	----	----	----	41	10/03	4.5
Capehart Stone	40.9	----	----	----	24	10/03	5.0
Terra-Vig 5676	37.1	----	----	----	23	09/30	4.5
Walters	36.8	----	55.8	46.3	26	10/05	5.0
Mean[2]	51.7	----	55.1	52.7	26	10/03	4.5
LSD (0.1)	5.2	----	----	----	--	-----	----
CV (%)	8.6	----	----	----	--	-----	----

Continued.

Table 2. Continued.

Maturity group and variety/brand	Yield				Plant height	Maturity date	A.B.[1] rating
	1994	1993	1992	1992 + 1994			
	(bu/A)				-(in)-		
Group VI							
Buckshot 66	64.9	----	48.2	56.6	32	10/24	1.5
AgraTech AT 602	59.7	----	----	----	34	10/18	2.5
AgraTech AT 93-44	59.3	----	----	----	31	10/17	3.5
Hartz variety H6464	59.1	----	----	----	31	10/25	1.5
LA88-407134	58.4	----	----	----	32	10/22	1.0
Hartz variety HX63245	57.8	----	----	----	35	10/15	2.0
Deltapine DP 3627	57.6	----	53.5	55.6	30	10/20	4.5
Asgrow A6961	56.8	----	53.2	55.0	29	10/22	2.5
Hartz variety HX613219	56.5	----	----	----	28	10/13	2.5
Terra-Vig 616	56.0	----	----	----	34	10/25	2.5
Hartz variety H6200	54.9	----	52.3	53.6	34	10/01	3.0
Hornbeck HBK 67	54.6	----	----	----	26	10/15	2.5
Hartz variety H6686	54.6	----	54.7	54.7	27	10/17	5.0
Riverside RVS 93-36	54.3	----	----	----	32	10/17	3.0
Terra-Vig 6253	53.4	----	54.3	53.9	32	10/25	3.0
D87-4647	52.5	----	----	----	30	10/14	3.0
LA88-408827	52.4	----	----	----	27	10/23	3.0
Deltapine DP3606	51.8	----	54.3	53.1	27	10/13	4.0
AgraTech AT 600	50.2	----	----	----	26	10/18	2.5
Terra-Vig 6792	50.1	----	----	----	26	10/25	3.5
Northrup King S62-66	50.0	----	50.4	50.2	24	10/13	4.5
Buckshot 67	49.5	----	----	----	26	10/25	2.5
AgraTech ATX 4684	49.2	----	----	----	25	10/16	3.0
Kunkle KSC 615	49.1	----	----	----	24	10/25	2.5
Hartz variety H6255	48.1	----	----	----	25	10/30	4.0
Asgrow A6711	48.0	----	----	----	23	10/19	3.0
Pioneer® variety 9692	46.8	----	----	----	24	10/22	3.5
Deltapine DP 3682	45.7	----	49.7	47.7	24	10/24	3.0
Kunkle KSC 611	45.5	----	----	----	25	10/26	3.0
Brim	45.3	----	44.2	44.8	31	10/12	4.5
Terra-Vig 6653	43.5	----	51.0	47.3	24	10/24	3.5
Northrup King S66-90	43.2	----	----	----	25	10/09	5.0
Kunkle KSC 607	42.0	----	52.4	47.2	21	10/19	4.5
Riverside RVS 93-15	41.6	----	----	----	22	10/07	4.5
Pioneer® variety 9641	40.6	----	53.2	46.9	24	10/16	5.0
Riverside RVS 699	39.3	----	52.8	46.1	27	10/20	4.5
LA88-24530	39.2	----	----	----	31	10/14	1.0
HyPerformer HY 683	38.9	----	47.5	43.2	25	10/21	3.5
Doles	38.7	----	----	----	25	10/15	4.0
Terral TV6565	38.4	----	----	----	33	10/10	5.0
HyPerformer HY 677	37.9	----	50.0	44.0	25	10/19	4.5
Asgrow A6297	36.5	----	57.0	46.8	23	10/20	4.0
Hartz variety H6115	36.3	----	----	----	25	10/07	5.0
Riverside Cajun	34.0	----	----	----	23	10/15	5.0
Mean[2]	48.7	----	51.7	49.8	27.6	10/18	3.4
LSD (0.1)	5.6	----	----	----	----	-----	---
CV (%)	9.7	----	----	----	----	-----	---

Continued.

Table 2. Continued.

Maturity group and variety/brand	Yield 1994	1993	1992	93-94	92-94	Plant height	Maturity date	A.B.[1] rating
	(bu/A)					-(in)-		
Group VII								
Hartz variety H7550	42.3	41.9	49.8	42.1	44.7	27	10/31	3.5
Hartz variety H7190	41.8	48.2	42.0	45.0	44.0	25	10/30	4.5
Hornbeck HBK 79	37.7	31.5	48.7	34.6	39.3	35	10/23	2.5
LA88-29003	37.3	41.5	----	39.4	----	30	-----	3.0
Northrup King S75-55	37.0	33.4	----	35.0	----	28	-----	3.5
Haskell	36.5	29.5	----	33.0	----	31	-----	2.5
Kunkle KSC 707	35.9	39.0	----	37.5	----	22	-----	3.0
Riverside RVS 757	35.5	36.6	40.9	36.1	37.7	33	10/27	1.5
Deltapine DP 3733	35.4	36.3	38.9	35.7	36.7	28	10/23	3.0
Pioneer® variety 9761	34.8	39.0	47.2	36.9	40.3	30	10/21	3.0
Hartz variety H7440	34.8	----	----	----	----	34	-----	2.5
HyPerformer HY 798	34.1	33.0	----	33.6	----	32	10/19	3.5
Buckshot 723	33.7	36.2	38.3	35.0	36.1	34	10/27	4.5
HyPerformer HSC 741	33.1	25.4	45.6	29.1	34.6	29	10/23	2.5
Dyna-Gro 3682	32.4	39.1	46.3	35.8	39.3	24	10/15	3.0
HyPerformer HSC 721	32.3	44.2	45.2	38.3	40.6	30	10/20	3.5
Terra-Vig 727	32.2	----	44.8	----	----	26	10/19	4.0
Stonewall	31.5	33.0	45.5	32.3	36.7	27	10/19	3.5
Mean[2]	35.5	36.7	44.4	36.2	39.1	29.0	-----	3.2
LSD (0.1)	2.7	----	----	----	----	----	-----	---
CV (%)	6.4	----	----	----	----	----	-----	---

[1] Aerial blight ratings: 0 = no A.B. observed; 5 = all plants affected, including pod loss.
[2] Represents only means of entries in this table, not means of all entries grown that year.

GRAIN SORGHUM VARIETY TEST

R.J. Habetz and M.J. Kang

Location: Rice Research Station South Unit

Soil Type: Crowley silt loam

Planting Date: May 11, 1994

Row Spacing: 32 inches

Fertilizer: 28-84-84 (N-P_2O_5-K_2O) banded at planting; 80-0-0 (21%), June 6

Plot Size: 4 rows x 30 ft

Treated: 3 pt/A atrazine applied broadcast at planting

Rainfall: Adequate

Harvested: Sept 12

Experimental Design: Randomized complete block with four replications

Comments: Yields were a little better than last year because of better growing conditions (Tables 1 and 2). There was very little difference in yield in the top three varieties HSC Cherokee, KS735, and Contender in the early-medium maturity varieties. In a 3-year average, KS710 showed a distinct higher yield average.

In the full season maturity group, Deltapine G-1711 E showed the highest yield in 1994, but in a 3-year average, Pioneer 8118 was highest.

Table 1. Performance of early-medium, bird-susceptible grain sorghum hybrids at the Rice Research Station South Unit, Crowley, LA. 1994.

Company/Brand	Hybrid	Mean yield 1994	Mean yield 2-yr	Mean yield 3-yr	Grain moisture	Plant height
		lb/A			%	in
HyPerformer Seed	HSC Cherokee	3864	3318	3393	14.8	53
Northrup King	KS735	3857	------	------	14.0	55
Capehart Seed	Contender	3820	3166	3305	13.8	56
Asgrow Seed	A570	3726	------	------	15.1	63
Northrup King	KS710	3622	3245	3518	14.2	50
Pioneer Hi-Bred	8310	3539	3074	3234	15.1	54
Terral-Norris Seed	Terral TV960	3505	3119	3375	14.9	51
Terral-Norris Seed	Terral TV900	3429	2859	3124	14.5	53
Mycogen Plant Sci.	444E	3346	------	------	14.4	52
Delta & Pine Land	Deltapine G522DR	3262	3065	3293	14.1	49
Pennington Seed	Penngrain DR	3152	2986	3109	14.7	51
DeKalb Genetics	DK56	3115	2806	3040	14.4	53
Pioneer Hi-Bred	8212Y	2985	2848	3006	14.6	46
Pioneer Hi-Bred	8305	2911	2704	------	16.5	63
Capehart Seed	Exp 93-2	2846	2302	------	14.4	61
Mycogen Plant Sci.	Oro Amigo	2842	2749	2986	16.1	56
Terral-Norris Seed	Terral TV1050	2838	2594	2899	14.6	50
Pioneer Hi-Bred	8333	2823	2844	3208	15.2	48
HyPerformer Seed	HY1320	2597	2815	------	15.3	58
Terral-Norris Seed	Terral TV9421	2522	2524	------	16.2	54
DeKalb Genetics	DK55	2390	------	------	14.6	59
Asgrow Seed	A603	2219	2444	2739	14.2	51
DeKalb Genetics	DK54	2202	2382	------	16.6	61
Terral-Norris Seed	Terral TV9241	2196	2405	------	15.0	44
Delta & Pine Land	Deltapine 1552	2116	2218	2640	18.2	58
Mean		3029			15.0	54.0
CV (%)		20.0			7.2	N/A
LSD (.10)		828			1.4	N/A

Table 2. Performance of full-season, bird-susceptible grain sorghum hybrids at the Rice Research Station South Unit, Crowley, LA. 1994.

Company/Brand	Hybrid	Mean yield			Grain moisture	Plant height
		1994	2-yr	3-yr		
		lb/A			%	in
Delta & Pine Land	Deltapine G-1711E	3813	------	------	15.5	61
Capehart Seed	Challenger	3357	2682	2798	16.2	62
Pioneer Hi-Bred	8118	3353	3003	3082	16.9	65
Capehart Seed	Cream	3346	2667	2578	17.0	51
DeKalb Genetics	DK64	3094	2444	2737	16.8	54
Capehart Seed	Champion	3080	2581	2730	17.2	64
Triumph Seed	TR82G	3008	------	------	16.7	56
HyPerformer Seed	HSC Wings	2656	2515	2678	16.2	57
Mean		3213			16.5	59
CV (%)		9.4			5.3	N/A
LSD (.10)		368			1.1	N/A

SCREENING SOYBEAN VARIETIES FOR WATER TOLERANCE

R.J. Habetz

Location: Rice Research Station South Unit

Soil Type: Crowley silt loam

Row Spacing: 32 inches

Seeding Rate: 10 seed/row ft

Planting Date: May 9, 1994

Plot Size: 4 rows x 30 ft

Herbicide(s): 2.5 pt/A Dual, .66 pt/A Scepter applied broadcast at planting

Fertilizer: 0-80-80

Water Treatment(s): applied June 13, plant 6-8 inches tall

Rated: June 30

1993 Tolerance Rate: 1 = all plants injured or dead, 5 = no plant damage

1994 Tolerance Rate: 1 = no plant damage, 5 = all plants injured or dead

Disease Rate: 1 = no damage, 9 = 100% damage

Temperature at Time of Flooding: High temp., 86-92°; avg. temp., 89.8°

Rainfall: .23 inches during 10-day flush; adequate during the rest of the growing period

Normal: No floodwater added to plots; only moisture came from rainfall

Flood: Soybean plants 6 to 8 inches tall, flooded to terminal bud, held on for 24 hours then water lowered to 2 to 3 inches for another 3 days and taken off

Flush: Soybean plants 6 to 8 inches tall, water held on for 10 days at a 2- to 3-inch depth then taken off

Experimental Design: Randomized sub-plots with four replications

Comments: The major problems associated with the production of soybeans in southwest Louisiana are drought, excessive moisture, and disease. These conditions can cause yields to be depressed significantly due to any one of the problems. For these reasons and from observations made in past years under excessive rainfall conditions in southwest Louisiana, this research was initiated to determine the effects of excessive rainfall on soybean varieties. An evaluation was made of soybean varieties to determine variety tolerance under different conditions of excessive rainfall. Our objective was to simulate weather conditions: to evaluate the effect of excessive soil moisture on soybean plants of selected varieties; evaluate plant regrowth response to excessive soil moisture of different soybean variety maturity groups; evaluate plant height differences due to excessive soil moisture; determine other stress factors, such as disease response due to excessive soil moisture; and evaluate yield potential of maturity groups under different water-related conditions.

Significant results showed that there was a reduction in disease in all flooded treatments. Also, water tolerance ratings were not as high as expected for all groups (Tables 1, 2, 3, and 4). This was probably due to the fact that flood treatments did not completely cover the plants. For this reason, future research will include a treatment where plants will be completely covered with water. The data did not show a plant regrowth response between groups. Again, this was probably due to the fact that not enough injury occurred, but there was a significant plant height difference between treatments within groups. There appeared to be a correlation between yield and disease ratings for most treatments when comparing water treatments with normal (Table 5).

Table 5. Average yield and disease rating results of Groups IV, V, VI, and VII under excessive moisture conditions. Rice Research Station South Unit, Crowley, LA. 1994.

	Normal		Flood		Flush	
Group	Yield	Disease	Yield	Disease	Yield	Disease
	(bu/A)	(1-9)	(bu/A)	(1-9)	(bu/A)	(1-9)
IV	51.8	3.2	58.2	2.0	53.0	1.5
V	54.6	5.8	55.8	4.1	53.6	2.3
VI	53.2	5.5	54.9	3.8	54.8	2.3
VII	50.3	5.8	51.2	3.8	50.9	2.3

Table 1. Screening Group IV soybean varieties for effect of excessive moisture. Rice Research Station South Unit, Crowley, LA. 1994.

Variety	1993 rate	Normal			Flood				Flush			
		Yield	Disease	Plant height	Yield	Disease	Plant height	Tol. rate	Yield	Disease	Plant height	Tol. rate
		(bu/A)	(1-9)	(in)	(bu/A)	(1-9)	(in)	(1-5)	(bu/A)	(1-9)	(in)	(1-5)
Riverside 499	4.2	64.6	2	41.8	67.4	2	39.5	1.3	64.9	1	33.5	2.5
Dyna-Gro 3495	3.8	59.0	3	39.0	59.2	1	38.0	2.8	64.2	1	31.8	3.3
Ring Around 452	1.8	57.7	4	34.8	55.9	2	28.0	2.8	53.1	1	24.5	2.8
Deltapine 3456	3.2	61.9	4	27.0	61.1	2	26.2	2.0	49.9	2	24.5	1.8
Hartz 4464	3.0	56.2	3	30.8	54.7	3	26.0	2.3	48.7	2	27.0	2.3
Pioneer 9501	4.5	49.2	3	23.2	50.7	2	21.5	1.0	37.2	2	19.0	1.8
LSD (.05)		5.0							5.4			
CV (%)		5.75							6.81			

Table 2. Screening Group V soybean varieties for effect of excessive moisture. Rice Research Station South Unit, Crowley, LA. 1994.

Variety	1993 rate	Normal			Flood				Flush			
		Yield	Disease	Plant height	Yield	Disease	Plant height	Tol. rate	Yield	Disease	Plant height	Tol. rate
		(bu/A)	(1-9)	(in)	(bu/A)	(1-9)	(in)	(1-5)	(bu/A)	(1-9)	(in)	(1-5)
Deltapine 105	3.5	63.0	5	26.2	59.4	3	23.2	2.3	57.2	2	21.0	2.0
Pioneer 9592	2.8	62.3	5	27.8	58.3	4	25.2	1.0	55.9	1	23.2	1.3
AgraTech 600	2.0	48.5	7	28.2	57.3	3	25.0	1.8	54.8	2	21.8	2.0
LA88-25723	3.5	55.4	5	27.8	55.9	5	20.8	2.5	54.6	4	20.0	2.5
Terra-Vig 5693	3.8	47.6	7	21.8	53.4	6	19.0	2.3	52.1	2	15.8	3.0
Hutcheson	3.8	51.0	6	21.2	50.7	4	17.2	1.8	47.1	3	14.5	3.0
LSD (.05)		4.9			4.4			0.8	6.5			0.5
CV (%)		5.9			5.3			26.2	8.0			14.4

Table 3. Screening Group VI soybean varieties for effect of excessive moisture. Rice Research Station South Unit, Crowley, LA. 1994.

Variety	1993 rate	Normal			Flood				Flush			
		Yield	Disease	Plant height	Yield	Disease	Plant height	Tol. rate	Yield	Disease	Plant height	Tol. rate
		(bu/A)	(1-9)	(in)	(bu/A)	(1-9)	(in)	(1-5)	(bu/A)	(1-9)	(in)	(1-5)
NKS62-66	4.0	56.2	7	27.2	60.3	6	23.2	1.3	58.9	3	21.8	1.3
Vernal	4.3	60.2	3	36.0	58.9	3	30.5	1.5	57.8	1	24.5	2.5
Deltapine DPX 3605	4.5	59.0	6	26.5	59.1	5	24.0	1.0	57.1	2	21.5	2.5
Asgrow 6297	1.8	36.1	7	24.0	46.6	4	21.2	1.5	52.1	3	20.8	2.5
Hartz 6200	4.3	57.6	6	26.8	53.2	3	25.2	1.8	51.8	3	23.5	2.0
Asgrow 6961	3.8	50.0	4	30.5	51.1	2	26.0	2.5	51.3	2	23.0	2.8
LSD (.05)		6.4			7.1			.6	5.1			1.0
CV (%)		8.0			8.6			26.6	6.2			28.1

Table 4. Screening Group VII soybean varieties for effect of excessive moisture. Rice Research Station South Unit, Crowley, LA. 1994.

Variety	1993 rate	Normal			Flood				Flush			
		Yield	Disease	Plant height	Yield	Disease	Plant height	Tol. rate	Yield	Disease	Plant height	Tol. rate
		(bu/A)	(1-9)	(in)	(bu/A)	(1-9)	(in)	(1-5)	(bu/A)	(1-9)	(in)	(1-5)
LA88-29003	----	49.2	5	30.5	52.4	4	27.0	1.5	57.4	3	23.0	2.8
Stonewall	----	58.2	4	26.8	58.7	3	24.5	2.3	54.1	1	22.5	2.8
Pioneer 9761	----	48.3	6	29.2	48.1	4	25.5	1.8	49.6	2	23.8	2.5
Hyperformer 721	----	49.0	6	33.0	51.8	4	27.8	2.0	48.5	1	23.5	2.5
Hartz 7190	----	44.3	8	26.5	46.8	6	24.0	1.8	48.5	4	20.8	1.8
Hyperformer 741	----	52.8	6	31.2	49.6	2	27.8	1.8	47.3	3	24.5	2.8
LSD (.05)		6.2			5.8			.7	6.8			.8
CV (%)		8.1			7.5			26.3	8.9			20.7

SOYBEAN CULTURAL PRACTICE STUDY

R.J. Habetz

Location: Rice Research Station South Unit

Soil Type: Crowley silt loam

Variety/Seeding Rate: Hutcheson; drill, 85 lb/A; row, 50 lb/A

Row Spacing: Drill, 7-inch; rows, 30 inches

Planting Date: June 21, 1994

Fertilizer: 300 lb 0-20-20 broadcast

Treated: As per treatment; all preemergence herbicides applied at planting; applied all POT treatments July 18; annual grass, 4 inches

Rated: Aug 1

Plot Size: 10 x 25 ft

Harvested: Oct 13

Experimental Design: Randomized complete block with four replications

Comments: Different results showed with preemergence treatments than from past years' data. Because of adequate rainfall, the pre-treatments gave excellent control, while the half-rate POT treatments gave poor control because of delayed application (Table 1). Yields were all good except for the flat-row planted treatments, which showed a decreased yield possibly because of poor stand due to standing water early in the test. Further studies will be made to compare planting, cultivation, and herbicide use, as well as other production practices.

Table 1. Performance of soybean cultural practices at the Rice Research Station South Unit, Crowley, LA. 1994.

Treatment	Rate of Application	Time of Application	Weed Control 8/1	Yield
	–lb ai/A–		—%—	-bu/A-
Drill- Dual + Sencor	2.0 + .38	PRE	95.0	53.3
Drill- Dual + Sencor Scepter	2.0 + .38 .125	PRE POT	95.0	54.7
Drill- Fusilade 2000 + Reflex	.06 + .188	POT	58.0	66.9
Drill- Fusilade 2000 + Reflex	.125 + .375	POT	87.0	66.1
Flat Row- Dual + Sencor	2.0 + .38	PRE	91.8	47.5
Flat Row- Dual + Sencor Scepter	2.0 + .38 .125	PRE POT	96.3	54.7
Flat Row- Fus. 2000 + Reflex	.06 + .188	POT	43.0	54.6
Flat Row- Fus. 2000 + Reflex	.125 + .375	POT	87.3	53.6
Flat Row- Cultivate Dual + Sencor	2.0 + .38	PRE	96.8	53.5
Flat Row- Cultivate Dual + Sencor Scepter	2.0 + .38 .125	PRE POT	96.8	47.5
Flat Row- Cultivate Fusilade 2000 + Reflex	.06 + .188	POT	67.5	48.3
Flat Row- Cultivate Fusilade 2000 + Reflex	.125 + .375	POT	91.5	48.2
Bedded Row- Dual + Sencor	2.0 + .38	PRE	91.3	53.9
Bedded Row- Dual + Sencor Scepter	2.0 + .38 .125	PRE POT	93.8	54.5
Bedded Row-Fus.2000+Reflex	.06 + .188	POT	46.3	45.3
Bedded Row-Fus.2000+Reflex	.125 + .375	POT	85.3	51.0
Bedded Row- Cultivate Dual + Sencor	2.0 + .38	PRE	94.5	49.8
Bedded Row- Cultivate Dual + Sencor Scepter	2.0 + .38 .125	PRE POT	96.8	46.6
Bedded Row- Cultivate Fusilade 2000 + Reflex	.06 + .188	POT	71.8	49.3
Bedded Row- Cultivate Fusilade 2000 + Reflex	.125 + .375	POT	88.8	53.9
CV (%)			3.9	19.1
LSD (.05)			4.6	14.2

SOYBEAN FUNGICIDE STUDY

R.J. Habetz and J.S. Russin

Location: Rice Research Station South Unit

Soil Type: Crowley silt loam

Variety: Group V, Deltapine 105; Group VI, Hartz 6686

Row Spacing: 30-inch

Planting Date: May 23, 1994

Herbicide: 2.5 pt/A Dual + .5 lb/A Sencor

Treated: Group V - R3, Aug 5; R5, Aug 16; Group VI - R3, Aug 16; R5, Aug 29

Comments: Even though there was a major disease problem in southwest Louisiana for 1994, the test plots had very little disease in them. Yields were excellent, but on a scale of 0-9, the highest disease rating for any treatment was 2.5 (Tables 1 and 2).

Table 1. Disease ratings and yield results for Deltapine 105 soybeans treated at the R3 and/or R5 growth stages. Rice Research Station South Unit, Crowley, LA. 1994.

Treatment	Rate	Time of application	Disease	Yield
	-(lb/A)-		-(0-9)-	-(bu/A)-
Check	----	----	1.5	50.4
Sodium Bicarbonate	.50	R3	2.0	57.0
Sodium Bicarbonate	.50	R5	2.0	62.1
Sodium Bicarb. + Benlate	.50 + .25	R3 R3	1.0	61.1
Sodium Bicarb. + Benlate	.50 + .25	R5 R5	2.0	59.5
Sodium Bicarbonate	1.0	R3	2.0	54.4
Sodium Bicarbonate	1.0	R5	1.5	58.5
Sodium Bicarb. + Benlate	1.0 + .25	R3 R3	1.5	56.2
Sodium Bicarb. + Benlate	1.0 + .25	R5 R5	1.5	62.1
Sodium Bicarb. + Benlate	.5 + .25	R3 R5	1.0	62.4
Benlate + Sodium Bicarb.	.25 + .50	R3 R5	1.0	61.4
Sodium Bicarb. + Benlate	1.0 + .25	R3 R5	1.5	59.4
Benlate + Sodium Bicarb.	.25 + 1.0	R3 R5	1.0	58.8
Benlate 50 DF	.50	R3 R5	1.0	69.1

Table 2. Disease ratings and yield results for Hartz 6686 soybeans treated at R3 and/or R5 growth stages. Rice Research Station South Unit, Crowley, LA. 1994.

Treatment	Rate	Time of application	Disease	Yield
	-(lb/A)-		-(0-9)-	-(bu/A)-
Check	----	----	2.0	79.4
Benlate 50 DF	.5 lb ai/A	R3 R5	2.5	76.9
Benlate 50 DF	.75 lb ai/A	R3	2.0	74.5
Benlate 50 DF	.75 lb ai/A	R5	2.0	78.4
Topsin M 85 WDG	.5 lb ai/A	R3 R5	2.0	69.2
Topsin M 85 WDG	.75 lb ai/A	R3	1.5	69.8
Topsin M 85 WDG	.75 lb ai/A	R5	2.5	79.4
Bravo 720	1.5 pt/A	R3 R5	1.5	72.5
Bravo 720	2.25 pt/A	R3	2.0	71.9
Tilt	5.5 oz/A	R3 R5	2.5	68.2
Supertin 4L	8.0 oz/A	R3 R5	1.5	74.1
Supertin 4L	12.0 oz/A	R3	1.5	70.7

SOYBEAN WEED CONTROL RESEARCH

R.J. Habetz and J.L. Griffin

INTRODUCTION

Research continued in 1994 on major weeds in the rice producing area. Control of jointvetch, mexicanweed, sesbania, redweed, with most emphasis on research with red rice, a major problem in southwest Louisiana, was conducted.

A preemerge study using Dual and Command with a combination of broadleaf herbicides was conducted for control of grasses, red rice, and broadleaf weeds. Also, a postemergence test for specific control of jointvetch had some broadleaf herbicides showing good control.

Three red rice tests were conducted, along with a study using Roundup Ready soybeans, for red rice control.

Specific information for each experiment is individually presented followed by a table of results.

Weed control ratings for all experiments are based on a scale of 0 to 100% where 0 equals no control and 100 equals complete control.

Experiment: Red Rice Control in Roundup Ready Soybeans

Location: Rice Research Station South Unit

Soil Type: Crowley silt loam

Variety: Roundup Ready soybeans

Row Spacing: 30-inch

Fertilizer: 0-60-60

Plot Size: 2 rows x 25 ft

Plant Date: June 17

Harvest Date: Oct 4

Treated: POT, July 13; POT (boot stage), Sept 1

Weed Size: Red rice (RR), 4-14 in (4-12 leaf); boot stage, 24-36 in; jointvetch (JV), 6 in; annual sedges (AS), 2 in

Sprayer: CO_2-pressurized backpack sprayer, 15 GPA

Rated: July 27; boot stage, Sept 14 and 29

Experimental Design: Randomized complete block with four replications

Comments: With the use of Roundup in Roundup Ready soybeans, producers will be able to control weeds that compete with soybeans with little concern for crop damage and reduce the amount of herbicides needed in their weed control program.

This test showed that red rice could be controlled as late as the 12-leaf stage and with excellent seedhead suppression in the boot stage (Table 1). Conditions were excellent for this control, so more data are needed with less ideal conditions and different stages of weed growth, which due to weather conditions, were not able to be accomplished.

Table 1. Red rice control in Roundup Ready soybeans. Rice Research Station South Unit, Crowley, LA. 1994.

							Boot stage		
Treatment	Rate	Rate unit	Growth stage	RR control 9-27	JV control 9-27	AS control 9-27	RR sh-emerg. 9-14	RR sh-emerg. 9-29	Soybean yield
				----------(%)----------					-(bu/A)-
Maleic Hydrazide	2.5	lb/A	boot stage				7.5	26.3	15.4
MON 2139 (Roundup) Induce	1.0 0.5	pt/A % v/v	9-leaf	82.5	88.8	57.5			16.7
MON 2139 Induce	1.5 0.5	pt/A % v/v	9-leaf	90.0	95.0	86.3			20.3
MON 2139 Induce	2.0 0.5	pt/A % v/v	9-leaf	95.0	96.3	91.3			25.2
Assure II Agridex	9.0 1.0	oz/A % v/v	9-leaf	92.5	0.0	0.0			18.0
Select Agridex	4.0 1.0	oz/A % v/v	boot stage				0.0	1.3	14.2
MON 2139 Induce	0.5 0.5	pt/A % v/v	boot stage				0.0	2.5	14.2
MON 2139 Induce	1.0 0.5	pt/A % v/v	boot stage				0.0	3.8	15.7
Weedy check				0.0	0.0	0.0	35.0	81.3	16.0
LSD (.05)				6.4	6.6	10.1	20.7	12.5	3.6
CV (%)				5.81	7.60	13.90	158.21	35.28	14.43

Experiment: Select in Tank Mixtures for Red Rice Control

Location: Rice Research Station South Unit

Soil Type: Crowley silt loam

Variety: Hutcheson

Row Spacing: 30-inch

Fertilizer: 0-60-60

Plot Size: 2 rows x 25 ft

Planting Date: June 7

Treated: June 17

Weed Size: Red rice (RR), 2-4 leaf; barnyardgrass (BG), 2-4 leaf; annual sedges (AS), 2-4 leaf

Sprayer: CO_2-pressurized backpack sprayer, 15 GPA

Rated: July 1

Experimental Design: Randomized complete block with four replications

Comments: Select, a grass herbicide, normally will also give good red rice control. In this test, control was low probably due to weather conditions. Only at the high rate was some control shown. When compared with Assure II, control was not adequate (Table 2).

Table 2. Select in tank mixtures for red rice control. Rice Research Station South Unit, Crowley, LA. 1994.

Treatment	Rate of application	Rate unit	Weed control 07/01/94			
			RR	BG	AS	Soybean injury
			----------(%)----------			
Select Agridex	6.0 1.0	oz/A % v/v	32.5	56.7	16.7	3.3
Select Agridex	8.0 1.0	oz/A % v/v	33.3	81.7	26.7	1.7
Select Agridex	10.0 1.0	oz/A % v/v	51.7	86.7	13.3	1.7
Select Classic Agridex	6.0 0.125 1.0	oz/A oz ai/A % v/v	25.0	41.7	90.0	11.7
Select Classic Agridex	6.0 0.188 1.0	oz/A oz ai/A % v/v	35.0	51.7	93.3	4.0
Select KU253 Agridex	6.0 0.21 1.0	oz/A oz ai/A % v/v	23.3	41.7	96.7	16.7
Select Pinnacle X-77	6.0 0.125 0.25	oz/A oz ai/A % v/v	25.0	61.7	11.7	15.0
Select Classic Agridex	8.0 0.125 1.0	oz/A oz ai/A % v/v	20.0	43.3	93.3	10.0
Select Classic Agridex	8.0 0.188 1.0	oz/A oz ai/A % v/v	20.0	55.0	95.0	13.3
Select KU253 Agridex	8.0 0.21 1.0	oz/A oz ai/A % v/v	10.0	70.0	98.3	11.7
Continued.						

Table 2. Continued.

Treatment	Rate of application	Rate unit	Weed control 07/01/94			
			RR	BG	AS	Soybean injury
			----------(%)----------			
Select Pinnacle X-77	8.0 0.063 0.25	oz/A oz ai/A % v/v	33.3	71.7	23.3	10.0
Select Classic Agridex	10.0 0.125 1.0	oz/A oz ai/A % v/v	20.0	78.3	88.3	13.3
Select Classic Agridex	10.0 0.188 1.0	oz/A oz ai/A % v/v	25.0	61.7	95.0	10.0
Select KU253 Agridex	10.0 0.21 1.0	oz/A oz ai/A % v/v	10.0	75.0	91.7	13.3
Select Pinnacle X-77	10.0 0.063 0.25	oz/A oz ai/A % v/v	31.7	75.0	6.7	13.3
Assure II Agridex	9.0 1.0	oz/A % v/v	65.0	90.0	3.3	13.3
Assure II Classic Agridex	9.0 0.188 1.0	oz/A oz ai/A % v/v	20.0	56.7	95.0	13.3
Select Classic Cobra Agridex	6.0 0.5 8.0 1.0	oz/A oz/A oz/A % v/v	15.0	30.0	95.0	16.7
Select Classic Cobra Agridex	8.0 0.5 8.0 1.0	oz/A oz/A oz/A % v/v	23.3	45.0	90.0	6.7
Untreated check			0.0	0.0	0.0	0.0
LSD (.05)			24.7	30.4	14.8	9.6
CV (%)			57.17	31.37	14.68	58.76

Experiment: Comparison of Preemergence Herbicides for Red Rice Control

Location: Rice Research Station South Unit

Soil Type: Crowley silt loam

Variety: Hutcheson

Row Spacing: 30-inch

Fertilizer: 0-60-60

Plot Size: 10 x 25 ft

Planting Date: May 25

Treated: At planting

Sprayer: CO_2-pressurized backpack sprayer, 15 GPA

Rated: July 1

Experimental Design: Randomized complete block with three replications

Comments: The combination of Dual + Broadstrike or Dual + F6285 did not give significantly more control of red rice than Dual applied alone (Table 3). The use of most preemergence herbicides did give adequate control, with Squadron possibly being the exception when used alone.

Table 3. Comparison of preemergence herbicides for red rice control. Rice Research Station South Unit, Crowley, LA. 1994.

Treatment	Rate of Application	Oryza Control 7/1/94
		--------(%)-------
Broadstrike + Dual (NAF-2)	2.4 lb ai/A	85.0
Broadstrike + Dual (NAF-9)	2.17 lb ai/A	94.0
Dual Scepter	2 lb ai/A 2.8 oz/A	88.3
Dual F6285	2 lb ai/A 0.38 lb ai/A	93.3
Squadron	3 pt/A	58.3
Frontier Scepter	16 oz/A 2.8 oz/A	73.3
Frontier Scepter	20 oz/A 2.8 oz/A	80.0
Frontier	20 oz/A	66.7
Frontier	24 oz/A	70.0
Dual	2 lb ai/A	86.7
Lasso	3 qt/A	72.7
Untreated check		0.0
LSD (.05) CV (%)		9.4 7.67

Experiment: Preemergence Herbicide Test

Location: Rice Research Station South Unit

Soil Type: Crowley silt loam

Variety: Hutcheson

Row Spacing: 30-inch

Plot Size: 2 rows x 25 ft

Planting Date: May 24

Treated: At planting

Sprayer: Tractor, compressed air, 20 GPA

Rated: July 18

Weeds: Annual grasses (AG), red rice (RR), jointvetch (JV), redweed (RW), and mexicanweed (MW)

Experimental Design: Randomized complete block with four replications

Comments: Good to excellent control was obtained for all treatments on annual grasses (Table 4). Red rice control was better for treatments with Dual than when Command was used. All broadleaf weeds had mixed control, depending on treatments used, with F6285 showing a higher than expected control of jointvetch and good to excellent control of other broadleafs.

Table 4. Comparison of preemergence herbicides for annual grass, broadleaf, and red rice control. Rice Research Station South Unit, Crowley, LA. 1994.

Treatment	Rate of application	Weed Control 7/18				
		AG	RR	JV	RW	MW
	--(lb ai/A)--	----------(%)----------				
Dual Lexone	2.00 .38	85.8	87.5	79.0	61.3	61.3
Command Lexone	1.00 .38	81.8	58.8	85.3	83.8	69.8
Dual Scepter	2.00 .125	84.0	87.8	46.3	57.5	62.5
Command Scepter	1.00 .125	87.0	50.0	77.5	83.8	60.0
Dual Canopy	2.00 .38	84.5	89.0	72.5	65.5	63.3
Command Canopy	1.00 .38	82.5	55.0	83.5	81.0	62.5
Broadstrike + Dual	2.16	88.8	91.0	56.3	73.8	62.5
Broadstrike + Dual	1.69	86.5	89.3	57.5	64.3	60.5
Broadstrike + Dual	1.93	85.3	88.5	61.8	68.8	71.3
Broadstrike + Dual	2.17	89.5	91.0	50.0	73.5	68.0
Command Broadstrike + Dual	1.00 1.69	92.8	88.8	63.3	80.5	65.0
Command Broadstrike + Dual	1.00 1.69	91.5	89.3	74.5	83.5	78.5
Dual F6285	2.00 .38	92.8	92.5	87.0	90.5	85.0
Command F6285	1.00 .38	90.8	71.3	89.8	86.3	81.3
Check (weedy)		10.0	10.0	10.0	10.0	10.0
LSD (.05) CV (%)		5.2 4.44	13.1 12.10	18.2 19.21	12.2 12.07	14.1 15.39

Experiment: Jointvetch Post Test

Location: Rice Research Station South Unit

Soil Type: Crowley silt loam

Plot Size: 5 rows x 20 ft

Planting Date: July 25

Treated: 10-12 inches

Rated: Aug 8

Sprayer: CO_2-pressurized backpack sprayer, 15 GPA

Experimental Design: Randomized complete block with three replications

Comments: Reflex is the only herbicide that gave good control with other treatments showing poor to fair results (Table 5). The low ratings could possibly be due to late application of herbicides. The objective of this study was to check control when the jointvetch was fairly mature.

Table 5. Controlling jointvetch with postemergence herbicides. Rice Research Station South Unit, Crowley, LA. 1994.

Treatment	Rate of Application	Weed Control 8/8/94
	--lb ai/A--	--------(%)-------
Storm	.75	60.0
Blazer	.38	74.3
Basagran	1.00	25.0
Cobra	.20	54.0
Reflex	.375	87.7
Classic	.008	75.0
Scepter	.125	10.0
Cadre	.032	63.3
F6285	.38	23.3
LSD (.05)		33.8
CV (%)		37.23

INTERNATIONAL RICE TRAINING PROGRAM

Joseph A. Musick

The Rice Research Station has cooperated for a number of years with the Foreign Training Division of the International Agricultural Development Service by providing an information training program for international leaders, government officials, farmers, students, and others interested in the production, processing, and marketing of rice.

Data regarding the classification of visitors according to countries are presented in Table 1. A total of 80 participants, representing 11 countries, were guests at the Rice Research Station in 1994. This was an increase of 23 participants compared with 1993. Uruguay provided the largest number of visitors (20) this year.

Table 1. Number of participants by country. Rice Research Station, Crowley, LA. 1994.

Country	Number of participants
Argentina	1
Australia	2
Brazil	19
China	2
Costa Rica	10
Hungary	1
Japan	19
Korea	2
Pakistan	2
Uruguay	20
Vietnam	2
TOTAL	80

Table 2 presents information regarding the number of participants according to sponsoring organizations. The largest number was sponsored by private companies (56).

Subject matter of interest to the participants varied from general rice production practices to specific interests, such as plant breeding, water management, processing, marketing, and control of rice diseases, insects, and weeds. There was also interest in crawfish, soybeans, biotechnology, rice genetics, milling, and grading.

Table 2. Number of visitors by sponsoring organizations. Rice Research Station, Crowley, LA. 1994.

Sponsoring organization	Number sponsored
Governments (Foreign)	15
IRGA	2
LSU Agricultural Center	3
Private Companies	56
Self	1
USIA/USDA	3
TOTAL	80

AQUACULTURE RESEARCH

ANNUAL SUMMARY OF ENVIRONMENTAL CONDITIONS AND CRAWFISH PRODUCTION

W.R. McClain, K.R. Taylor, and J.J Sonnier

Following (Table 1) is the average weekly data for environmental conditions and crawfish catch, 1993-94 season, crawfish research project, Rice Research Station, Crowley, LA. The summary is composed of averages across all experimental plots and management conditions.

Pond History: Ponds were in crawfish production for three consecutive seasons prior to the 1993/94 season

Soil Type: Crowley silt loam

Water Source: Well water that traveled through 3600 feet of earthen canals prior to its entrance to crawfish ponds

Pond Area: Sixteen 0.4-acre ponds

Forage Crops: Rice ('Mars')

Permanent Flood Date: 4 Oct 1993

Crawfish Harvest: Trapping began 21 Feb 1994, three consecutive days per week and continued through 26 May 1994; twenty-five traps/A were used for a total of 42 days (1,050 total trap sets/A)

Crawfish Grades: All crawfish harvested were subjected to a grader (passive, water type) and sorted into four size-grade categories as follows: "Jumbo" - $\leq$ 15 count/lb, "Large" - 16-20 count/lb, "Medium" - 21-28 count/lb, and "Peeler" - > 28 count/lb

Trap Type: 3-funnel pyramid

Bait Used: Manufactured bait (Purina, Purina Mills, Inc., St. Louis, MO)

Table 1. Annual summary of average weekly environmental conditions and crawfish production. Rice Research Station, Crowley, LA. 1994.

Weeks	Soil Temp.[1] Min.	Soil Temp.[1] Max.	Air Temp. Min.	Air Temp. Max.	Water Temp. Min.	Water Temp. Max.	Average Weekly D.O.[2] (mg/l)	Average Monthly Forage Biomass (g/m²)	Total Water Pumped (gal/A)	Total Rainfall (inches)	Large Crawfish Count (#/trap)	Juvenile Crawfish Count (#/dip)	Crawfish Harvest (lb/A)	Crawfish Size (cnt/lb)	Total Trap-sets (#/A/wk)
	deg. F														
June 1-7	77.4	94.3	68.6	87.6					69,714	0.15					
June 8-14	81.0	96.6	72.7	89.9					64,000						
June 15-21	84.3	90.3	73.3	89.6					68,000	6.70					
June 22-28	77.7	86.9	73.4	85.9						2.60					
June 29-July 5	81.3	95.6	75.0	90.1					30,000						
July 6-12	83.1	97.6	74.0	89.3						1.50					
July 13-19	79.6	91.1	73.9	88.4					25,714	3.20					
July 20-26	81.4	94.9	74.7	90.4											
July 27-Aug 2	85.3	101.	74.9	94.7					15,000	1.10					
Aug 3-9	83.0	97.7	73.4	92.3						1.20					
Aug 10-16	83.9	101.	74.4	94.1											
Aug 17-23	84.7	100.	74.4	95.3						0.40					
Aug 24-30	81.3	96.7	72.9	92.7						0.20					
Aug 31-Sept 6	81.6	98.6	72.7	94.6						1.20					
Sept 7-13	81.6	96.1	71.3	92.4						0.50					
Sept 14-20	76.1	87.4	67.3	86.0						0.30					
Sept 21-27	80.6	95.3	70.0	94.3					108,000	1.20					
Sept 28-Oct 4	69.4	85.0	59.3	85.1				183.38	36,000						
Oct 5-11	72.4	87.1	61.0	84.0					171,000	0.20		0.2			
Oct 12-18	67.3	78.6	62.0	77.0	65.8	74.3	6.3			1.90	3.5	0.9			
Oct 19-25	65.7	79.0	59.6	78.7	69.8	81.0	4.5	259.88		1.00	2.5	2.3			
Oct 26-Nov 1	57.4	71.4	44.1	66.6	61.9	76.6	4.7		72,000	3.70	3.2	3.5			
Nov 2-8	51.1	63.9	43.9	65.7	54.0	68.4	6.7		54,000	0.20	4.8	1.6			
Nov 9-15	57.6	66.1	56.7	67.3	51.6	62.4	7.2			7.00	1.8	1.4			
Nov 16-22	56.1	67.9	46.7	66.7	59.9	70.7	5.2	410.62		2.20	10.3	2.1			

Continued.

Table 1. Continued.

Weeks	Soil Temp.[1] Min.	Soil Temp.[1] Max.	Air Temp. Min.	Air Temp. Max.	Water Temp. Min.	Water Temp. Max.	Average Weekly D.O.[2] (mg/l)	Average Monthly Forage Biomass (g/m^2)	Total Water Pumped (gal/A)	Total Rainfall (inches)	Large Crawfish Count (#/trap)	Juvenile Crawfish Count (#/dip)	Crawfish Harvest (lb/A)	Crawfish Size (cnt/lb)	Total Trap-sets (#/A/wk)
	deg. F														
Nov 23-29	48.7	61.7	38.1	62.7	50.6	65.0	7.3		52,500		6.3	2.1			
Nov 30-Dec 6	54.1	67.7	49.9	71.0	50.9	61.7	6.4			0.30	6.7	2.7			
Dec 7-13	52.0	63.6	45.9	67.3	54.0	63.5	6.0		56,250	1.25	9.3	1.5			
Dec 14-20	48.3	59.1	41.7	59.9	48.7	60.1	8.0	424.73		1.25	9.9	1.8			
Dec 21-27	42.1	52.9	31.9	51.6	45.5	53.6	7.3			0.20	12.9				
Dec 28-Jan 3	46.3	56.3	37.9	58.6						0.08		2.1			
Jan 4-10	42.1	55.1	34.4	58.4	42.8	56.8	9.2		63,000		5.2	2.2			
Jan 11-17	46.3	55.4	41.1	58.3	46.3	56.7	7.2			0.60	3.4	1.5			
Jan 18-24	41.4	53.3	32.3	58.9	40.3	51.8	10.9	388.28		1.20	5.9	1.2			
Jan 25-31	51.6	61.4	46.7	61.7	54.0	65.7	6.5			3.50	3.3	1.6			
Feb 1-7	46.4	57.3	42.0	59.0	42.4	52.9	8.4			0.10	6.9	1.5			
Feb 8-14	52.9	63.6	45.3	61.9	52.5	68.4	4.9		139,500	1.55	12.2	0.9			
Feb 15-21	52.1	64.6	48.6	68.6	47.8	60.1	6.1	291.85	58,500	0.15		1.2			
Feb 22-28	53.1	66.3	43.7	63.6	57.0	69.4	4.5		45,000			1.1	14.35	23.0	75
Mar 1-7	50.1	64.0	46.0	66.7	47.5	63.5	6.7			2.00		0.9	13.43	25.0	75
Mar 8-14	52.4	67.9	45.3	66.6	50.9	75.8	4.5		90,000	7.60		1.1	20.93	26.9	75
Mar 15-21	58.6	73.6	56.4	73.4	54.9	70.2	3.4	245.62	82,500	0.10		0.8	20.85	27.5	75
Mar 22-28	65.6	77.3	58.4	77.4	63.0	78.4	2.4			0.25		0.7	30.97	27.4	75
Mar 29-Apr 4	55.6	74.6	44.1	68.9	52.4	71.3	5.2		48,750			0.9	40.54	26.7	75
Apr 5-11	59.7	74.9	54.6	74.4	50.9	75.2	5.2			2.30		0.4	44.12	25.2	75
Apr 12-18	66.4	75.4	61.3	75.6	62.6	81.3	3.4			2.70		0.7	50.33	24.1	75
Apr 19-25	68.3	81.0	65.3	80.6	65.8	84.4	2.0	116.92	33,231	1.60		0.4	62.67	22.8	75
Apr 26-May 2	73.1	85.4	68.1	82.7	72.3	89.6	2.9			1.80		0.3	75.34	21.6	75
May 3-9	68.9	80.7	65.0	79.9	62.6	81.3	4.6			2.10			83.28	21.8	75
May 10-16	75.7	89.1	70.3	85.6	74.8	87.4	2.5	43.95	151,500	0.60			81.03	22.3	75
May 17-23	68.6	83.1	62.9	81.6	69.8	86.7	4.5		56,250	1.20			65.97	23.4	75
May 24-31	76.1	92.9	68.1	86.0	69.8	91.9	3.7		45,450	2.60			45.53	23.7	75
Season total									1,635,85	71.48			649.34		1050

[1] Soil temperature was measured at a depth of 4 inches.
[2] Dissolved oxygen readings were taken about 8:00 a.m.

EFFECTS OF DENSITY REDUCTION ON THE PRODUCTION OF LARGE CRAWFISH

W.R. McClain, R.P. Romaire, K.R. Taylor, and J.J. Sonnier

INTRODUCTION

A common problem facing Louisiana crawfish producers is the over-production of small, low-value crawfish. Production of small or stunted crawfish has been attributed mainly to overcrowding and is exacerbated by early depletion of food resources. Post-harvest grading according to size is a recent development in the Louisiana crawfish industry and has caused a shift in market demand to the largest size grades. The shift in demand with market prices proportionally higher for the larger crawfish reduces profitability for the producer of small or stunted crawfish.

Supplemental feeding of crawfish in earthen ponds has shown some increase in total production but none or, at best, only marginal increases in size-at-harvest. Other studies have documented overwhelming density-dependent growth in crawfish that linked slow growth and stunting to high population densities, regardless of food availability. However, under current pond production practices, little control of population density is achievable. Young-of-the-year (YOY) are not stocked as in most other pond culture systems, but are produced by broodstock contained within the pond. The resulting population density in a given season is a function of the number and size of broodstock successfully spawned and the survival of the young.

In Louisiana, overpopulation is highly likely in permanent ponds after several annual cycles. At present, there is no recommended method to sufficiently reduce crawfish numbers within a current production season once a pond has been flooded and overpopulation is suspected. Therefore, this study was conducted to evaluate three methods for their effectiveness in reducing crawfish density in overpopulated ponds sufficiently to affect the production of larger crawfish.

Pond Area: Sixteen 0.4-acre ponds

Forage Crop: Rice ('Mars') planted at 110 lb/A

Planting Date: 3 Aug 1993

Seeding Method: Broadcast then lightly covered

Fertilizer: 23-12-12 at 260 lb/A preplant incorporated; 46-0-0 at 70 lb/A (topdress), 8 Sept; 21-0-0 at 200 lb/A (topdress), 4 Oct

Herbicide(s): Stam + Basagran (4 qt + 2 pt/A), Aug 20

Insecticide: None

Permanent Flood: 4 Oct

Crawfish Harvest: 21 Feb - 26 May, 3 consecutive days/wk, every week, total of 42 trap-days (1,050 total trap sets/A)

Trap Type and Density: 3-funnel pyramid at 25 traps/A

Crawfish Grades: All crawfish harvested were subjected to a grader (passive, water type), and sorted into four grade categories as follows: "Jumbo grade" - ≤ 15 count/lb, "Large grade" - 16-20 count/lb, "Medium grade" - 21-28 count/lb, "Peeler grade" - > 28 count/lb

Feed: None

Exp. Design: Randomized complete block (four replications)

Treatments: 1) Physical removal of crawfish with small-mesh-bottom traps (17 Feb - 10 Mar, 32 traps/A); 2) Ammonia toxicity via application of urea fertilizer (300 lb/A, 12 Jan and 8 Feb) and calcium hydroxide (50 lb/A, 24 Jan; 25 lb/A, 1 Feb; 272 lb/A, 8 Feb); 3) Temporary drain of ponds for 5 days (20% of pond bottoms retained some amount of water), and 4) A control whereby no density reduction method was implemented.

Parameters: Crawfish production, crawfish size, proportional yields according to size, forage persistence

Comments: Monthly population estimates determined from the three sampling methods generally revealed no differences during the pre-treatment period (Table 1). A significant reduction in population density, as estimated from each of the three sampling gears, was evident after implementation of the density reduction measures. The control and physical-removal treatments usually had higher population densities than did the urea application and temporary drain treatments during the post-treatment period.

Table 1. Average indications of density by three sampling techniques in experimental crawfish ponds pre- and post-period of density reduction measures. Averages followed by the same letter within a column, by sampling method, were not significantly different ($P>0.05$). Standard errors are in parentheses.

Density control measure	Pre-treatment period					Post-treatment period		
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May
	Catch Per Unit Effort[1]							
No control	2.9^{A} (0.4)	5.0^{A} (1.2)	8.8^{A} (1.9)	5.0^{A} (2.2)	9.6^{A} (1.5)	16.2^{A} (0.9)	25.9^{A} (1.3)	26.5^{A} (1.8)
Physical-removal	2.9^{A} (0.4)	5.4^{A} (0.8)	11.7^{A} (2.4)	7.1^{A} (2.3)	8.0^{A} (1.9)	10.1^{B} (1.1)	23.8^{A} (1.2)	19.8^{B} (1.7)
Urea application	2.7^{A} (0.5)	5.7^{A} (1.0)	10.7^{A} (2.0)	3.2^{A} (0.5)	2.7^{B} (0.3)	10.0^{B} (0.9)	16.7^{B} (1.0)	21.3^{B} (1.3)
Temporary drain	3.5^{A} (0.6)	7.7^{A} (1.6)	11.6^{A} (2.7)	2.4^{A} (0.9)	2.8^{B} (1.1)	1.8^{C} (0.2)	9.5^{C} (0.7)	15.6^{C} (0.6)
	Dip Net Sweep Counts[2]							
No Control	1.0^{A} (0.3)	2.1^{A} (0.2)	1.8^{A} (0.2)	1.9^{A} (0.4)	1.5^{B} (0.3)	1.1^{B} (0.2)	0.9^{A} (0.2)	0.4^{A} (0.1)
Physical-removal	1.5^{A} (0.6)	2.5^{A} (0.4)	2.1^{A} (0.4)	2.1^{A} (0.3)	2.1^{A} (0.3)	1.9^{A} (0.3)	1.0^{A} (0.2)	0.2^{A} (0.1)
Urea application	0.8^{A} (0.3)	1.9^{A} (0.2)	2.1^{A} (0.4)	1.6^{A} (0.2)	1.0^{BC} (0.1)	0.3^{C} (0.04)	0.3^{B} (0.1)	0.3^{A} (0.1)
Temporary drain	1.2^{A} (0.4)	2.0^{A} (0.2)	2.1^{A} (0.4)	1.4^{A} (0.3)	0.5^{C} (0.1)	0.1^{C} (0.03)	0.1^{B} (0.03)	0.2^{A} (0.07)

Continued.

Table 1. Continued.

Density control measure	Pre-treatment period				Post-treatment period			
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May
	Drop Sampler Counts[3]							
No control	4.2^{A} (1.8)	19.3^{A} (2.9)	25.5^{A} (3.0)	20.7^{A} (2.7)	26.6^{A} (3.1)	28.3^{A} (2.2)	10.6^{A} (1.9)	11.4^{A} (1.5)
Physical-removal	6.2^{A} (2.9)	13.9^{A} (2.4)	14.9^{B} (2.6)	4.2^{C} (1.6)	15.0^{B} (2.2)	11.5^{B} (1.3)	7.9^{A} (1.2)	7.9^{B} (1.2)
Urea application	3.8^{A} (1.7)	15.1^{A} (2.4)	12.9^{B} (2.7)	12.7^{B} (1.9)	9.6^{BC} (2.4)	3.3^{C} (0.6)	3.5^{B} (0.7)	4.1^{C} (0.9)
Temporary drain	5.2^{A} (1.8)	16.1^{A} (2.3)	23.7^{A} (2.3)	9.0^{BC} (1.5)	5.0^{C} (2.0)	1.5^{C} (0.4)	2.8^{B} (0.8)	3.2^{C} (1.0)

[1] Number of crawfish caught per trap (3-funnel pyramid, 19-mm mesh) after a 24-h baited set. Crawfish were returned to the ponds during the pre-treatment period.
[2] Number of crawfish caught per dip net (2-mm mesh) sweep (0.6 m^2 area).
[3] Number of crawfish per m^2 caught with drop sampler per set. A sampler was randomly placed within one pond replicate per treatment.

Un-ionized ammonia concentrations in the urea-treated ponds remained low after the first application of urea and the two subsequent applications of $Ca(OH)_2$ (Fig. 1). Two crawfish mortalities occurred (18 and 24 January) after the first application, but it is uncertain whether they were related to ammonia toxicity. Only after the second application of urea did NH_3 levels reach toxic concentrations > 2mg/L NH_3-N and shortly thereafter, 23 crawfish mortalities occurred (Fig. 1). Average mortality of the original caged crawfish was 35%, while on average 26% of the replacements died, bringing the overall average mortality of the caged crawfish to 33.7%. Eighty-four percent of the dead crawfish were immature.

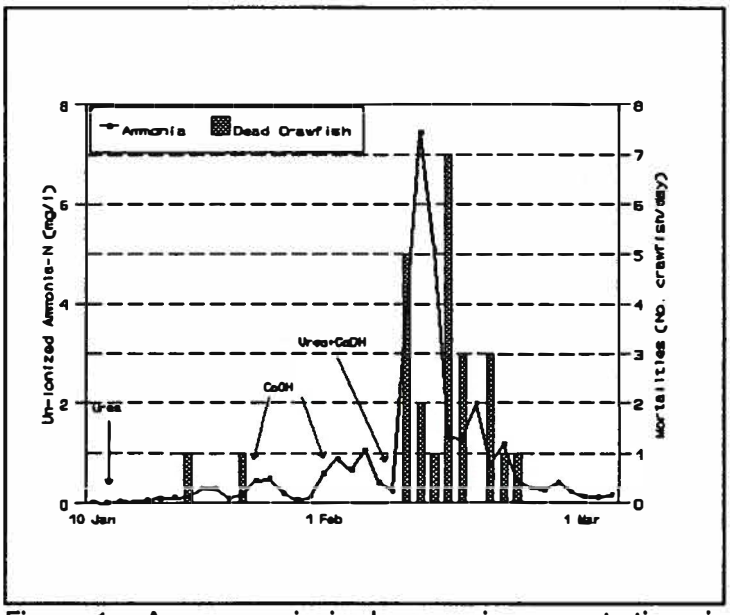


Figure 1. Average un-ionized ammonia concentrations in crawfish ponds after additions of urea and calcium hydroxide and total daily mortalities of cages (40 original and 25 replacements) crawfish.

In the physical-removal treatment, an average of 176 lb crawfish/A were removed with the small-mesh-bottom traps. Of those, 60 lb/A (34%) were of marketable size. The temporary drain appeared to have reduced crawfish densities to one-fourth to one-third of densities observed in the control (Table 1).

Only one of the density reduction measures (temporary drain) caused a significant reduction in the total yield (Table 2). However, average crawfish size-at-harvest and yields according to size-grade were profoundly altered by two treatments. Average sizes of harvested crawfish were 15.9, 14.8, 23.6, and 22.1 g in the control, physical-removal, urea application, and temporary drain treatments, respectively. In the control and physical-removal treatments, only 18.3 and 9.9% of the harvested crawfish, respectively, were in the largest two size categories. In the urea application and temporary drain treatments, 67.7 and 61.3% of the crawfish, respectively, were in the top two categories. Only in the urea application treatment was there a major shift to larger crawfish without a significant reduction in total yield.

Vegetative biomass was also significantly affected by treatment (Table 3) and was negatively correlated with crawfish density. Forage crop persistence late in the season was greatest in the temporary drain treatment, followed by the urea treatment, and significantly less in the control and physical-removal treatments.

Table 2. Avèrage total annual yield and proportional percentages of crawfish harvested from experimental crawfish ponds. Averages followed by the same letter within a column were not significantly different (P>0.05). Standard errors are in parentheses.

Density control measure	Yield by grade category[1]								Total annual yield (lb/A)
	Grade 1		Grade 2		Grade 3		Grade 4		
	(lb/A)	(% of total)	(lb/A)	(% of total)	(lb/A)	(% of total)	(lb/A)	(% of total)	
No control	21.8^{C} (3.2)	2.2	155.3^{BC} (20.3)	16.1	651.8^{A} (43.7)	67.5	137.0^{A} (20.5)	14.2	965.8^{A} (61.8)
Physical-removal	9.5^{C} (2.1)	1.3	64.3^{C} (3.2)	8.6	653.3^{A} (39.7)	69.8	151.7^{A} (15.6)	20.3	745.6^{A2} (45.3)
Urea application	297.7^{A} (17.4)	33.1	291.9^{A} (46.2)	34.6	233.2^{B} (37.1)	27.6	40.0^{B} (4.1)	4.7	844.8^{A} (96.0)
Temporary drain	103.2^{B} (16.1)	22.5	178.0^{B} (26.7)	38.8	154.2^{B} (32.4)	33.6	23.5^{B} (3.5)	5.1	458.9^{B} (71.0)

[1] Crawfish in grade categories 1, 2, 3, and 4 averaged 34.7, 24.2, 16.4, and 11.6 g, respectively.

[2] An additional 60 lb/A of marketable crawfish (average wt. 17.4 g) were harvested during the physical-removal period, bringing the total harvest of marketable crawfish to 805.6 lb/A for the physical-removal treatment group.

Table 3. Average forage biomass (lb/A dry weight) during the season in experimental crawfish ponds. Averages followed by the same letter within a column were not significantly different ($P>0.05$). Standard errors are in parentheses.

Density control measure	Pre-flood	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May
No control	1573^{A} (291)	2300^{A} (335)	4216^{A} (664)	4049^{A} (496)	3733^{A} (689)	2554^{A} (288)	1981^{A} (125)	612^{C} (82)	6^{B} (6)
Physical-removal	1815^{A} (269)	2468^{A} (235)	3422^{A} (443)	4053^{A} (625)	2868^{A} (291)	2396^{A} (315)	2138^{A} (193)	627^{C} (137)	17^{B} (17)
Urea application	1523^{A} (213)	2299^{A} (307)	3520^{A} (396)	3456^{A} (663)	3233^{A} (185)	2787^{A} (230)	2118^{A} (351)	1107^{B} (128)	628^{AB} (221)
Temporary drain	1634^{A} (197)	2207^{A} (269)	3496^{A} (510)	3597^{A} (560)	3021^{A} (214)	2678^{A} (121)	2529^{A} (252)	1825^{A} (6)	917^{A} (317)

Overpopulation and stunting was apparent in the control and physical-removal treatments as illustrated by the size-at-harvest data and further supported by the rapid depletion of forage. Less than 19% of the total catch from the control and physical-removal groups were in the two largest grades. Reducing the density in the physical-removal treatment by an average of 176 lb crawfish/A did not increase the average size or proportion of large crawfish, indicating that the reduction in density was insufficient to positively affect the outcome. Post-treatment indicators of density in the physical-removal group, although generally lower than the control, were generally higher than the other two treatments, supporting the contention that insufficient numbers were removed.

Overpopulation was corrected and subsequent stunting was prevented by two of the density reduction measures. Although not accurately quantified, all indications suggest that crawfish numbers were substantially reduced by the temporary drain and that this reduction method was sufficient to increase the percentage of large crawfish in the catch. However, the increase was offset by a significant reduction in total yield. The reduction in crawfish density was most effective with the urea application. Based on the mortality of caged crawfish, it is estimated that about one third of the population was reduced, mostly from juvenile mortality. The reduction was apparently adequate to positively affect size-at-harvest without a substantial reduction in total yield.

It is not known whether the first two mortalities of caged crawfish in the urea treatment occurred as a result of the urea application because ammonia levels remained low due to low pH and water temperatures. Although some residual ammonia was present prior to the second urea application in this study, it is probable that a single application of urea (at 300 lb/A) under favorable conditions of pH and water temperature would have caused mortality sufficient enough to alleviate stunting.

This study supports other findings that attribute slow growth and small harvest size of crawfish to high density and also demonstrates a positive response within a current production season when density is reduced in earthen ponds. No attempt was made to evaluate the economic feasibility of the density reduction methods used in this study because of the high variability of economic factors. Whereas the implementation cost would be easily attainable and relatively stable, the cost effectiveness would depend largely on the market price of crawfish and on the price differentials between the various size-grades. From a biological standpoint, the urea treatment was the most effective in producing the greatest amount of large crawfish. Corroboration and refinement are needed before this method can be recommended as a management practice. Furthermore, additional evaluation would likely improve the efficacy of a temporary drain in controlling overpopulation. If refined, a temporary drain would likely be a practical method easily implemented by commercial producers.

EFFECTS OF FOOD RESOURCES ON CRAWFISH REPRODUCTION

W.R. McClain, K.R. Taylor, J.J. Sonnier

INTRODUCTION

Production of crawfish from commercial ponds in Louisiana is mostly dependent on recruitment of young-of-the-year (YOY) crawfish from broodstock that burrowed the previous spring/early summer. Recruitment of YOY is unpredictable and is often highly variable. This results in uncertain annual harvests of crawfish with far ranging economical consequences. Low annual yields with small (or negative) returns frequently result from too few YOY. Recruitment of too many YOY causes an over-population condition which results in the production of small, often stunted, crawfish that are sub-marketable or of low-value.

The number of YOY is dependent mainly on the number of broodstock surviving in burrows, the spawning success, and survival of the young. Little is known of the "normal" values for these parameters or to what extent they can be affected by environmental conditions. A more thorough understanding of the reproductive biology of crawfish is needed before management practices can be implemented to optimize numbers of YOY.

Physiological condition of broodstock at the time of burrowing may impact reproductive performance since crawfish must rely on reserves while in the burrow. Nutritional conditions in a culture pond at the end of the season (time of burrowing) may be limited. Therefore, this study used artificial burrows maintained in the laboratory to evaluated the effects of different food resources on crawfish condition and reproductive efficiency.

Female crawfish were collected from ponds at the Rice Research Station that contained different types and amounts of food resources. One group of ponds had been depleted of nearly all vegetative food resources for several weeks prior to collection due to an over population of crawfish. A second group of ponds, which contained crawfish at much lower densities, had approximately 1,000 lb/A of forage dry matter present. Two other ponds types that were forage depleted received either pelleted feed or raw soybeans for 3 weeks prior to collection of crawfish.

Artificial Burrows: **Group System**: 3"W X 4"H PVC cylinders that housed individual crawfish but shared a common water bath.
Individual System: 3.5"W X 5"H plastic cups that housed crawfish and water in individual containment. Systems were placed adjacent to one another in the laboratory and were maintained under constant temperature and subdued light. Disturbance was kept to a minimum and systems were check once per week after observance of the first spawn.

Collection Date: 6 June 1994

Temperature: Spawning room was maintained at 24 ± 2 °C

Water: Well water (passed through a commercial water softener) was maintained at 1/2" depth in artificial burrows. Water was changed as needed (approximately 8-10 times during the experiment).

Experimental Design: Randomized block design with 44 replications per treatment combination (food resource by artificial burrow system).

Feed: 25% crude protein crawfish feed (Peoples Moss Gin Co., Palmetto, LA) or raw heat-damaged soybeans. Fed 35 lb/A, 5 days/week, for 3 weeks prior to collection for selected ponds.

Spawning Period: **First Spawn:** Observed 18 Aug 1994
Last Spawn: Observed 13 Oct 1994

Terminated: 9 Dec 1994 and all non-spawned crawfish were dissected for determination of condition indices.

Treatments: The main treatment was pond culture environment that contained different food resources prior to collection of crawfish, which included: 1) Forage depleted ponds, 2) Forage repleted ponds, 3) Forage depleted ponds that received pelleted feed, and 4) Forage depleted ponds that received raw soybeans. The secondary treatment factor was containment type of artificial burrow, which included a group system or individual system.

Parameters: Crawfish weight at collection, weight loss after spawning (or termination), survival of brood females, spawning success, fungal infection of eggs, number of young hatched, hepatopancreas and abdominal muscle moisture and ratio as percent of body weight after spawning (or at termination).

Comments: Supplemental feed applied to forage depleted ponds at the end of a production season appeared to have had a positive impact on broodstock spawning success under simulated burrow conditions in the laboratory (Tables 1 and 2). Crawfish receiving supplemental feed had higher survival rates and spawned in greater numbers. Crawfish collected from forage depleted ponds without supplemental feed exhibited a much lower propensity to spawn than others and also hatched fewer young. However, it is unclear whether these reductions were due directly to nutrition deficiencies in the pond. Since female crawfish collected from forage depleted ponds, although representative of the harvestable population, were very small, it is possible that some may not have been sexually mature. It is much more difficult to estimate maturity with a high degree of certainty when crawfish are small because the visual characteristics associated with maturity are not as obvious. The number of eggs laid are generally related to crawfish size therefore, it is unclear whether the small number of young hatched by this group of crawfish was a direct function of nutrition or crawfish size. There was no significant difference in spawning success between the two feed types.

There were some general trends in spawning success due to type of simulated burrow system in this experiment (Table 3). Crawfish housed in the individual containment system had higher rates of survival and spawning but also had more incidences of fungal infestation of the egg mass. Further research is needed before assertions can be made as to the accuracy of laboratory burrows in simulating real burrow conditions and before recommendations of the most appropriate simulated burrow type is given.

Table 1. Average reproductive success and physiological condition of female crawfish collected (6 June 1994) from ponds with various food resources and housed in simulated burrows in the laboratory. Eighty-eight crawfish per treatment were collected. Averages followed by the same letter within a column were not significantly different (P≥0.05). Rice Research Station, Crowley, LA. 1994.

Treatment	Initial weight	Survival	Spawned[1]	Spawned group					Non-spawned group				
				Weight[2] loss	Tissue ratio[3]		Tissue moisture		Weight[2] loss	Tissue ratio[3]		Tissue moisture	
					Hep.	Tail	Hep.	Tail		Hep.	Tail	Hep.	Tail
	(g)	(%)	(%)	(%)			(%)	(%)	(%)			(%)	(%)
Forage deplete	13.8	65.9	5.7	3.8[a]	0.64[b]	0.65[b]	84.7[a]	86.4[a]	3.0[ab]	0.63[b]	0.49[b]	80.7[b]	73.6[b]
Forage replete	26.8	67.0	20.4	4.9[a]	0.56[b]	0.68[b]	84.3[a]	86.3[a]	2.3[b]	0.49[c]	0.66[b]	85.3[a]	84.9[a]
Forage deplete w/ pellets	17.1	81.9	43.2	5.4[a]	0.65[b]	0.70[b]	83.7[a]	85.9[a]	3.4[a]	0.66[ab]	0.91[a]	81.4[b]	80.7[a]
Forage deplete w/soybeans	18.7	76.1	44.3	6.0[a]	0.91[a]	0.98[a]	78.7[b]	85.4[a]	3.9[a]	0.76[a]	1.09[a]	80.2[b]	82.5[a]
Group mean[4]				5.5	0.73	0.79	81.4	85.6	2.9	0.60	0.74	82.4	83.8

[1] As percent of the initial crawfish collected (88 per treatment).
[2] Percentage weight loss from time of collection (June) to release of young (or termination) (Aug-Dec).
[3] Dry hepatopancreas or abdominal muscle (tail) weight as percentage of wet body wt.
[4] Average values according to spawning status.

Table 2. Average fecundity of female crawfish collected (6 June 1994) from ponds with various food resources and housed in simulated burrows in the laboratory. Averages followed by the same letter within a column were not significantly different (P≥0.05). Rice Research Station, Crowley, LA. 1994

Treatment	Number spawned	No fungus detected		Partial fungus infestation		Full fungal infestation (%)[1]
		%[1]	Number juveniles hatched	%[1]	Number juveniles hatched	
Forage deplete	5	60.0	70.1[b]	0.0	-----	40.0
Forage replete	18	66.7	224.5[a]	0.0	-----	33.3
Forage deplete w/pellets	38	60.5	164.2[a]	10.5	118.2[a]	29.0
Forage deplete w/soybeans	39	64.1	167.7[a]	7.7	97.0[a]	28.2
Group mean[2]			172.7		109.1	----

[1] As percent of crawfish spawned.
[2] Average values according to fungal group.

Table 3. Average fecundity comparisons of female crawfish collected (6 June 1994) from ponds with various food resources and housed in different simulated burrow types in the laboratory. Rice Research Station, Crowley, LA. 1994.

Treatment	Laboratory containment	Survival	Spawned	No fungus	Partial fungus	Full fungus	Number juveniles hatched
		(%)[1]	No.(%)[1]	(%)[2]	(%)[2]	(%)[2]	
Forage deplete	Group	61.4	2 (4.5)	50.0	0.0	50.0	45.0
Forage deplete	Individual	70.4	3 (6.8)	66.7	0.0	33.3	83.5
Forage replete	Group	65.9	10 (22.7)	100.0	0.0	0.0	207.1
Forage replete	Individual	68.2	8 (18.2)	25.0	0.0	75.0	311.5
Forage deplete w/pellets	Group	72.7	19 (43.2)	68.5	21.0	10.5	148.2
Forage deplete w/pellets	Individual	88.6	19 (43.2)	52.6	0.0	47.4	170.7
Forage deplete w/soybeans	Group	77.3	16 (36.4)	81.2	6.3	12.5	153.6
Forage deplete w/soybeans	Individual	75.0	23 (52.3)	52.2	39.1	8.7	165.6
Grand Means							
	Group	69.3	26.7	78.8	10.6	10.6	162.1
	Individual	75.6	30.1	49.0	3.8	47.2	172.0

[1] As percent of the initial crawfish collected (88 per treatment).
[2] As percent of crawfish spawned.

RELAYING CRAWFISH INTO A RICE CROP AT TWO STOCKING RATES AND COMPARISON OF TRADITIONAL AND DRAIN HARVEST METHODS FOR RETRIEVING RELAYED CRAWFISH

W.R. McClain, K.R. Taylor, and J.J Sonnier

INTRODUCTION

Research at the Rice Research Station has shown that "relaying" small stunted crawfish at the end of a typical crawfish season into the improved environment of a rice field can yield further growth and substantially increase market value. Average crawfish size was more than doubled and market value was increased up to three-fold in a substantial proportion of the retrieved crawfish. Moreover, results indicate that it is possible to achieve very favorable rice yields after crawfish have been reharvested. Integrating crawfish and rice as an intercropping approach in this nontraditional manner may have very favorable economic impacts to farming systems, which are already somewhat integrated. Producers who have the ability to, or, who are already culturing rice and crawfish would likely benefit from such integration.

Although past results from this research have been very encouraging, the scope of research during 1994 was intended to evaluate a lower stocking rate and the possibility of using a nontraditional harvest technique to retrieve the relayed crawfish. Previous research investigated outcomes when crawfish were stocked at rates ranging from 500 - 1,000 lb/A. This recent study investigated similar parameters when much lower rates of crawfish (250 lb/A) were stocked into rice fields.

All water is routinely discharged from rice fields in preparation for the rice harvest. This research investigated the use of the water discharge as a means of harvesting the crawfish. Harvesting crawfish during the draining process would eliminate much of the costs associated with the traditional trap harvest method. Harvest costs are the major production expenses (60 to 80% of the total operating cost) of traditional crawfish aquaculture. The drain harvest method was evaluated as a means of retrieving the crawfish without most of the traditional harvest costs. Also, the drain harvest approach, in lieu of the traditional trapping practice, would spare that portion of the rice crop destroyed by the use of trapping lanes (approximately 15%).

Field Area: Twenty 0.5-acre fields

Forage Crop: Rice ('Orion')

Planting Date: 5 Apr 1994

Seeding Rate: 150 lb/A

Seeding Method: Broadcast then lightly covered

Fertilizer: 23-12-12 at 200 lb/A preplant incorporated
46-0-0 at 200 lb/A (topdress), 10 May

Herbicide: Stam + Basagran (4 qt + 2 pt/A), 27 Apr

Insecticide: None

Permanent Flood: 13 May (8-10 inches)

Relay: 16 June - 25 June (250 or 750 lb/A)

Relay Crawfish: Average size - 38.0 crawfish/lb, purchased from a commercial operation

Rice Stage at Relaying: Tillering

Enclosures: Cylindrical small-mesh (5 mm) wire, 0.5 m^2 surface area, placed over rice forage in fields (stocked at same rate as treatment, used for mortality estimates)

Crawfish Harvest: **Trap Harvest:** 11 July - 28 July (total of 16 trap-days) 32 traps/A
Drain Harvest: Via hoop nets (3/4" mesh) placed over drain pipes 25 July - 29 July

Crawfish Grades: "Jumbo"- < 15 count/lb, "Large"- 15-19 count/lb, "Medium"- 20-26 count/lb, "Peeler"- > 26 count/lb

Feed: None

Bait: Manufactured (Purina, Purina Mills, Inc., St. Louis, MO)

Rice Harvest: 15 - 16 Aug

Exp. Design: Completely randomized design (four replications per treatment)

Treatments: **Conventionally harvested fields**: low stocking rate (250 lb/A), high stocking rate (750 lb/A); **Drain harvested fields**: low stocking rate (250 lb/A), high stocking rate (750 lb/A); **Rice control fields**

Parameters: Crawfish mortality, production, and harvest size; Rice production

Comments: This experiment comprised the fourth year of study for which information was gained on integrating crawfish production with that of rice production in a non-traditional approach (intercropping). The effectiveness of "relaying" small crawfish into a rice crop and reharvesting them at a larger size was consistently very good. Additionally, the subsequent rice yields following the crawfish harvest was good. However, the initial evaluation of an alternative crawfish harvesting strategy to improve total rice yields and decrease crawfish harvest cost resulted in disappointing results.

Mortality from handling and transferring was estimated to be 6.5% during the first 24 hr after transferring with an additional 13% over the next 6 days. Crawfish were reharvested with either baited traps prior to drainage or with nets during the water discharge period. Average yields of 388 and 590 lb of crawfish per acre were achieved by trap harvest from the low and high stocked fields, respectively (Table 1). Average crawfish size in this study more than doubled (from 38 to 16 crawfish/lb) and retrieval rates from trap harvest, based on total weight, was 155 and 78% of that stocked. Stocking rate affected growth of crawfish; the low stocking rate yielded more crawfish in the largest size grade. Yields corresponding to size categories were significantly different, according to treatment, and averaged 44, 44, 8, and 4% for the "Jumbo," "Large," "Medium," and "Peeler" grades, respectively, for crawfish trap harvested after the low stocking rate, and 18, 57, 21, and 4%, respectively, for the same categories from the high stocked fields. Similar size trends were observed in the net harvested crawfish however, greatly reduced crawfish yields of only 30 and 79 lb/A for the low and high stocked fields, respectively, were achieved during the drain process. Crawfish movement was poorly correlated with water flow under the conditions of this experiment which would make returns with the drain harvest approach uneconomical. This aspect will be further investigated.

Rice yields averaged 6,835 lb/A for the control fields and 5,377 lb/A for fields where crawfish were removed by trap harvest. This reduction was attributed mainly to the presence of trapping lanes. Fields containing crawfish but no traps yielded an average of 6,459 lb of rice/A. Higher crawfish densities did not adversely affect rice yields.

Table 1. Average total yields, proportional percentages, and size-at-harvest of crawfish trap harvested from rice fields stocked at 250 lb/A (low rate) and 750 lb/A (high rate) and average rice yield for each treatment. Rice Research Station, Crowley, LA. 1994.

	Low stocking rate			High stocking rate			
Grade	Average size	Yield	% of Total	Average size	Yield	% of Total	Rice only
	(count/lb)	(lb/A)		(count/lb)	(lb/A)		(lb/A)
Jumbo	12.0	170	44	13.9	107	18	-----
Large	14.9	170	44	16.7	337	57	-----
Medium	21.2	31	8	21.2	124	21	-----
Small	32.3[1]	17	4	32.3[1]	22	4	-----
TOTAL							
Crawfish Yield		388			590		
Rice Yield		5299			5456		6835

[1] Crawfish in grade category 4 from both treatments were pooled and average size determinations were assessed from pooled samples.

EFFECTS OF WATER SOURCE ON CRAWFISH MORTALITY DURING PURGING

W.R. McClain, K.R. Taylor, and J.J Sonnier

INTRODUCTION

Approximately 60% of Louisiana crawfish production is sold in live form and the majority of these are marketed through private households and restaurants as whole boiled product. Crawfish are sometimes held in purging systems (where feed is withheld) for 24-48 hours prior to being sold or consumed. Most of these systems are of a flow-through type composed of a water-filled tank or canal with suspended wire-mesh baskets that hold crawfish off of the bottom and in the water column. Good water quality is maintained with either profuse supplemental aeration and/or by high volumes of oxygenated water replacement. The purging procedure eliminates or greatly reduces the contents of the gut, which is exposed when the tail is peeled for consumption. The process also washes the outer surface and gill area, which results in more sanitary conditions during the cooking process when crawfish are boiled whole. Overall, purging renders a cleaner, more attractive product with better consumer appeal. Improved quality, resulting from purging, is a major contributor to repeat sales and historic loyalty to certain producers or restaurants.

Crawfish loss during the purging process is highly variable and can be substantial. Mortalities during purging ranged from 2.4 - 32% in previous studies. Several factors can affect mortality losses such as loading rates, stresses, and physiological stage of crawfish. Little is known of the effects of water source on crawfish losses during this process. Therefore, this study compared crawfish mortalities after 24 hours in a flow-though purge system when pond water or well water was used. Crawfish were randomly taken from the daily harvest 2 consecutive days per week during the test period. One day each week well water was used in the purge vat and pond water was used the other day. The order of water source used was alternated each week.

Cultural Conditions: Typical rice-forage crawfish ponds

Crawfish Harvest: From baited pyramid traps, approximately 45,387 individual crawfish were subjected to the study

Grader: Passive, water-type, developed by LSU Agricultural Center (see 84th Annual Research Report, Rice Research Station)

Purge System: Flow-through, rectangular (200 gallon) with 5 submerged wire-mesh baskets and profuse supplemental aeration.
Flow Rate: 0.56 gallon/min (turnover = 6 hr)
Loading Rates: 2.8 lb crawfish/ft^2 of basket

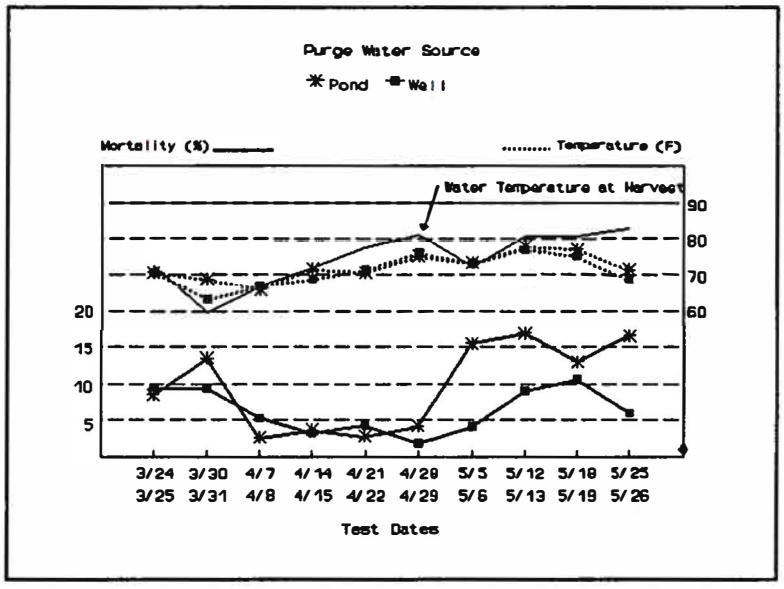
Test Dates: 3/24-25, 3/30-31, 4/7-8, 4/14-15, 4/21-22, 4/28-29, 5/5-6, 5/12-13, 5/18-19, 5/25-26

Treatments: Crawfish were held in a flow-through purge system after being graded. Water source was either well water (passed through a commercial water softener) or pond water

Parameters: Crawfish mortality (%) after purging; crawfish maturity (%) was also determined for crawfish entering the purge system and for dead crawfish after the purge process

Comments: Crawfish mortality during purging varied from 1.9 to 16.9% in this study (Figure 1). As observed in previous studies, crawfish mortality was higher with immature crawfish. The average percent of immature crawfish in the test group was 62% while the immature crawfish in the dead group averaged 81%, indicating that immature crawfish were more susceptible to mortality during purging. Mortality was not highly affected by water source. However, there appeared to be a general trend of higher mortalities associated with pond water. Average mortality for crawfish purged in pond water was 9.7% while average mortality for crawfish purged in well water was 6.4%. Pond water was correlated with consistently higher mortalities during the later test dates. The reason for this was unclear and did not appear to be related to water temperatures. Although not obvious, nitrite and total iron are two suspected water quality variables (Table 1). Further research is needed in this area.

Figure 1. Average mortality of crawfish after purging when purged in either well or pond water. The corresponding water temperature[1] for each water source and the average pond water temperature[2] at time of harvest are also presented. Data represent values for weekly test dates of the study period. Rice Research Station, Crowley, LA. 1994.



[1] Purge water temperatures were determined by taking the median 24-hr temperature (from minimum and maximum recorded values).

[2] Pond water temperature at harvest was determined by averaging the median 24-hr temperatures (from minimum and maximum recorded values) for the two consecutive days of harvest.

Table 1. Average water quality characteristics of well and pond water used for the purging process during the study period. Effluent was measured at full loading capacity and after 24 hours of purging. Rice Research Station, Crowley, LA. 1994.

Parameter	Pond Water		Well Water	
	Influent	Effluent	Influent	Effluent
pH	8.27	8.33	7.35	8.33
Total Ammonia (mg N/L)	0.88	2.95	1.47	3.54
Nitrite (mg N/L)	0.015	0.326	0.015	0.199
Total Iron (mg/L)	0.19	0.16	0.12	0.06

MALEIC HYDRAZIDE AND RICE BIOMASS PRODUCTION AND PERSISTENCE FOR CRAWFISH - STUDY 1

R.T. Dunand, W.R. McClain, R.R. Dilly, Jr., K.R. Taylor, and J.J. Sonnier

Location: Rice Research Station, Crowley, LA (South Unit)

Variety: Mars

Seeding Rate: 100 lb/A

Planting Date: See treatments

Row Spacing: 7-inch

Planting Depth: 1 inch

Fertilizer: 7-21-21 with 3.5% zinc at 300 lb/A drilled preplant, 11 May;
urea (46% N) at 100 lb/A by Gandy, 24 Aug;
ammonium sulfate (21% N) at 200 lb/A by airplane, 4 Oct

Water Management: Flushed, 6 Aug and 5 Oct

Plot Size: 1750 ft^2 - 7 (12 rows) x 250 ft

Treated Area: 1750 ft^2 - 7 (12 rows) x 250 ft

Treatment(s): **Planting Date**

Early planting, 7 July
Late planting, 16 Aug

Plant Growth Regulator

Maleic Hydrazide (1.5 lb/A) - Royal MH 30 SG (2.5 lb/A)

Timing

Early boot (1/2-inch panicle), 17 Sept
First heading, 5 Oct

Sprayer: CO_2-driven, hand-held, 32 psi, 15 GPA, 8002 nozzles

Pertinent Rainfall: No rainfall within 24 hours of application

Herbicide(s): Arrosolo + Prowl (3 qt + 1 pt/A) by airplane, 20 July
Arrosolo + Londax (1 gal + 1 oz/A) by bicycle sprayer, 26 July
Stam M4 + Basagran (1 gal + 2 pt/A) by backpack sprayer, 2 Sept

Insecticide(s): None

Fungicide(s): None

Emergence: Early planting, 12 July
Late planting, 21 Aug

Permanent Flood: 14 Oct

Harvest Date: Biomass sampling - 13 Oct (preflood), 27 Oct, 22 Nov, 20 Dec, 20 Jan, 16 Feb, 14 Mar, and 11 Apr

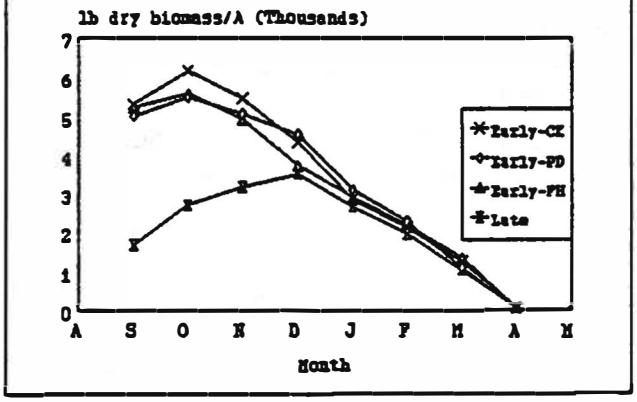
Harvested Area: Oct - Mar sampling: 9.33 ft^2 - 4.67 (8 rows) x 2 ft
Apr sampling: 23.33 ft^2 - 4.67 (8 rows) x 5 ft

Exp. Design: Randomized complete block and four replications

Comments: Rice biomass was monitored on a monthly basis from September 1993 through April 1994. Biomass evaluations were made on total dry weight, vegetative (leaves and stems) dry weight, and reproductive (panicles and grain) dry weight. Dry weight determinations were made after drying tissue in a forced-air oven at 70°C for 48 hours.

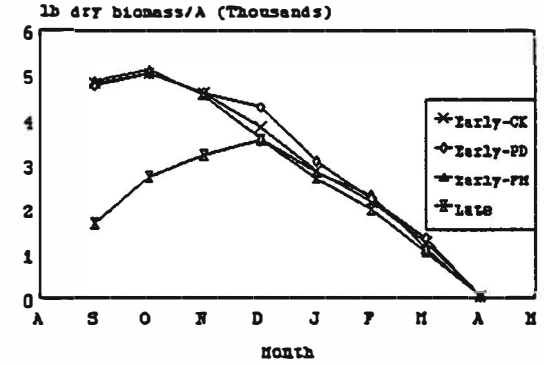
Total Dry Weight. Changes in rice biomass during the crawfish season were observed, and date of planting and maleic hydrazide (MH) influenced rice biomass (Figure 1). Regardless of treatment, rice biomass increased initially and then declined steadily. In the early planted rice, biomass peaked in October. In the late planted rice, the peak occurred in December. This resulted in the early planted rice having higher biomass during the period from September to December compared with the late planted rice. Both MH treatments decreased biomass in the early planted rice in October and November. By December, MH applied at panicle development continued to decrease biomass of early planted rice while MH applied at first heading either no longer affected rice biomass or slightly increased it. From January to April, biomass persistence (amount and rate of decline) was similar for all treatments and unaffected by date of planting or MH.

Figure 1. Rice Biomass Seasonal ('93-'94) Pattern as Influenced by Planting Date and Maleic Hydrazide



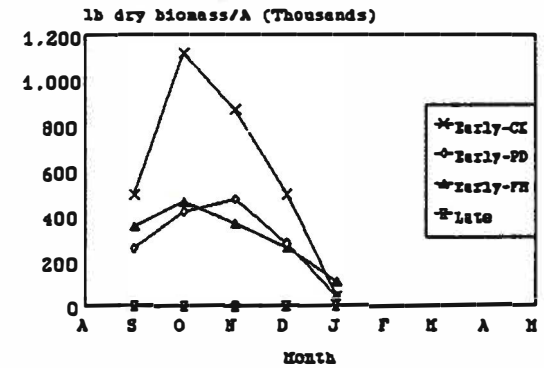
Vegetative Dry Weight. The pattern of vegetative biomass during the crawfish season was similar to total biomass patterns (Figure 2). The major difference was MH had no negative effects on vegetative biomass of early planted rice from September to November. Also, the increase in vegetative biomass during December and January due to the application of MH at first heading was greater compared with the effects on total biomass.

Figure 2. Rice Vegetative Biomass Seasonal ('93-'94) Pattern as Influenced by Planting Date and Maleic Hydrazide



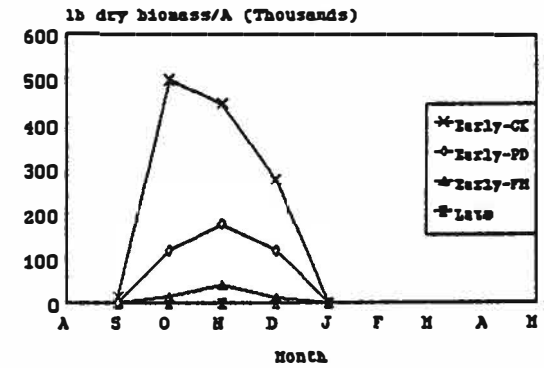
Panicle Dry Weight. Maleic hydrazide and late planting affected the pattern of reproductive biomass during the crawfish season (Figure 3). Reproductive biomass increased in early-planted rice, peaking in October and declining to negligible levels by January. Maleic hydrazide reduced reproductive biomass, and the effect of MH was independent of time of application. Reproductive biomass was nonexistent in late-planted rice due to no heading. Maleic hydrazide applied to early-planted rice tends to have the same effect on reproductive development as a late planting date.

Figure 3. Rice Reproductive Biomass Seasonal ('93-'94) Pattern as Influenced by Planting Date and Maleic Hydrazide



Grain Dry Weight. The effect of MH and late planting on reproductive biomass was due primarily to reduced grain production. In early-planted rice, grain production was highest in October and declined to negligible levels in January (Figure 4). Maleic hydrazide decreased grain production, and the application of MH at first heading was more effective than the application at early boot. Grain was absent in late-planted rice.

Figure 4. Rice Grain Biomass Seasonal ('93-'94) Pattern as Influenced by Planting Date and Maleic Hydrazide



Overall, MH had a minor effect on rice biomass production and persistence in a crawfish pond culture. Rice total biomass production was initially lowered by MH as the result of reduced reproductive development. Reproductive plant parts degraded early in the season, and the remaining vegetative biomass was unaffected by application of MH at early boot and improved slightly during mid season (December and January) by MH applied at first heading. Without decreasing vegetative biomass and by limiting reproductive growth, MH can improve crawfish production. Vegetative biomass degrades more slowly than reproductive biomass (grain) and provides a steady supply of forage in crawfish ponds. Grain, on the other hand, is a concentrated source of biomass and provides a more massive influx of biomass upon breakdown. When this high influx of biomass begins degrading in the water, oxygen levels can be reduced and negatively affect crawfish growth. The application of MH minimizes this problem by suppressing grain production while at the same time allowing optimum vegetative biomass production.

MALEIC HYDRAZIDE AND RICE BIOMASS PRODUCTION AND PERSISTENCE FOR CRAWFISH - STUDY 2

R.T. Dunand, W.R. McClain, R.R. Dilly, Jr., K.R. Taylor, and J.J. Sonnier

Location: Rice Research Station, Crowley, LA (South Unit)

Variety: Mars

Seeding Rate: 100 lb/A

Planting Date: 7 July

Row Spacing: 7-inch

Planting Depth: 1 inch

Fertilizer: 7-21-21 with 3.5% zinc at 300 lb/A drilled preplant, 11 May;
urea (46% N) at 100 lb/A by Gandy, 24 Aug;
ammonium sulfate (21% N) at 200 lb/A by airplane, 4 Oct

Water Management: Flushed, 6 Aug and 5 Oct

Plot Size: 1750 ft^2 - 7 (12 rows) x 250 ft

Treated Area: 1750 ft^2 - 7 (12 rows) x 250 ft

Treatment(s): **Plant Growth Regulator**

Maleic hydrazide (1.5 and 3 lb/A) -
Royal MH 30 SG (2.5 and 5 lb/A)

2,4-Dichlorophenoxyacetic acid (1.5 lb/A) -
Riverside Terra 2,4-D Amine 4 (3 pt/A)

Timing (weeks after planting)

Six (late tiller), 18 Aug
Eight (internode initiation), 1 Sept
Ten (panicle differentiation), 17 Sept
Twelve (late boot), 27 Sept
Thirteen (first heading), 5 Oct

Sprayer: CO_2-driven, hand-held, 32 psi, 15 GPA, 8002 nozzles

Pertinent Rainfall: No rainfall within 24 hours of application

Herbicide(s): Arrosolo+Prowl (3 qt+1 pt/A) by airplane, 20 July
Arrosolo+Londax (1 gal+1 oz/A) by bicycle sprayer, 26 July
Stam M4+Basagran (1 gal+2 pt/A) by backpack sprayer, 2 Sept

Insecticide(s): None

Fungicide(s): None

Emergence: 21 Aug

Permanent Flood: 14 Oct

Harvest Date: Biomass sampling - 16 Nov, 20 Jan, and 14 Mar

Harvested Area: Oct - Mar sampling: 9.33 ft^2 - 4.67 (8 rows) x 2 ft
Apr sampling: 23.33 ft^2 - 4.67 (8 rows) x 5 ft

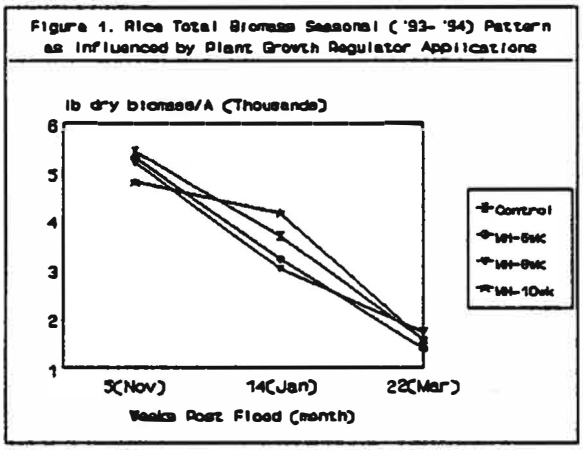
Exp. Design: Randomized complete block and four replications

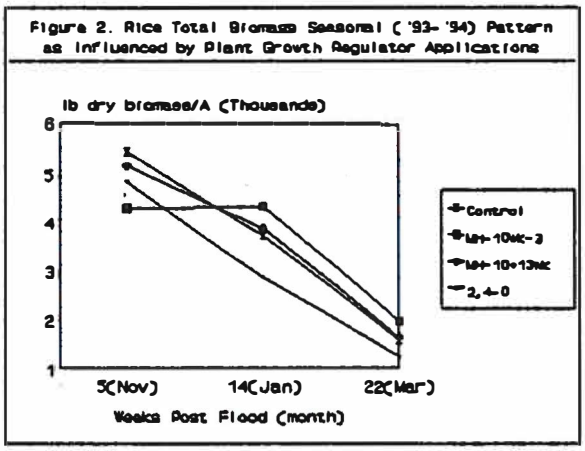
Comments: Rice biomass was monitored on a 6-week basis from November 1993 through March 1994. Biomass evaluations were made on total dry weight, vegetative (leaves and stems) dry weight, and reproductive (panicles and grain) dry weight. Dry weight determinations were made after drying tissue in a forced-air oven at 70°C for 48 hours.

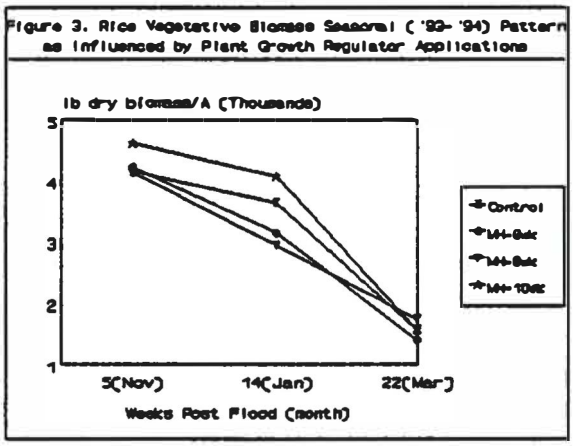
Total Dry Weight. Changes in rice biomass during the crawfish season were observed, and maleic hydrazide (MH) time of application influenced rice biomass (Figure 1). Maleic hydrazide applied at 6 and 8 weeks after planting (WAP) reduced biomass in January, yet had no effect on initial rice biomass in November or final biomass in March. In comparison, MH applied later at 10 WAP decreased rice biomass in November, increased biomass in January and had no affect on biomass in March. Doubling the rate of MH to 3 lb/A at 10 WAP had not only the effect of increasing biomass but also of improving biomass persistence (Figure 2). The pattern was similar to the lower rate of MH applied at the same timing with a decrease in biomass initially in November and an increase in biomass in January, which persisted into March. Multiple applications of MH at 10 and 13 WAP had no effect on rice biomass and 2,4-D applied at booting decreased rice biomass.

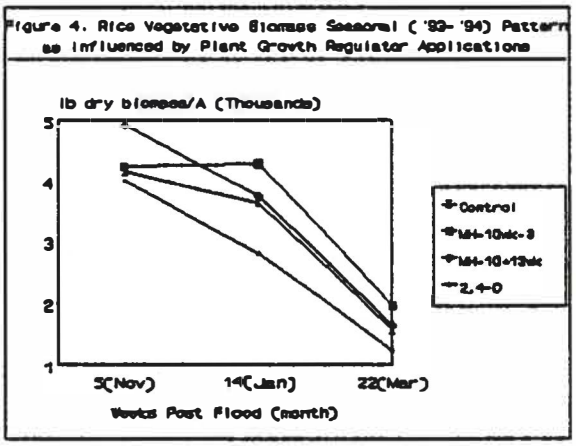
Vegetative Dry Weight. The patterns of vegetative biomass during the crawfish season were similar to total biomass patterns. Two major positive differences were noted in initial vegetative biomass. Treatments with MH (1.5 lb/A) applied at 10 WAP increased vegetative biomass in November, and there was no negative effect of the high rate of MH on vegetative biomass in November. These positive differences resulted in an increase

in vegetative biomass in November and January from MH applied at 10 WAP (Figure 3), an increase in vegetative biomass in November from MH applied at 10 and 13 WAP (Figure 4), and an increase in vegetative biomass at mid and late season by application of the high rate of MH at 10 WAP (Figure 4). Otherwise, similar effects to those on total biomass were noted. Applications of MH at 6 and 8 WAP decreased vegetative biomass in January while having no effect in November and March (Figure 3), and application of 2,4-D generally decreased vegetative biomass.



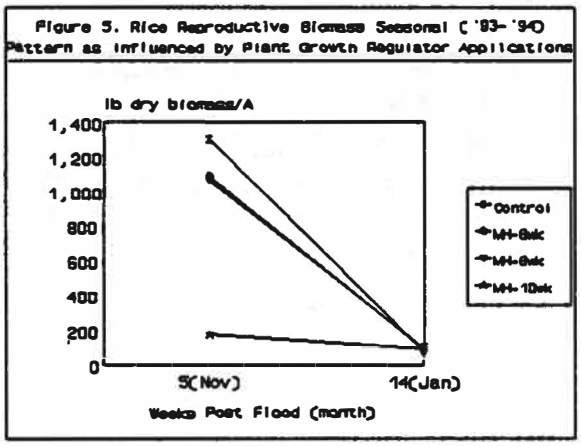


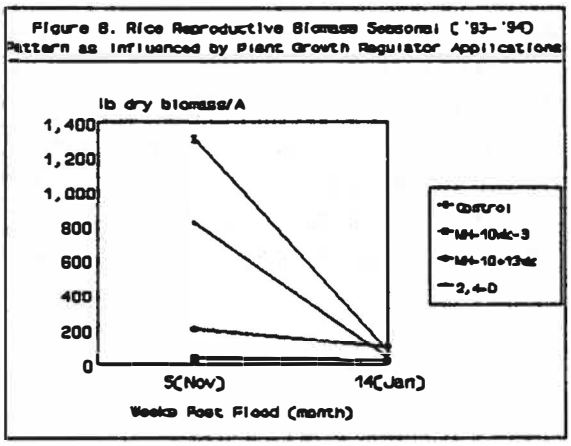




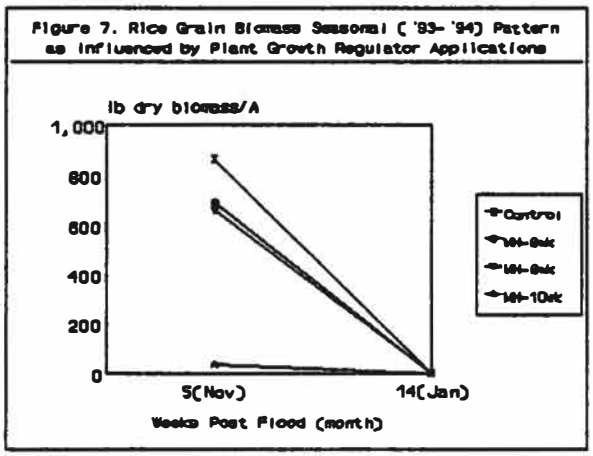
Panicle Dry Weight. Maleic hydrazide time and rate of application and 2,4-D decreased reproductive biomass during the crawfish season (Figure 5). Differences in effects were noted in November only since reproductive biomass declined rapidly to very low levels in January for all treatments. With time of application, MH applied at 6 and 8 WAP decreased reproductive biomass equally, and the most dramatic decrease occurred when MH was applied at 10 WAP. The high rate of MH caused almost complete elimination of reproductive biomass (Figure 6), and multiple applications of MH at 10 and 13 WAP were

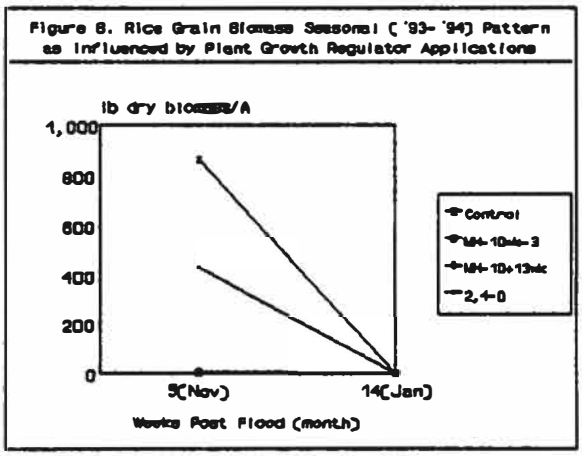
almost as effective as the high rate. The application of 2,4-D at 12 WAP was slightly more effective than the 6 and 8 WAP applications of MH but not as effective as the high rate and multiple applications of MH.





Grain Dry Weight. The effect of MH and 2,4-D on reproductive biomass was due primarily to reduce grain production. A comparison of the effects of plant growth regulators on grain production and reproductive biomass shows similar effects. All plant growth regulator applications reduced grain production. Applications of MH at 6 and 8 WAP reduced grain production equally while delaying the application until 10 WAP almost completely eliminated grain production (Figure 7). Other applications of MH at 10 WAP including the high rate and multiple application treatment at 10 and 13 WAP also eliminated grain production (Figure 8). The application of 2,4-D at 12 WAP was slightly more effective than the 6 and 8 WAP treatments but less effective than any of the treatments which included application of MH at 10 WAP.





Overall, MH had a modest effect on rice biomass production and persistence in a crawfish pond culture. Although total rice biomass production was relatively unaffected by plant growth regulators, vegetative and reproductive biomass were noticeably altered. Application of MH at 10 WAP increased vegetative biomass and decreased reproductive biomass. By increasing vegetative biomass and eliminating reproductive growth, MH can improve crawfish production. Vegetative biomass degrades more slowly than reproductive biomass (grain) and provides a steady supply of forage in crawfish ponds. Grain, on the other hand, is a concentrated source of biomass and provides a more massive influx of biomass upon breakdown. When this high influx of biomass begins degrading in the water oxygen levels can be reduced and negatively affect crawfish growth. The application of MH minimizes this problem by suppressing grain production while at the same time allowing optimum vegetative biomass production.

FORAGE CROPS BIOTECHNOLOGY RESEARCH

S.S. Croughan

BERMUDAGRASS

Cooperators: J.D. Barbour, J.H. Bouton, P.D. Colyer, G.J. Cuomo, M.M. Eichhorn, Jr., J.L. Hafley, and S.S. Quisenberry

Evaluation of over 1500 bermudagrass somaclones produced earlier was completed. The top somaclones that had been identified from preliminary tests were evaluated further during 1994. Out of the original 1598 bermudagrass somaclones, 45 have been selected for advanced field testing.

The 13 bermudagrass lines identified with increased resistance to the pathogen *Bipolaris cynodontis* were tested against four isolates to confirm resistance. Fifty cuttings of each somaclone and its corresponding parent were maintained in 2-inch pots in the greenhouse. Plants were clipped and fertilized 2 weeks prior to the test. Plants were randomly arranged, 10 replications per isolate, and sprayed with solutions containing 1.8 x 10^4 spores per ml. Controls were sprayed with water. All plants were enclosed in clear plastic bags and scored for amount of disease symptoms after 6 days. Disease symptoms were rated as 0 if no lesions were present; 1 for a few small lesions; 2, 3, and 4 for an increasing number and size of lesions; and 5 if heavily covered by large lesions. Data is being analyzed and will be published in 1995.

Fifty-two bermudagrass somaclones and the cultivars from which they were derived were grown in 12 x 18 inch metal flats in the greenhouse. Two-week regrowth was removed, weighed, dried, reweighed, and ground for quality parameter analysis. Samples were evaluated by NIR for percentage of crude protein (CP), neutral-detergent fiber (NDF), acid-digestible fiber (ADF), in vitro true digestibility (IVTD), and dry matter at the Southeast Research Station. All values were adjusted for moisture. While values will be higher than field-derived data, relative differences can be detected between the somaclones and the cultivar from which they were derived. Figures 1 and 2 show the results from some of the somaclones tested.

Fifty-seven bermudagrass somaclones were evaluated in feeding trials for fall armyworm resistance. Fall armyworm neonates were fed leaf tissue daily, and growth and development parameters were measured. Table 1 shows the results from some of the somaclones tested.

Figure 1. Quality parameters of Brazos and bermudagrass somaclones derived from Brazos. Greenhouse-grown material, Rice Research Station, Crowley, LA. 1994.

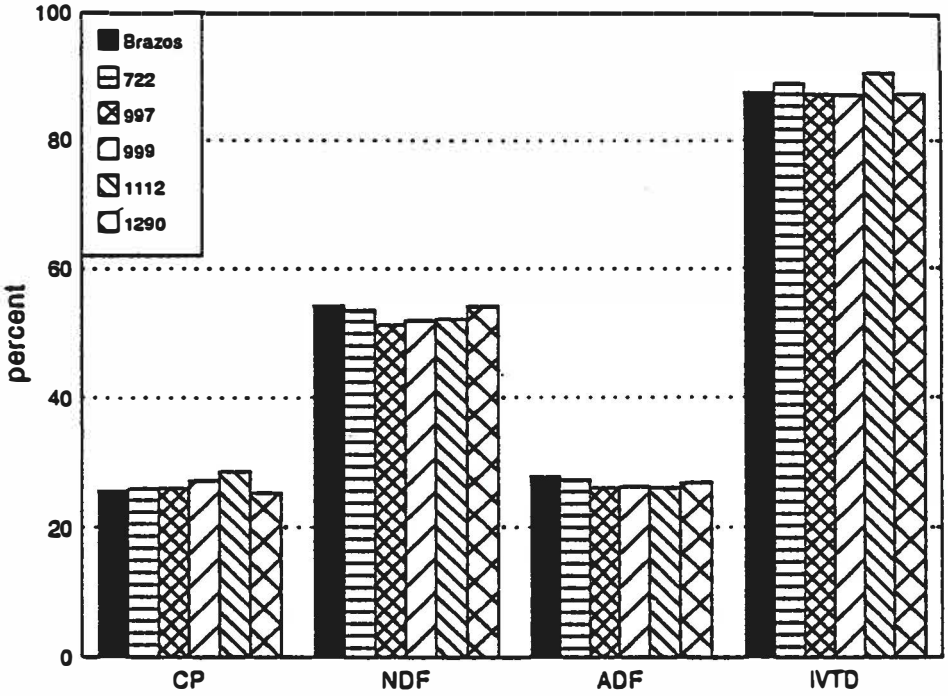


Figure 2. Quality parameters of OSU74x12-1 and bermudagrass somaclones derived from OSU74x12-1. Greenhouse-grown material. Rice Reseasrch Station, Crowley, LA. 1994

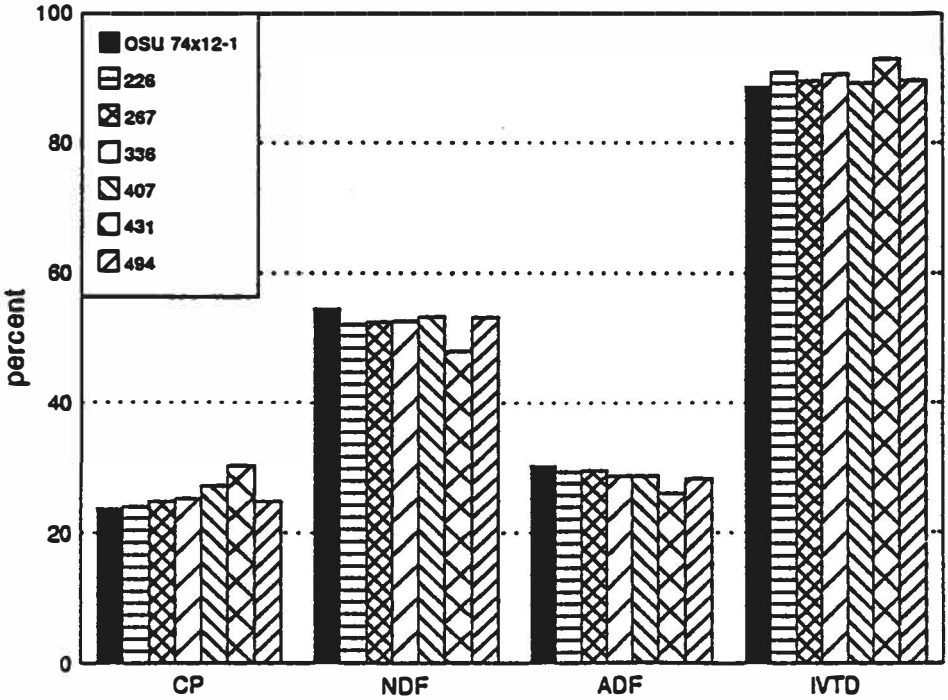


Table 1. Growth and development parameters of fall armyworm fed leaves of bermudagrass somaclones and the genotype from which they were derived.

Bno	Day 6	Day 9	RGR	Days to pupation	pupae wt	Days to emerge	Mortality
Brazos	0.0323	0.1996	0.645	13.2	0.1654	7.6	45
722	0.0229	0.2121	0.747	12.6	0.1619	7.1	20
997	0.0192	0.1467	0.800 **	13.6	0.1612	7.1	15
998	0.0138 **	0.1437	0.775 *	13.8	0.1544	6.9	40
999	0.0168 *	0.1511	0.722	13.5	0.1594	7.4	25
1137	0.0227	0.1798	0.639	14.4	0.1571	7.3	40
1242	0.0167 *	0.1427	0.727	13.1	0.1530	6.8 *	30
1256	0.0221	0.1973	0.722	12.8	0.1537	7.2	20
1407	0.0181 *	0.2036	0.794 **	13.6	0.1739	7.1	25
1563	0.0139 *	0.1143	0.688	14.0	0.1651	7.6	50
1577	0.0230	0.2186	0.787 *	12.9	0.1629	7.0	25
1580	0.0216	0.1404	0.701	13.6	0.1450 *	6.9 *	50
Coastal	0.0201	0.2108	0.738	13.4	0.1544	7.0	35
1382	0.0489 **	0.2138	0.467 **	12.3	0.1514	6.4	50
1422	0.0351 *	0.2812	0.693	12.6	0.1684	7.1	30
1464	0.0339 *	0.2856	0.728	12.3	0.1510	6.9	35
1538	0.0293	0.2516	0.694	13.1	0.1705	7.2	15
Alicia	0.0238	0.1799	0.760	12.8	0.1469	8.1	15
912	0.0144	0.1521	0.749	13.9 **	0.1451	7.8	15
915	0.0159	0.1964	0.803	13.0	0.1305 *	6.9 *	30
1368	0.0280	0.2953 **	0.736	12.3	0.1469	7.2	15
1370	0.0187	0.2220	0.741	12.7	0.1400	7.8	25
1410	0.0231	0.2010	0.638	12.8	0.1456	7.9	25
1411	0.0224	0.2038	0.726	12.6	0.1435	8.1	30
1486	0.0303	0.2036	0.516 **	12.6	0.1606 *	8.0	45
1490	0.0351	0.2151	0.541 **	12.1	0.1429	6.8 *	40
OSU74x12-1	0.0057	0.0604	0.728	17.6	0.1453	13.1	30
333	0.0071	0.0934	0.833	16.8	0.1574	13.8	80
407	0.0067	0.1645 *	0.896	17.3	0.1519	12.9	40
494	0.0086 **	0.1041	0.822	15.5 **	0.1518	12.9	25

*, ** significantly different from the genotype from which the somaclone was derived.

DALLISGRASS

Cooperators: J.L. Hafley and B.C. Venuto

The objective of this project is to develop improved germplasm of dallisgrass through biotechnology. Dallisgrass (*Paspalum dilatatum*) is a deep-rooted perennial grass grown in the southeastern United States for pastures. Its advantages include the ability to withstand heavy grazing and the production of good quality forage that often retains its quality into the late summer. Dallisgrass has been shown to be highly competitive with 'Alicia' bermudagrass in maintaining cows and calves under high stocking rates. The Louisiana Cattlemen's Association has requested increased research in this area as they feel that dallisgrass has economic potential for their industry.

There are several areas in which improvements are needed in the current varieties of dallisgrass. Dallisgrass has poor seed quality and slow germination, making it difficult to establish. Dallisgrass is also susceptible to ergot (*Claviceps paspali*), anthracnose (*Colletotrichum graminicola*), and leaf blight (*Helminthosporium micropus*). Increased resistance to any of these diseases would increase yield and quality of the forage. A variety with increased seed production and viability would improve stand establishment.

Dallisgrass reproduces by apomixis, reducing natural variability that could be useful in a breeding program. Current cultivars were produced through selection of naturally occurring ecotypes. Dallisgrass somaclonal variants can be produced through tissue culture and evaluated for improvements in agronomic characteristics. This technique has proven successful in a number of other crops and would provide a new source of useful germplasm for dallisgrass improvement programs.

During 1994, over 1300 dallisgrass somaclones were regenerated and transferred to the greenhouse. These somaclones were developed from immature inflorescences of field- and greenhouse-grown dallisgrass. The genotypes utilized include common and two hexaploid ecotypes. Of these, 180 were split, and one set was planted at the Center Research Station in Baton Rouge, and the other set planted at the Iberia Research Station in Jeanerette, LA. The remainder of the plants are maintained in the greenhouse for seed germination and viability studies.

At the Baton Rouge test, plants were spaced planted and alleys kept clear for observation of individual plants. At the Iberia test, dallisgrass somaclones were planted in a pasture during June and July. In August, plants were evaluated for vigor (1 = poor to 5 = excellent), and then cattle were allowed to graze until September. Amount of grazing was determined (0 = no grazing to 10 = completely grazed) and then regrowth potential estimated (0 = no regrowth to 5 = maximum regrowth) in October. Forage samples were taken for crude protein and IVDMD analysis. Table 2 lists the data from the Iberia test. Somaclones 99 and 150 appear to have the best combination of overall ratings and dry matter yield. Some individual somaclones were noted as potentially having increased seed production capability.

Table 2. Dallisgrass somaclone evaluation in Iberia Research Station field test, Jeanerette, LA. 1994.

ID #	Vigor	Grazing	Regrowth	Dry matter	ID #	Vigor	Grazing	Regrowth	Dry matter
90	4	8	4	7.2	140	3	8	.	.
92	5	8	3	9.5	141	3	8	.	.
93	4	8	2	8.5	142	5	9	2	8.9
94	5	9	1	4.6	143	2	9	2	1.8
95	4	8	3	10.3	144	2	8	1	1.6
96	4	9	1	4.4	145	1	8	.	.
97	4	8	1	0.8	146	2	9	3	2.1
98	4	9	4	9.0	147	3	9	1	3.6
99	5	8	4	10.0	148	4	9	.	1.3
100	4	9	1	3.2	149	5	9	3	4.6
101	5	8	3	13.0	150	5	8	4	11.6
103	3	9	2	0.4	151	4	8	1	0.7
104	4	9	3	3.3	152	3	9	.	.
105	2	8	2	2.1	153	5	9	.	.
106	3	8	3	2.7	154	5	9	3	7.0
107	3	8	4	6.7	155	5	9	2	2.1
108	5	9	3	3.9	156	3	8	.	.
109	4	8	3	3.4	157	2	8	3	4.2
111	3	8	1	0.3	160	2	7	4	6.4
112	2	9	1	.	162	4	.	.	.
114	3	9	2	4.1	163	3	8	3	5.7
115	3	9	3	2.7	165	3	8	3	3.0
116	4	8	3	5.8	166	1	7	3	6.0
117	1	9	.	.	169	0	8	2	1.6
118	2	9	3	2.5	171	3	.	.	.
119	5	8	3	6.7	173	1	7	3	2.9
120	5	8	3	6.1	175	1	8	2	1.7
121	4	9	3	4.8	176	5	9	.	.
122	4	9	1	1.0	177	5	9	3	1.6
125	4	9	.	.	178	5	9	2	3.5
126	3	9	2	1.4	179	2	7	3	7.4
128	4	8	3	5.8	182	1	.	.	.
130	4	9	3	3.3	186	2	.	3	2.9
131	4	9	2	6.3	189	1	8	2	3.2
132	4	8	4	4.3	190	2	8	2	1.7
133	4	8	4	8.2	191	2	.	1	0.3
134	3	8	1	0.4	193	3	7	3	6.9
135	3	9	2	4.4	195	2	7	3	3.8
136	4	9	1	2.4	198	2	8	3	8.1
137	2	9	.	1.0	199	5	8	4	8.1
138	2	9	.	.	200	3	8	.	.
139	3	8	2	2.8	201	2	.	1	1.0

Continued.....

Table 2. Continued.

ID #	Vigor	Grazing	Regrowth	Dry matter	ID #	Vigor	Grazing	Regrowth	Dry matter
202	2	8	3	3.6	296	3	8	3	2.7
204	2	8	2	2.9	298	1	9	1	0.4
205	2	7	2	2.0	299	2	7	2	1.7
206	5	8	3	3.5	301	1	8	2	1.7
207	3	9	3	5.4	302	2	.	2	1.2
208	1	8	3	4.5	303	1	7	2	5.1
209	2	8	3	5.4	304	1	8	4	8.1
211	1	.	.	.	305	3	7	3	3.5
217	1	8	2	3.1	316	1	8	3	5.1
219	5	8	3	7.6	317	2	.	2	0.5
221	2	.	.	.	319	1	7	2	6.8
222	4	.	.	.	322	2	7	.	.
223	1	7	1	0.5	324	2	.	.	.
226	2	8	1	7.2	328	3	8	3	3.8
227	2	7	3	2.7	331	2	.	1	1.6
229	2	.	.	.	334	1	7	2	2.9
231	4	8	2	2.7	336	1	7	2	2.1
236	2	.	2	2.3	337	1	.	2	1.3
241	3	8	3	2.8	340	2	8	2	1.1
242	2	8	1	1.3	348	3	8	3	7.4
243	1	8	3	9.7	349	3	.	.	.
244	3	9	3	2.8	351	2	7	2	1.4
245	2	8	2	1.2	352	2	7	2	3.8
248	3	8	4	7.4	359	2	.	1	0.6
250	2	8	3	2.4	376	2	8	1	0.6
251	3	9	2	2.1	378	2	.	.	.
252	2	.	1	.	388	1	.	.	.
253	3	8	.	.	390	1	8	3	7.6
254	4	8	3	5.5	396	2	8	1	1.1
261	1	8	3	4.1	397	1	7	4	10.7
262	5	8	2	4.5	399	2	7	.	.
269	1	7	3	3.6	406	1	8	2	2.6
270	3	8	3	1.0	409	1	9	2	1.3
271	3	8	2	1.8	421	3	7	3	3.5
272	3	7	4	13.4	422	3	.	.	.
279	2	8	3	7.4	423	3	7	2	4.1
285	1	7	2	4.3	424	2	.	1	0.6
287	1	8	2	1.7	426	3	8	2	1.1
289	1	.	.	.	428	2	.	1	1.5
292	1	7	1	0.8	429	1	.	2	1.2
293	1	7	.	.	430	3	7	3	5.0
294	1	.	4	8.5	432	2	8	2	0.2
295	3	9	2	2.2					

SOYBEAN BIOTECHNOLOGY RESEARCH [1]

S.S. Croughan

Cooperators: D.J. Boethel, R.J. Habetz, B.G. Harville, J.S. Russin, S. Yao, and G. Zhao

This project is involved in producing improved germplasm that can be incorporated into cultivar development programs. The central technique utilized is somaclonal variation. Progeny from regenerated plants are evaluated for improvements in several agronomic traits. Plants are regenerated from callus derived from immature cotyledons and the seed collected from the regenerated plants is used in progeny evaluations. Over 1100 somaclones have been produced to date from soybean varieties and breeding lines. During 1994, several somaclones were grown in the greenhouse and field for a seed increase. Seed from 97 somaclones given to the Louisiana Agricultural Experiment Station soybean entomologist was grown in the field in Baton Rouge. Leaves were fed to soybean loopers to test for resistance. No somaclones were found with superior resistance to the soybean looper.

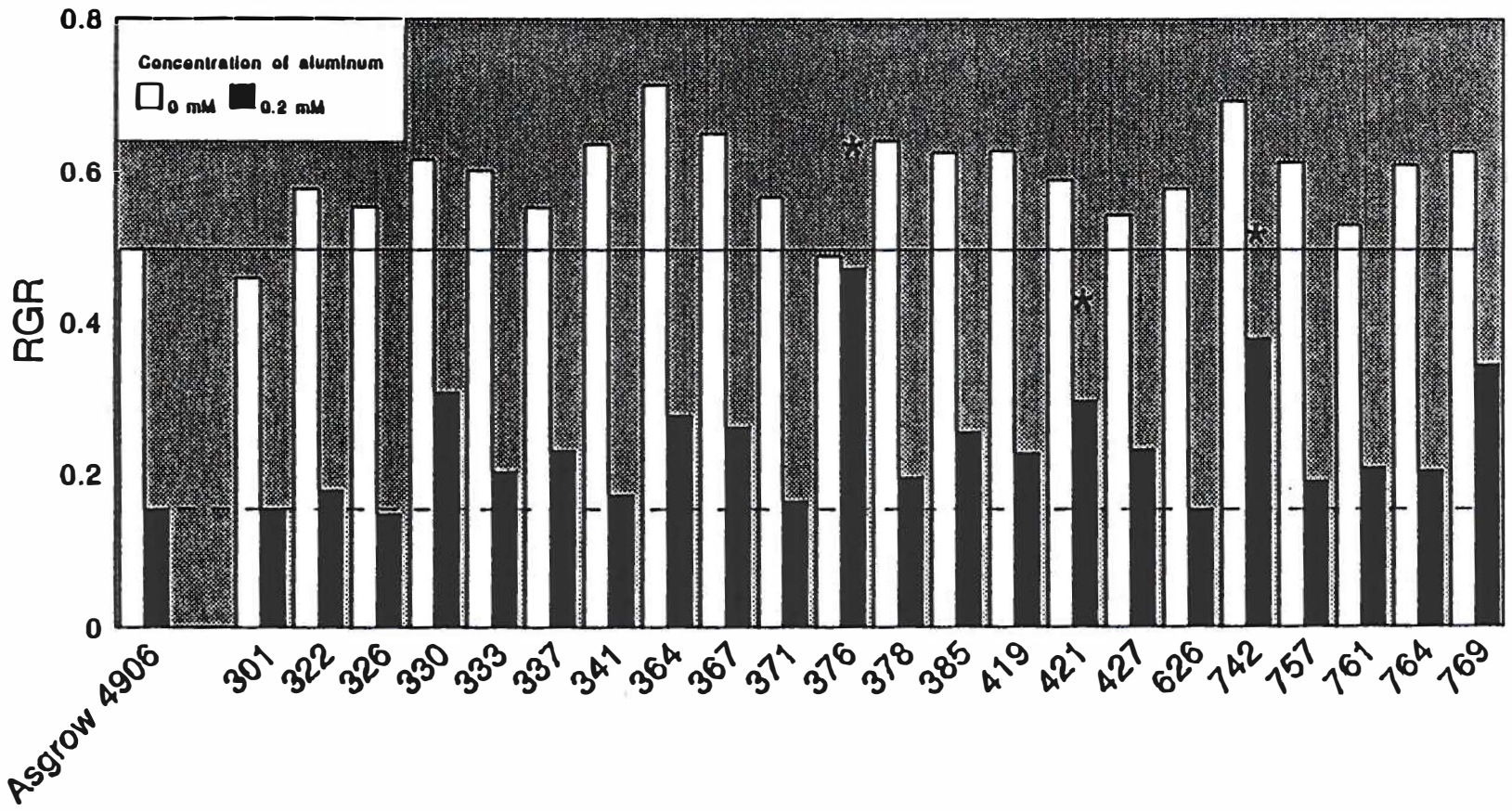
Soybean somaclones were also tested for tolerance to aluminum/acid conditions, and several look promising. Cultivars were evaluated for root growth under a range of aluminum concentrations to select a concentration for screening somaclones. A significant reduction in root growth occurred at 0.2 mM aluminum and this concentration was chosen for screening. Growth of roots under aluminum/acid stress conditions was compared with growth under acid stress conditions. Progeny of somaclonal variants were compared with the cultivar from which they were derived. Three of the tested somaclones showed significant improvement in tolerance to aluminum. For one line in particular, root growth was only reduced 3% when grown under aluminum/acid stress conditions compared with a 73% reduction in the cultivar from which it was derived (Figure 1).

Research was conducted on the development of an anther culture system for soybeans. Immature flower buds were collected from both greenhouse- and field-grown plants, surface sterilized, and the anthers plated on nutrient medium and incubated in the dark. Callus was transferred when it was approximately 3 mm in size to various nutrient media to induce regeneration. Experiments conducted in 1994 included evaluation of genotypic variation in response to the sucrose concentration in the induction medium, effect of auxin and cytokinin combinations on callus induction and plant regeneration, and several studies to determine the genetics and cultural practices that affect the genotypic responses observed. Several plants have now been regenerated. These are the first anther culture-derived soybean plants from U.S. germplasm.

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Figure 1. The relative growth rate of roots of Asgrow 4906 compared to 22 somaclones derived from Asgrow 4906, grown in acidified 10 mM $CaSO_4$ solutions with and without 0.2 mM aluminum added as $Al_2(SO_4)_3 \cdot 16H_2O$. (* values are significant at $P<0.05$)



CEREAL CROPS AND COASTAL EROSION CONTROL BIOTECHNOLOGY RESEARCH

RICE IMPROVEMENT THROUGH BIOTECHNOLOGY

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INTRODUCTION

An objective of the biotechnology project is to help expedite the production of improved varieties for Louisiana's producers. Anther culture is utilized to produce genetically stabilized breeding lines in a few months, rather than the few years required to achieve this necessary stabilization using conventional breeding techniques. Losses to red rice are significant in U.S. rice production. Providing an effective method for controlling red rice during the commercial rice crop production would help alleviate these losses. Developing a herbicide-resistant rice variety would allow Louisiana growers to spray herbicides on the rice crop to effectively control red rice. This would give growers the flexibility to crop rice without intervening rotation crops to control red rice.

Developing the capability to conduct effective *in vitro* screening, using both suspension cells and protoplasts, provides a tool for developing useful new germplasm for varietal development purposes. An example of what might be accomplished through this technology is the development of more nutritious rice through cellular level selection of the overproduction of lysine. Protoplasts can further be used for genetic engineering of plants with introduced characteristics of breeding value. Overall, genetic engineering technology offers the opportunity to develop plants with characteristics unobtainable by traditional plant breeding techniques. The capability to conduct such work with rice germplasm adapted to Louisiana's conditions offers the potential for direct benefits to Louisiana producers from this new technology.

MATERIALS AND METHODS

Three years ago, screening anther culture-derived lines in the field was effective in identifying a mutant rice with resistance to the herbicide Pursuit. Further evaluations in 1992 and 1993 showed that this herbicide resistant line (designated as 139-3512) had a good yield potential along with improved resistance to Accent, Scepter, and Pursuit. Using 7-row plots 30 feet in length and six replications, a yield comparison between the herbicide resistant line and Lemont was conducted in 1993. Several herbicides were evaluated for their effects on the herbicide resistant line and the check variety Lemont. Additional field tests evaluated the effect of Pursuit, Scepter, and Accent applications at

different maturity stages, planting densities, and nitrogen fertility levels. Concurrently, 35 million M_2 seedlings were sprayed with Accent and Pursuit herbicides in the field to screen for herbicide resistant mutants. Also, rice cells were exposed to high concentrations of herbicides in the nutrient medium to conduct cellular level selection for mutant cells from which herbicide resistant plants might be developed.

During 1994 a field test was conducted to evaluate the herbicide resistance of a selection identified through field screening in 1993. Replicated rows of the selected lines along with four check rice genotypes were sprayed with delayed pre-emerge and post-emerge applications of Scepter, Pursuit, Arsenal, Cadre, and Accent at recommended rates. Application was made using a backpack sprayer with a spraying rate of 10 gallons per acre. Ratings of injury, ranging from 0 = no injury to 100 = death, were made by Dr. M. Braverman of the LAES and Dr. D. Sanders of LCES.

RESULTS

The herbicide-resistant line showed resistance to both delayed pre-emerge and post-emerge applications of all herbicides tested. Degree of resistance varied with the herbicide and application method (Tables 1 - 18). The line appears more resistant to pre-emerge than post-emerge applications, and the herbicide to which it was most resistant in this test was Arsenal.

Table 1. Analysis of variance and Duncan's multiple range test for the effect of five herbicides sprayed delayed pre-emergence on the rice genotype Bengal. Rice Research Station, Crowley, LA. 1994.

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	6	32255.49167	5375.91528	21.79	0.0001
Error	17	4193.96667	246.70392		
Corrected Total	23	36449.45833			

R-Square	C.V.	Root MSE	MPRE Mean
0.884937	20.12619	15.70681	78.04167

Source	DF	Type I SS	Mean Square	F Value	Pr > F
REP	1	11.40833	11.40833	0.05	0.8323
TRT	5	32244.08333	6448.81667	26.14	0.0001

Source	DF	Type III SS	Mean Square	F Value	Pr > F
REP	1	11.40833	11.40833	0.05	0.8323
TRT	5	32244.08333	6448.81667	26.14	0.0001

Means with the same letter are not significantly different.

Duncan Grouping	Mean	N	TRT
A	100.00	4	Accent
A			
A	100.00	4	Pursuit
A			
A	100.00	4	Cadre
A			
A	99.13	4	Scepter
B	69.13	4	Arsenal
C	0.00	4	check

Table 2. Analysis of variance and Duncan's multiple range test for the effect of five herbicides sprayed postemergence on the rice genotype Bengal. Rice Research Station, Crowley, LA. 1994.

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	6	33066.90417	5511.15069	2543.46	0.0001
Error	17	36.83542	2.16679		
Corrected Total	23	33103.73958			

R-Square	C.V.	Root MSE	MPOST Mean
0.998887	1.773941	1.472002	82.97917

Source	DF	Type I SS	Mean Square	F Value	Pr > F
REP	1	3.85208	3.85208	1.78	0.2000
TRT	5	33063.05208	6612.61042	3051.80	0.0001

Source	DF	Type III SS	Mean Square	F Value	Pr > F
REP	1	3.85208	3.85208	1.78	0.2000
TRT	5	33063.05208	6612.61042	3051.80	0.0001

Means with the same letter are not significantly different.

Duncan Grouping	Mean	N	TRT
A	100.000	4	Accent
A			
A	100.000	4	Pursuit
A			
A	100.000	4	Cadre
A			
A	99.875	4	Scepter
A			
A	98.000	4	Arsenal
B	0.000	4	check

Table 3. Analysis of variance and Duncan's multiple range test for the effect of five herbicides sprayed delayed pre-emergence on the rice genotype AS3510. Rice Research Station, Crowley, LA. 1994.

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	6	33229.50833	5538.25139	23.37	0.0001
Error	17	4029.11667	237.00686		
Corrected Total	23	37258.62500			

R-Square	C.V.	Root MSE	MPRE Mean
0.891861	21.27119	15.39503	72.37500

Source	DF	Type I SS	Mean Square	F Value	Pr > F
REP	1	197.63333	197.63333	0.83	0.3739
TRT	5	33031.87500	6606.37500	27.87	0.0001

Source	DF	Type III SS	Mean Square	F Value	Pr > F
REP	1	197.63333	197.63333	0.83	0.3739
TRT	5	33031.87500	6606.37500	27.87	0.0001

Means with the same letter are not significantly different.

Duncan Grouping	Mean	N	TRT
A	100.00	4	Scepter
A			
A	100.00	4	Pursuit
A			
A	100.00	4	Cadre
A			
A	85.50	4	Accent
B	48.75	4	Arsenal
C	0.00	4	check

Table 4. Analysis of variance and Duncan's multiple range test for the effect of five herbicides sprayed postemergence on the rice genotype AS3510. Rice Research Station, Crowley, LA. 1994.

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	6	32044.25833	5340.70972	751.18	0.0001
Error	17	120.86667	7.10980		
Corrected Total	23	32165.12500			

R-Square	C.V.	Root MSE	MPOST Mean
0.996242	3.266673	2.666422	81.62500

Source	DF	Type I SS	Mean Square	F Value	Pr > F
REP	1	31.00833	31.00833	4.36	0.0521
TRT	5	32013.25000	6402.65000	900.54	0.0001

Source	DF	Type III SS	Mean Square	F Value	Pr > F
REP	1	31.00833	31.00833	4.36	0.0521
TRT	5	32013.25000	6402.65000	900.54	0.0001

Means with the same letter are not significantly different.

Duncan Grouping	Mean	N	TRT
A	99.125	4	Pursuit
A			
A	98.625	4	Cadre
A			
A	98.500	4	Accent
A			
A	98.000	4	Scepter
A			
A	95.500	4	Arsenal
B	0.000	4	check

Table 5. Analysis of variance and Duncan's multiple range test for the effect of five herbicides sprayed delayed pre-emergence on the rice genotype 139-3512. Rice Research Station, Crowley, LA. 1994.

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	6	46406.08333	7734.34722	198.79	0.0001
Error	17	661.41667	38.90686		
Corrected Total	23	47067.50000			

R-Square	C.V.	Root MSE	MPRE Mean
0.985947	11.34098	6.237537	55.00000

Source	DF	Type I SS	Mean Square	F Value	Pr > F
REP	1	140.83333	140.83333	3.62	0.0742
TRT	5	46265.25000	9253.05000	237.83	0.0001

Source	DF	Type III SS	Mean Square	F Value	Pr > F
REP	1	140.83333	140.83333	3.62	0.0742
TRT	5	46265.25000	9253.05000	237.83	0.0001

Means with the same letter are not significantly different.

Duncan Grouping	Mean	N	TRT
A	99.125	4	Cadre
A			
A	98.000	4	Scepter
A			
A	97.875	4	Pursuit
B	24.375	4	Accent
C	10.625	4	Arsenal
D	0.000	4	check

Table 6. Analysis of variance and Duncan's multiple range test for the effect of five herbicides sprayed postemergence on the rice genotype 139-3512. Rice Research Station, Crowley, LA. 1994.

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	6	26292.53333	4382.08889	24.41	0.0001
Error	17	3051.42500	179.49559		
Corrected Total	23	29343.95833			

R-Square	C.V.	Root MSE	MPOST Mean
0.896012	19.21950	13.39760	69.70833

Source	DF	Type I SS	Mean Square	F Value	Pr > F
REP	1	19.20000	19.20000	0.11	0.7476
TRT	5	26273.33333	5254.66667	29.27	0.0001

Source	DF	Type III SS	Mean Square	F Value	Pr > F
REP	1	19.20000	19.20000	0.11	0.7476
TRT	5	26273.33333	5254.66667	29.27	0.0001

Duncan Grouping	Mean	N	TRT
A	97.250	4	Pursuit
A			
A	94.375	4	Scepter
A			
A	86.125	4	Cadre
A			
B A	76.250	4	Accent
B			
B	64.250	4	Arsenal
C	0.000	4	check

Table 7. Analysis of variance and Duncan's multiple range test for the effect of five herbicides sprayed delayed pre-emergence on the rice genotype Lemont. Rice Research Station, Crowley, LA. 1994.

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	6	33545.61667	5590.93611	32.34	0.0001
Error	17	2938.84167	172.87304		
Corrected Total	23	36484.45833			

R-Square	C.V.	Root MSE	MPRE Mean
0.919449	17.75773	13.14812	74.04167

Source	DF	Type I SS	Mean Square	F Value	Pr > F
REP	1	15.40833	15.40833	0.09	0.7689
TRT	5	33530.20833	6706.04167	38.79	0.0001

Source	DF	Type III SS	Mean Square	F Value	Pr > F
REP	1	15.40833	15.40833	0.09	0.7689
TRT	5	33530.20833	6706.04167	38.79	0.0001

Means with the same letter are not significantly different.

Duncan Grouping	Mean	N	TRT
A	100.000	4	Scepter
A			
A	100.000	4	Pursuit
A			
A	100.000	4	Cadre
A			
A	93.000	4	Accent
B	51.250	4	Arsenal
C	0.000	4	check

Table 8. Analysis of variance and Duncan's multiple range test for the effect of five herbicides sprayed postemergence on the rice genotype Lemont. Rice Research Station, Crowley, LA. 1994.

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	6	31821.92917	5303.65486	257.19	0.0001
Error	17	350.56042	20.62120		
Corrected Total	23	32172.48958			

R-Square	C.V.	Root MSE	MPOST Mean
0.989104	5.613462	4.541057	80.89583

Source	DF	Type I SS	Mean Square	F Value	Pr > F
REP	1	0.00208	0.00208	0.00	0.9921
TRT	5	31821.92708	6364.38542	308.63	0.0001

Source	DF	Type III SS	Mean Square	F Value	Pr > F
REP	1	0.00208	0.00208	0.00	0.9921
TRT	5	31821.92708	6364.38542	308.63	0.0001

Means with the same letter are not significantly different.

Duncan Grouping	Mean	N	TRT
A	100.000	4	Accent
A			
A	100.000	4	Pursuit
A			
A	99.125	4	Cadre
A			
A	98.125	4	Scepter
B	88.125	4	Arsenal
C	0.000	4	check

Table 9. Analysis of variance and Duncan's multiple range test for the effect of five herbicides sprayed delayed pre-emergence on the rice genotype 93AS3510. Rice Research Station, Crowley, LA. 1994.

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	6	262.7408854	43.7901476	1.92	0.1359
Error	17	388.0240885	22.8249464		
Corrected Total	23	650.7649740			

R-Square	C.V.	Root MSE	MPRE Mean
0.403742	101.3579	4.777546	4.713542

Source	DF	Type I SS	Mean Square	F Value	Pr > F
REP	1	7.1907552	7.1907552	0.32	0.5819
TRT	5	255.5501302	51.1100260	2.24	0.0975

Source	DF	Type III SS	Mean Square	F Value	Pr > F
REP	1	7.1907552	7.1907552	0.32	0.5819
TRT	5	255.5501302	51.1100260	2.24	0.0975

Means with the same letter are not significantly different.

Duncan Grouping	Mean	N	TRT
A	10.938	4	Cadre
A			
B A	5.625	4	Accent
B A			
B A	4.063	4	Pursuit
B A			
B A	4.063	4	Scepter
B A			
B A	3.594	4	Arsenal
B			
B	0.000	4	check

Table 10. Analysis of variance and Duncan's multiple range test for the effect of five herbicides sprayed postemergence on the rice genotype 93AS3510. Rice Research Station, Crowley, LA. 1994.

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	6	4201.533535	700.255589	19.39	0.0001
Error	17	613.910767	36.112398		
Corrected Total	23	4815.444303			

R-Square	C.V.	Root MSE	MPOST Mean
0.872512	42.50831	6.009359	14.13690

Source	DF	Type I SS	Mean Square	F Value	Pr > F
REP	1	82.147109	82.147109	2.27	0.1499
TRT	5	4119.386426	823.877285	22.81	0.0001

Source	DF	Type III SS	Mean Square	F Value	Pr > F
REP	1	82.147109	82.147109	2.27	0.1499
TRT	5	4119.386426	823.877285	22.81	0.0001

Means with the same letter are not significantly different.

Duncan Grouping	Mean	N	TRT
A	40.625	4	Accent
B	17.031	4	Cadre
B			
C B	13.594	4	Pursuit
C B			
C B D	9.196	4	Scepter
C D			
C D	4.375	4	Arsenal
D			
D	0.000	4	check

Table 11. Analysis of variance and Duncan's multiple range test for the effect of delayed pre-emergence application of Scepter on five rice genotypes. Rice Research Station, Crowley, LA. 1994.

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	5	29026.75562	5805.35112	1588.06	0.0001
Error	14	51.17875	3.65563		
Corrected Total	19	29077.93438			

R-Square	C.V.	Root MSE	MPRE Mean
0.998240	2.382887	1.911969	80.23750

Source	DF	Type I SS	Mean Square	F Value	Pr > F
REP	1	2.80563	2.80563	0.77	0.3958
GENO	4	29023.95000	7255.98750	1984.88	0.0001

Source	DF	Type III SS	Mean Square	F Value	Pr > F
REP	1	2.80563	2.80563	0.77	0.3958
GENO	4	29023.95000	7255.98750	1984.88	0.0001

Means with the same letter are not significantly different.

Duncan Grouping	Mean	N	GENO
A	100.000	4	AS3510
A			
A	100.000	4	LMNT
A			
A	99.125	4	Bengal
A			
A	98.000	4	139-3512
B	4.063	4	Resistant

Table 12. Analysis of variance and Duncan's multiple range test for the effect of postemergence application of Scepter on five rice genotypes. Rice Research Station, Crowley, LA. 1994.

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	5	25078.40420	5015.68084	413.43	0.0001
Error	14	169.84746	12.13196		
Corrected Total	19	25248.25166			

R-Square	C.V.	Root MSE	MPOST Mean
0.993273	4.358541	3.483097	79.91429

Source	DF	Type I SS	Mean Square	F Value	Pr > F
REP	1	9.28073	9.28073	0.76	0.3965
GENO	4	25069.12347	6267.28087	516.59	0.0001

Source	DF	Type III SS	Mean Square	F Value	Pr > F
REP	1	9.28073	9.28073	0.76	0.3965
GENO	4	25069.12347	6267.28087	516.59	0.0001

Means with the same letter are not significantly different.

Duncan Grouping	Mean	N	GENO
A	99.875	4	Bengal
A			
A	98.125	4	LMNT
A			
A	98.000	4	AS3510
A			
A	94.375	4	139-3512
B	9.196	4	Resistant

Table 13. Analysis of variance and Duncan's multiple range test for the effect of delayed pre-emergence application of Pursuit on five rice genotypes. Rice Research Station, Crowley, LA. 1994.

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	5	29155.70563	5831.14113	2757.62	0.0001
Error	14	29.60375	2.11455		
Corrected Total	19	29185.30938			

R-Square	C.V.	Root MSE	MPRE Mean
0.998986	1.808926	1.454150	80.38750

Source	DF	Type I SS	Mean Square	F Value	Pr > F
REP	1	14.63063	14.63063	6.92	0.0198
GENO	4	29141.07500	7285.26875	3445.30	0.0001

Source	DF	Type III SS	Mean Square	F Value	Pr > F
REP	1	14.63062	14.63062	6.92	0.0198
GENO	4	29141.07500	7285.26875	3445.30	0.0001

Means with the same letter are not significantly different.

Duncan Grouping	Mean	N	GENO
A	100.000	4	Bengal
A			
A	100.000	4	AS3510
A			
A	100.000	4	LMNT
A			
A	97.875	4	139-3512
B	4.063	4	Resistant

Table 14. Analysis of variance and Duncan's multiple range test for the effect of postemergence application of Pursuit on five rice genotypes. Rice Research Station, Crowley, LA. 1994.

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	5	23420.06078	4684.01216	366.57	0.0001
Error	14	178.89156	12.77797		
Corrected Total	19	23598.95234			

R-Square	C.V.	Root MSE	MPOST Mean
0.992420	4.359635	3.574628	81.99375

Source	DF	Type I SS	Mean Square	F Value	Pr > F
REP	1	7.08891	7.08891	0.55	0.4687
GENO	4	23412.97187	5853.24297	458.07	0.0001

Source	DF	Type III SS	Mean Square	F Value	Pr > F
REP	1	7.08891	7.08891	0.55	0.4687
GENO	4	23412.97187	5853.24297	458.07	0.0001

Means with the same letter are not significantly different.

Duncan Grouping	Mean	N	GENO
A	100.000	4	Bengal
A			
A	100.000	4	LMNT
A			
A	99.125	4	AS3510
A			
A	97.250	4	139-3512
B	13.594	4	Resistant

Table 15. Analysis of variance and Duncan's multiple range test for the effect of delayed pre-emergence application of Arsenal on five rice genotypes. Rice Research Station, Crowley, LA. 1994.

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	5	14711.53203	2942.30641	4.28	0.0142
Error	14	9613.97656	686.71261		
Corrected Total	19	24325.50859			

R-Square	C.V.	Root MSE	MPRE Mean
0.604778	71.46467	26.20520	36.66875

Source	DF	Type I SS	Mean Square	F Value	Pr > F
REP	1	1974.69141	1974.69141	2.88	0.1120
GENO	4	12736.84062	3184.21016	4.64	0.0136

Source	DF	Type III SS	Mean Square	F Value	Pr > F
REP	1	1974.69141	1974.69141	2.88	0.1120
GENO	4	12736.84062	3184.21016	4.64	0.0136

Means with the same letter are not significantly different.

Duncan Grouping	Mean	N	GENO
A	69.13	4	Bengal
A			
B A	51.25	4	LMNT
B A			
B A	48.75	4	AS3510
B			
B C	10.63	4	139-3512
C			
C	3.59	4	Resistant

Table 16. Analysis of variance and Duncan's multiple range test for the effect of postemergence application of Arsenal on five rice genotypes. Rice Research Station, Crowley, LA. 1994.

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	5	24442.88750	4888.57750	24.42	0.0001
Error	14	2802.18750	200.15625		
Corrected Total	19	27245.07500			

R-Square	C.V.	Root MSE	MPOST Mean
0.897149	20.19652	14.14766	70.05000

Source	DF	Type I SS	Mean Square	F Value	Pr > F
REP	1	33.06250	33.06250	0.17	0.6906
GENO	4	24409.82500	6102.45625	30.49	0.0001

Source	DF	Type III SS	Mean Square	F Value	Pr > F
REP	1	33.06250	33.06250	0.17	0.6906
GENO	4	24409.82500	6102.45625	30.49	0.0001

Means with the same letter are not significantly different.

Duncan Grouping	Mean	N	GENO
A	98.00	4	Bengal
A			
A	95.50	4	AS3510
A			
A	88.13	4	LMNT
B	64.25	4	139-3512
C	4.38	4	Resistant

Table 17. Analysis of variance and Duncan's multiple range test for the effect of delayed pre-emergence application of Cadre on five rice genotypes. Rice Research Station, Crowley, LA. 1994.

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	5	25267.86500	5053.57300	209.10	0.0001
Error	14	338.35063	24.16790		
Corrected Total	19	25606.21563			

R-Square	C.V.	Root MSE	MPRE Mean
0.986786	5.994313	4.916086	82.01250

Source	DF	Type I SS	Mean Square	F Value	Pr > F
REP	1	7.29000	7.29000	0.30	0.5915
GENO	4	25260.57500	6315.14375	261.30	0.0001

Source	DF	Type III SS	Mean Square	F Value	Pr > F
REP	1	7.29000	7.29000	0.30	0.5915
GENO	4	25260.57500	6315.14375	261.30	0.0001

Means with the same letter are not significantly different.

Duncan Grouping	Mean	N	GENO
A	100.000	4	Bengal
A			
A	100.000	4	AS3510
A			
A	100.000	4	LMNT
A			
A	99.125	4	139-3512
B	10.938	4	Resistant

Table 18. Analysis of variance and Duncan's multiple range test for the effect of postemergence application of Cadre on five rice genotypes. Rice Research Station, Crowley, LA. 1994.

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	5	20476.78828	4095.35766	135.04	0.0001
Error	14	424.57031	30.32645		
Corrected Total	19	20901.35859			

R-Square	C.V.	Root MSE	MPOST Mean
0.979687	6.868122	5.506946	80.18125

Source	DF	Type I SS	Mean Square	F Value	Pr > F
REP	1	16.50391	16.50391	0.54	0.4729
GENO	4	20460.28437	5115.07109	168.67	0.0001

Source	DF	Type III SS	Mean Square	F Value	Pr > F
REP	1	16.50391	16.50391	0.54	0.4729
GENO	4	20460.28437	5115.07109	168.67	0.0001

Means with the same letter are not significantly different.

Duncan Grouping	Mean	N	GENO
A	100.000	4	Bengal
A			
A	99.125	4	LMNT
A			
A	98.625	4	AS3510
B	86.125	4	139-3512
C	17.031	4	Resistant

Table 19. Analysis of variance and Duncan's multiple range test for the effect of delayed pre-emergence application of Accent on five rice genotypes. Rice Research Station, Crowley, LA. 1994.

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	5	30379.21500	6075.84300	227.18	0.0001
Error	14	374.42250	26.74446		
Corrected Total	19	30753.63750			

R-Square	C.V.	Root MSE	MPRE Mean
0.987825	8.381694	5.171505	61.70000

Source	DF	Type I SS	Mean Square	F Value	Pr > F
REP	1	176.89000	176.89000	6.61	0.0222
GENO	4	30202.32500	7550.58125	282.32	0.0001

Source	DF	Type III SS	Mean Square	F Value	Pr > F
REP	1	176.89000	176.89000	6.61	0.0222
GENO	4	30202.32500	7550.58125	282.32	0.0001

Means with the same letter are not significantly different.

Duncan Grouping	Mean	N	GENO
A	100.000	4	Bengal
A			
B A	93.000	4	LMNT
B			
B	85.500	4	AS3510
C	24.375	4	139-3512
D	5.625	4	Resistant

Table 20. Analysis of variance and Duncan's multiple range test for the effect of postemergence application of Accent on five rice genotypes. Rice Research Station, Crowley, LA. 1994.

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	5	10638.42250	2127.68450	44.62	0.0001
Error	14	667.65250	47.68946		
Corrected Total	19	11306.07500			

R-Square	C.V.	Root MSE	MPOST Mean
0.940947	8.312676	6.905756	83.07500

Source	DF	Type I SS	Mean Square	F Value	Pr > F
REP	1	0.72250	0.72250	0.02	0.9038
GENO	4	10637.70000	2659.42500	55.77	0.0001

Source	DF	Type III SS	Mean Square	F Value	Pr > F
REP	1	0.72250	0.72250	0.02	0.9038
GENO	4	10637.70000	2659.42500	55.77	0.0001

Means with the same letter are not significantly different.

Duncan Grouping	Mean	N	GENO
A	100.000	4	Bengal
A			
A	100.000	4	LMNT
A			
A	98.500	4	AS3510
B	76.250	4	139-3512
C	40.625	4	Resistant

BIOTECHNOLOGY APPLICATIONS TO COASTAL EROSION CONTROL

T.P. Croughan, S.S. Croughan, M.M. Meche, X.H. Wang,
D.B. Trumps, and M.D. Materne

INTRODUCTION

Coastal erosion causes losses of as much as 40 - 50 square miles a year in Louisiana. Applying biotechnology to improve the ability to utilize vegetation as a biological erosion control measure offers the potential to reduce this serious loss.

Research on applying biotechnology to coastal erosion control is being conducted in collaboration with the U.S.D.A. Natural Resources Conservation Service. Earlier research in this project resulted in the regeneration of several *Spartina alterniflora* (smooth cordgrass) plants. Subsequent research with *Spartina alterniflora* has resulted in the development of a promising protoplast system for this species. Colony formation by protoplasts has been obtained at high frequencies, and plantlets obtained from protoplast-derived calli. In the fall of 1994 a field planting was conducted at a marsh reclamation site outside of Hackberry, Louisiana. Over 400 protoplast-derived *Spartina alterniflora* plants were included in an evaluation of 10 marsh species, including a planting of conventionally propagated *Spartina alterniflora* plants. Comparative data to determine the performance of biotechnology derived transplants with conventional *Spartina alterniflora* performance will be collected during 1995. This will provide information useful for determining the suitability of biotechnology derived plants for use in marsh reclamation.

RICE INSECTS RESEARCH

FIPRONIL AS A SEED TREATMENT IN WATER- AND DRILL-SEEDED RICE

W.C. Rice, J.D. Barbour, G.B. Trahan, and P.A. Bollich

Test: Rhone I 94 - Water-seeded

Location: Rice Research Station, Crowley, LA

Soil Type: Midland silt loam; pH: 6.2

Variety/Seeding Rate: Lemont, 140 lb/A

Planting Method and Date: Presprouted seed, by hand, May 27

Row Spacing: Broadcast seed

Experiment Design: Four replications with six treatments

Plot Size: 5 x 25 ft

Water Management: Flooded, May 26; drained, June 3; permanent flood, pinpoint, June 6; drained, Sept 6

Fertilization: 13-13-13 ppi was applied at a rate of 45-45-45 with a Kincaid drill, May 25; Urea was applied at a rate of 69-0-0 by airplane, June 27

Herbicide(s): Propanil 4 lb ai/A by airplane, June 13;
Basagran 3 pt by airplane, June 17

Insecticide(s): Furadan 3G .6 lb/A (shaker jar), June 29; Fripronil applied as a seed treatment at the following rates in grams/hectare: 25, 50, 100, and 150

Fungicide(s): None applied

Sampling: June 20, June 27, July 6, July 12, July 19, July 29, Aug 4, and Aug 11

Harvest Date: Sept 19 (whole plots harvested with Kubota combine)

Test: Rhone I 94 - Drill-seeded

Location: Rice Research Station, Crowley, LA

Soil Type: Midland silt loam; pH: 6.2

Variety/Seeding Rate: Lemont (treated with Fips), 100 lb/A

Planting Method and Date: Drill seeded half with a Kincaid cone planter, May 25

Row Spacing: 10-inch

Experiment Design: Four replications with six treatments

Plot Size: 5 x 25 ft

Water Management: Flushed, May 26; permanent flood, June 20; drained, Sept 6

Fertilization: 13-13-13 ppi was applied at a rate of 45-45-45 with a Kincaid drill, May 25;

Herbicide(s): Propanil 4 lb ai/A by airplane, June 13;
Basagran 3 pt by airplane, June 17

Insecticide(s): Furadan 3G .6 lb/A (shaker jar), July 7; Fripronil applied as a seed treatment at the following rates in grams/hectare: 25, 50, 100, and 150

Fungicide(s): None applied

Sampling: June 20, June 27, July 6, July 12, July 19, July 29, Aug 4, and Aug 11

Harvest Date: Sept 19 (whole plots harvested with Kubota combine)

Comments: Blk 1 and 2 appear to be lighter green on drill seeded, probably due to improper fertilization by airplane.

All seed treatment rates of fipronil gave statistically significant rice water weevil control over that of the untreated check (Trt. 1 and 6, Table 1) in the water-seeded trial for the duration of the study. In the drill-seeded trial, all fipronil seed treatment rates gave statistically significant control over that of the untreated check and all but two sampling dates (July 19 and July 29) of the carbofuran control (Table 1, Trt. 7 and 12). A statistically significant yield response was seen with all seed treatment rates over that of the control (Table 2, Trt. 1 and 7) in both the water- and drill-seeded trials. The highest yield response was seen at a seed treatment rate of 100 gm ai/ha in the water-seeded

trial. All seed treatment rates but one (Trt. 2, Table 2) gave higher yields (though not significant) than the carbofuran 3G (Trt. 6, Table 2) control. In the drill-seeded trial, the highest yield response was at a rate of 150 gm ai/ha (Table 2, Trt. 11), which is significantly higher than the carbofuran 3G check (Trt. 12, Table 2).

Table 1. Rhone I. Fipronil as seed treatment in water- and drill-seeded rice. Rice Research Station, Crowley, LA. 1994.

Trt No	Treatment Name	Rate*	Larvae/plant 6/20	6/27	7/6	7/12	7/19	7/29	8/4	8/11
1	water		0.7 a	1.9a	4.5a	6.1 b	4.5 a	2.5 a	1.9 ab	0.7 a
1	utc	0								
2	water		0.1 b	0.3b	1.0c	1.3 cd	0.6 bc	0.6 c	0.6 c	0.1 b
2	exp80415a	25								
3	water		0.1 b	0.4b	1.2 c	1.7 cd	1.3 bc	0.6 c	0.5 c	0.2 b
3	exp80515a	50								
4	water		0.3 b	0.0b	0.8 c	0.8 cd	0.5 c	0.4 c	0.2 c	0.1 b
4	exp80415a	100								
5	water		0.0 b	0.2b	0.5 c	0.7 cd	0.4 c	0.2 c	0.3 c	0.1 b
5	exp80415a	150								
6	water		0.2 b	1.9a	2.9 b	2.0 c	2.2 b	1.4 b	1.3 b	0.6 a
6	fur 3g	.6								
7	drill				4.3 a	8.4 a	5.9 a	3.0 a	2.0 a	0.5 a
7	utc	0								
8	drill				0.1 c	0.1 d	0.3 c	0.2 c	0.1 c	0.0 b
8	exp80415a	25								
9	drill				0.1 c	0.1 d	0.2 c	0.2 c	0.1 c	0.0 b
9	exp80515a	50								
10	drill				0.1 c	0.1 d	0.2 c	0.2 c	0.1 c	0.0 b
10	exp80415a	100								
11	drill				0.1 c	0.2 d	0.3 c	0.1 c	0.1 c	0.0 b
11	exp80415a	150								
12	drill				5.2 a	1.9 c	0.3 c	0.9 bc	0.3 c	0.6 a
12	fur 3g	.6								
LSD (.05) =			0.3	0.6	1.3	1.5	1.6	0.7	0.6	0.3
Standard Dev.=			.224599	.398057	.869738	1.03460	1.11065	.507558	.437912	.222367
CV =			98.01	51.03	50.27	52.99	80.19	59.51	69.60	91.54

Means followed by same letter do not significantly differ (P=.05, Duncan's MRT).
* Fipronil, gm/ha; Furadan 3G, lb/A

Table 2. Rhone 94 I.

Trt No	Treatment Name	Rate*	Height	Yield
			-(cm)-	-(lb/A)-
1	water		75.5 bc	3689.4 bc
1	utc	0		
2	water		82.5 a	4371.0 abc
2	exp80415a	25		
3	water		81.3 ab	4268.3 abc
3	exp80515a	50		
4	water		82.8 a	4786.1 a
4	exp80415a	100		
5	water		79.5 abc	4571.5 ab
5	exp80415a	150		
6	water		81.4 ab	4415.5 abc
6	fur 3g	.6		
7	drill		72.8 c	2741.2 d
7	utc	0		
8	drill		78.8 abc	4132.1 abc
8	exp80415a	25		
9	drill		78.2 abc	4242.0 abc
9	exp80515a	50		
10	drill		80.8 ab	4240.7 abc
10	exp80415a	100		
11	drill		79.2 abc	4565.3 ab
11	exp80415a	150		
12	drill		77.7 abc	3445.9 cd
12	fur 3g	.6		
LSD (.05)	=		6.0	897.0
Standard Dev.	=		4.14895	621.253
CV	=		5.24	15.07

Means followed by same letter do not significantly differ (P=.05, Duncan's MRT).
* Fipronil, gm/ha; Furadan 3G, lb/A

FIPRONIL AS A GRANULAR APPLICATION IN WATER- AND DRILL-SEEDED RICE

W.C. Rice, J.D. Barbour, G.B. Trahan, and P.A. Bollich

Test: Rhone II 94 - Water-seeded

Location: Rice Research Station, Crowley, LA

Soil Type: Midland silt loam; pH: 6.2

Variety/Seeding Rate: Lemont, 140 lb/A

Planting Method and Date: presprouted seed, by hand, May 27

Row Spacing: 7-inch

Experiment Design: Four replications with seven treatments

Plot Size: 5 x 25 ft

Water Management: Flooded, May 26; drained, June 3; pinpoint flood, June 6; drained, Sept 6

Fertilization: 13-13-13 ppi was applied at a rate of 45-45-45 with a Kincaid drill, May 25; Urea was applied at a rate of 69-0-0 by airplane, June 27

Herbicide(s): Propanil 4 lb ai/A by airplane, June 13;
Basagran 3 pt by airplane, June 17

Insecticide(s): Furadan 3G .6 lb/A (shaker jar), June 29

Fungicide(s): None applied

Sampling: June 20, June 27, July 6, July 12, July 20, Aug 1, Aug 8, and Aug 15

Harvest Date: Sept 21 (whole plots harvested with Kubota combine)

Test: Rhone II 94 - Drill-seeded

Location: Rice Research Station, Crowley, LA

Soil Type: Midland silt loam; pH: 6.2

Variety/Seeding Rate: Lemont, 100 lb/A

Planting Method and Date: Drill seeded half with a Kincaid cone planter, May 25

Row Spacing: 10-inch

Experiment Design: Four replications with seven treatments

Plot Size: 5 x 25 ft

Water Management: Flushed, May 26 and June 9; permanent flood, June 20; drained, Sept 6

Fertilization: 13-13-13 ppi was applied at a rate of 45-45-45 with a Kincaid drill, May 25

Herbicide(s): Propanil 4 lb ai/A by airplane, June 13;
Basagran 3 pt by airplane, June 17

Insecticide(s): Furadan 3G .6 lb/A (shaker jar), Post flood treatment appl., June 21;
Treatment 14 application, July 7

Fungicide(s): None applied

Sampling: June 20, June 27, July 6, July 12, July 20, Aug 1, Aug 8, and Aug 15

Harvest Date: Sept 21 (whole plots harvested with Kubota combine)

Comments: Treatments 2, 3, 4 (water-seeded), 8, 9, and 10 (drill-seeded) were preplant and incorporated into the soil, while treatments 5, 6 (water-seeded), 12 and 13 (drill-seeded) were at flood. Carbofuran 3G was applied at economic injury level. Fipronil at preplant in the water-seeded trial provided significant rice water weevil (RWW) larval control for the duration of the study over that of the control (Table 1, Trt. 1). At flood application, fipronil provided significant control of RWW larvae over the check plots for the first four sampling dates (Table 1, Trt. 5 and 6). All treatment rates of fipronil in the drill-seeded trial (Table 1, Trt. 9-13) gave significant control over the untreated plots (Table 1, Trt. 8) and controlled RWW larvae for the duration of the study. Again, the highest yield

response was seen in the water-seeded trial at the highest granular rate of 100 gm ai/ha (Trt. 4, Table 2). All fipronil treatments gave significantly higher yield responses than the untreated controls. Fipronil provides significant control of RWW larvae and gives significant yield responses both as a granular application and as a seed treatment in both water- and drill-seeded rice.

Table 1. Rhone II. Fipronil as a granular application in water- and drill-seeded rice. Rice Research Station, Crowley, LA. 1994.

Trt No	Treatment Name	Rate*	Larvae/plant 6/20	6/27	7/6	7/12	7/20	8/1	8/8	8/15
1	water		1.2 a	2.9 a	10.4 a	8.3 a	4.7 b	4.9 ab	2.3 ab	0.8 b
1	utc	0								
2	water		0.2 b	0.3 bc	2.4 def	0.4 b	0.8 def	0.9 d	0.5 c	0.1 de
2	exp6055a	25								
3	water		0.2 b	0.4 bc	1.0 ef	0.4 b	0.8 def	0.4 d	0.2 c	0.1 de
3	exp6055a	50								
4	water		0.1 b	0.1 c	0.6 f	0.1 b	0.7 ef	0.3 d	0.2 c	0.0 e
4	exp6055a	100								
5	water		0.3 b	1.1 b	5.1 c	1.1 b	3.0 bc	2.7 bcd	1.9 b	0.4 cde
5	exp6055a	25								
6	water		0.3 b	1.1 b	3.6 cd	1.1 b	2.5 cde	1.7 d	1.2 bc	0.5 bcd
6	exp6055a	50								
7	water		1.0 a	2.8 a	3.0 cde	2.8 ab	2.7 cd	4.3 abc	3.2 a	1.4 a
7	fur 3g	.6								
8	drill				8.8 ab		7.6 a	5.6 a	2.0 b	0.6 bc
8	utc	0								
9	drill				0.9 ef		0.9 def	2.1 cd	0.7 c	0.1 de
9	exp6055a	25								
10	drill				0.4 f		1.1 def	0.5 d	0.1 c	0.1 de
10	exp6055a	50								
11	drill				0.3 f		0.1 f	0.3 d	0.4 c	0.1 de
11	exp6055a	100								
12	drill				1.1 ef		0.7 def	0.6 d	0.3 c	0.2 de
12	exp6055a	25								
13	drill				0.4 f		0.2 f	0.3 d	0.2 c	0.1 de
13	exp6055a	50								
14	drill				7.4 b		0.4 f	0.8 d	0.7 c	0.3 cde
14	fur 3g	.6								
LSD (.05) =			0.5	0.8	2.1	5.7	1.7	2.4	1.1	0.4
Standard Dev.=			.324145	.515377	1.46914	3.85540	1.19816	1.65490	.786013	.247817
CV =			71.46	41.78	45.30	190.22	64.22	91.12	79.12	73.82

Means followed by same letter do not significantly differ (P=.05, Duncan's MRT).
* Fipronil, lb/ha; Furadan 3G, lb/A.

Table 2. Rhone 94 II

Trt No	Treatment Name	Rate*	Height	Yield
			-(cm)-	-(lb/A)-
1	water		70.3 c	2370.2 e
1	utc	0		
2	water		80.4 ab	4400.4 ab
2	exp6055a	25		
3	water		82.5 a	4490.0 ab
3	exp6055a	50		
4	water		84.0 a	4788.8 a
4	exp6055a	100		
5	water		81.3 a	3922.4 bc
5	exp6055a	25		
6	water		81.7 a	3933.2 bc
6	exp6055a	50		
7	water		81.7 a	4015.5 bc
7	fur 3g	.6		
8	drill		77.3 b	3006.2 d
8	utc	0		
9	drill		82.9 a	4176.5 abc
9	exp6055a	25		
10	drill		83.8 a	4035.7 bc
10	exp6055a	50		
11	drill		82.7 a	4045.4 bc
11	exp6055a	100		
12	drill		80.4 ab	3691.8 c
12	exp6055a	25		
13	drill		83.3 a	3795.7 bc
13	exp6055a	50		
14	drill		80.4 ab	3576.3 cd
14	fur 3g	.6		
LSD (.05)	=		3.1	604.2
Standard Dev.	=		2.15383	422.806
CV	=		2.66	10.91

Means followed by same letter do not significantly differ (P=.05, Duncan's MRT).
* Fipronil, gm/ha; Furadan 3G, lb/A.

EVALUATION OF IGR'S FOR THE CONTROL OF THE RICE WATER WEEVIL

W.C. Rice, J.D. Barbour, G.B. Trahan, and P.A. Bollich

Test: Rohm and Haas

Location: Rice Research Station, Crowley, LA

Soil Type: Crowley silt loam

Variety/Seeding Rate: Cypress, 100 lb/A

Planting Method and Date: Kincaid drill, June 9

Row Spacing: 7-inch

Experiment Design: Four replications with 10 treatments

Plot Size: 20 ft x 49 in

Water Management: Flushed, June 21 and July 1; permanent flood, July 6; drained, Sept 14

Fertilization: 13-13-13 was applied at a rate of 45-45-45 with a Kincaid drill, June 9; 21-0-0 was applied at a rate of 100-0-0 by airplane, July 21

Herbicide(s): Propanil 4 lb ai/A by airplane, June 27

Insecticide(s): Furadan 3G applied by shaker jar on July 20 at 0.6 lb ai/A

Fungicide(s): RH-0345 applied on the following dates as a flowable: July 5, July 7, July 13, and July 20, and as a granular on July 6, July 7, July 13

Sprayer: CO_2-driven, hand-held, 36 psi, 15 GPA, 110015 nozzles

Sampling: July 29

Harvest Date: Sept 27 (Kubota combine)

Comments: RH-0345 when applied either as a granular or as a flowable 1 day before permanent flood was able to provide significant rice water weevil larvae control (Table 1, Trt. 1 and 5). However, these treatments did not provide either a significant yield or plant height response. A phytotoxic effect was seen in the RH-0345 treated plots and significantly reduced plant height response were seen in Trt. 5, 6, and 7. There was not enough granular for Trt. 8. The phytotoxic response seen may thus preclude a significant yield response due to significant rice water weevil larvae control seen in Trt. 1 and 5.

Table 1. Evaluation of IGR's for the control of the rice water weevil. Rice Research Station, Crowley, LA. 1994. Rohm and Haas.

Trt No	Treatment Name	Rate (lb ai/A)	Larvae/Plant
1	RH-0345 2F	2.0	2.1 cde
2	RH-0345 2F	2.0	2.6 abc
3	RH-0345 2F	2.0	2.9 ab
4	RH-0345 2F	2.0	2.3 bcd
5	RH-0345 GR	2.0	1.6 e
6	RH-0345 GR	2.0	1.8 de
7	RH-0345 GR	2.0	2.2 cde
8	RH-0345 GR	2.0	2.4 bcd
9	FURADAN 3G	0.6	0.2 f
10	UTC	0	3.1 a
LSD (.05) =			0.6
Standard Dev.=			.418914
CV =			19.82

Means followed by same letter do not significantly differ (P=.05, Duncan's MRT).

Table 2. Evaluation of Rohm and Haas compounds for the control of the rice water weevil. Rice Research Station, Crowley, LA. 1994.

Trt No	Treatment Name	Rate (lb ai/A)	Height -(cm)-	Yield (lb/A)
1	RH-0345 2F	2.0	68.1 ab	2581.7 cd
2	RH-0345 2F	2.0	70.8 a	3188.2 b
3	RH-0345 2F	2.0	67.8 ab	3423.9 ab
4	RH-0345 2F	2.0	69.9 a	3041.5 bc
5	RH-0345 GR	2.0	65.6 bc	2056.4 de
6	RH-0345 GR	2.0	64.1 cd	1998.8 e
7	RH-0345 GR	2.0	61.5 d	2099.5 de
8	RH-0345 GR	2.0	68.4 ab	2949.6 bc
9	FURADAN 3G	0.6	71.1 a	3738.1 a
10	UTC	0	70.6 a	3126.1 bc
LSD (.05) =			3.2	517.4
Standard Dev.=			2.23066	356.572
CV =			3.29	12.64

Means followed by same letter do not significantly differ (P=.05, Duncan's MRT).

ESTABLISHMENT OF SOMACLONAL LINES OF WC1711

W.C. Rice, G.B. Trahan, and P.A. Bollich

Introduction

WC1711 is a moderately resistant rice water weevil line that has good yield and disease resistance potential, but has poor agronomic traits (tall and very susceptible to lodging). Plant tissue culture offers a potential to improve a plants agronomic traits through manipulation of the plant at the cellular level. "Somaclonal variability" is the term used to describe the high level of genetic variability exhibited by some plants developed through tissue culture. The objective of this study was to 1) determine if WC1711 would show a high degree of plant variability when derived from somatic explants and 2) to generate plants with better agronomic traits that still contain RWW resistance.

Selection and Sterile Transfer of Immature Panicles

Panicle Selection

Tillers from a ratoon crop of WC1711 planted in 1993 were cut near the soil with a sharp blade when the flag leaf was beginning to emerge until completely emerged. The blade collar has not separated from the penultimate leaf blade collar. This gives panicles at the correct stage with most cultivars. Tillers with white panicles 1 to 6 cm in length in the boot were selected.

Panicle Preparation and Sterilization

In the laboratory, the outer sheaths were removed so that the panicle was covered by only two sheaths. The flag leaf and penultimate leaf blades were cut off at the collar. Cut through the tiller about 1 cm below the last node (can be felt through the sheaths). The boots were sterilized for 30 to 40 minutes in 250 ml graduated cylinders filled with a 30% solution of household bleach (5.25% sodium hypochlorite) to which 2 to 4 ml Tween 20 was added. Sterilization and panicle planting were performed in a biological safety cabinet.

Removing and Planting Panicles

Boots were removed from the cylinder and placed on a sterile towel in a tray. A boot was cut open from top to bottom with sterile scalpel to expose the panicle. The base of the panicle was cut free from the node with a scalpel and the panicle was transferred to a petri dish containing MS_4 media (Table 1) and incubated in the dark at 26°C. When the callus formed and calli reached 2 to 3 mm in diameter, they were transferred to fresh MS_4 or R_2 medium (Table 2). After 3 to 4 weeks, calli were removed from panicle branches.

Table 1. Callus induction media (MS_4)

Item	Stock solution		1 liter
MS salts	---		4.3 g/l
Sucrose	---		30.0 g/l
Agar	---		10.0 g/l
Casein	---		0.5 g/l
B1	1.0 ppm	(400.0 mg/200 ml)	0.5 ml/l
B6	0.5 ppm	(100.0 mg/100 ml)	0.5 ml/l
Nicot. A.	0.5 ppm	(100.0 mg/100 ml)	0.5 ml/l
Glycine	2.0 ppm	(200.0 mg/100 ml)	1.0 ml/l
Inositol	100.0 ppm	(4.0 g/200 ml)	5.0 ml/l
2,4-D	4.0 ppm	(200.0 mg/400 ml)	8.0 ml/l
pH	5.8		

Table 2. Regeneration media (R).

Item	Stock solution		1 liter
MS salts	---		4.3 g/l
Sucrose	---		30.0 g/l
Agar	---		10.0 g/l
Casein	---		0.5 g/l
B1	1.0 ppm	(400.0 mg/200 ml)	0.5 ml/l
B6	0.5 ppm	(100.0 mg/100 ml)	0.5 ml/l
Nicot. A.	0.5 ppm	(100.0 mg/100 ml)	0.5 ml/l
Glycine	2.0 ppm	(200.0 mg/100 ml)	1.0 ml/l
Inositol	100.0 ppm	(4.0 g/200 ml)	5.0 ml/l
I A A	0.5 ppm	(100.0 mg/100 ml)	0.5 ml/l
BA	0.8 ppm	(100.0 mg/100 ml)	0.8 ml/l
pH	5.8		

Somaculture

Calli produced on solid MS_4 medium were transferred to regeneration medium, and subsequently, transferred to fresh medium about every 3 weeks. These cultures were incubated at 26°C, under fluorescent lights on a 16-hr light - 8 hr dark schedule. When green spots appeared on the calli, they were transferred to fresh regeneration medium. When the plant formed well developed shoots and roots, it was transferred to soil potted in the greenhouse. Subsequently, the plant was transferred to agricultural plots in the field where plant height, maturity, and hull color were recorded. Individual panicles were harvested per plant.

Location: Rice Research Station, Crowley, LA

Soil: Crowley silt loam; pH: 6.2

Variety: 1711 somaclones (tissue culture)

Planting Method and Date: Space planted, transferred from greenhouse to field, Apr 21, 1994

Row Spacing: 3 x 2 ft

Water Management: Permanent flood, Apr 21

Fertilization: 13-13-13 at a rate of 45-45-45 with a motorized gandy, Apr 20; 75-0-0 (46% N) with a Casoron spreader, June 4

Harvested: By hand, July 28

Comments: WC1711 is a germplasm source that is capable of producing a high degree of somaclonal variation (Table 3). The plant phenotype that was observed to be the most variable was plant height, which ranged from 42 to 104 cms. Hull color followed by alterations in maturity date were the next most frequent plant phenotypic alterations observed. Panicles from selected lines were planted in the greenhouse to increase seed to evaluate the somaclonal variants for altered RWW resistance. Rice water weevil somaclonal lines may serve as a source of enhanced germplasm.

Table 3. Establishment of somaclonal lines of WC1711.

Line	Height	Maturity	Hull color
A1-2W	42	VVE	SH
A1-3M	65	M	SH
A1-3O	65	M	SH
A1-3U	69	M	SH
A1-3I	70	E	SH
A1-3L	71	E	SH
A1-5P	71	E	SH
A1-2I	75	E	SH
A1-7W	75	E	SH
A1-2K	76	E	SH
A1-2X	77	E	M
A1-5L	77	E	SH
A1-6H	77	E	SH
A1-2M	78	E	SH
A1-6K	78	E	SH
A1-7B	78	VE	SH
A1-2S	79	E	SH
A1-1S	80	E	SH
A1-2Y	80	E	SH
A1-2Z	80	E	SH
A1-3J	80	E	SH
A1-6A	80	VE	GH
A1-6R	80	E	SH
A1-3A	81	E	SH
A1-7R	81	E	SH
A1-2N	82	E	SH
A1-3D	82	E	SH
A1-5J	82	E	SH
A1-6I	82	E	SH
A1-1C	83	E	GH
A1-1D	83	E	GH
A1-1O	83	E	SH
A1-2T	83	E	SH
A1-4K	83	E	SH
A1-5G	83	E	SH
A1-6C	83	E	SH
A1-7L	83	E	SH

Continued.

Table 3. Continued.

Line	Height	Maturity	Hull color
A1-7J	83	E	SH
A1-7N	83	E	SH
A1-1F	85	E	GH
A1-1G	85	E	GH
A1-1W	85	E	SH
A1-1Y	85	E	SH
A1-1Z	85	E	SH
A1-2G	85	E	GH
A1-3K	85	E	SH
A1-4J	85	E	SH
A1-4L	85	E	SH
A1-4Z	85	E	SH
A1-5A	85	E	SH
A1-5O	86	E	SH
A1-2B	87	E	SH
A1-3E	87	E	SH
A1-4O	87	E	GH
A1-5U	87	E	SH
A1-6U	87	E	SH
A1-7A	87	E	SH
A1-1P	88	E	SH
A1-1X	88	E	SH
A1-3F	88	E	SH
A1-4V	88	E	SH
A1-5B	88	E	SH
A1-7I	88	E	SH
A1-7Q	88	E	SH
A1-4M	89	E	SH
A1-6J	89	M	SH
A1-7C	89	M	SH
A1-7V	89	E	SH
A1-1H	90	E	GH
A1-1M	90	E	GH
A1-1R	90	E	SH
A1-4E	90	E	SH
A1-4F	90	E	GH
A1-4Q	90	E	SH

Continued.

Table 3. Continued.

Line	Height	Maturity	Hull color
A1-6D	90	E	SH
A1-6L	90	E	SH
A1-7G	90	E	GH
A1-7K	90	E	SH
A1-7Z	90	E	SH
A1-1K	91	E	GH
A1-4T	91	E	GH
A1-6Y	91	E	SH
A1-1B	92	E	GH
A1-3G	92	E	SH
A1-5M	92	E	SH
A1-5S	92	L	---
A1-6E	92	E	SH
A1-7T	92	E	GH
A1-1J	93	E	GH
A1-1L	93	E	GH
A1-1N	93	E	GH
A1-1U	93	E	SH
A1-4W	93	M	SH
A1-6O	93	E	GH
A1-6W	93	M	SH
A1-1A	94	E	GH
A1-4P	94	E	GH
A1-1Q	95	E	GH
A1-1V	95	E	GH
A1-2H	95	E	GH
A1-7K	95	E	SH
A1-8A	95	E	GH
A1-7P	96	E	GH
A1-6S	97	E	SH
A1-1E	98	E	GH
A1-1I	98	E	GH
A1-1T	98	E	GH
A1-2D	99	E	GH
A1-2C	100	E	GH
A1-7U	100	E	GH
A1-7F	104	E	GH
WC 1711-Parent	98	E	SH

EVALUATION OF WORLD COLLECTION LINES - SET 3

W.C. Rice, G.B. Trahan, and P.A. Bollich

Location: Rice Research Station, Crowley, LA

Soil Type: Crowley silt loam; pH: 6.2

Variety/Seeding Rate: World collection lines

Planting Method and Date: Hege Drill, June 8

Row Spacing: 10-inch

Experiment Design: 62 lines, four replications per line

Plot Size: 3-ft single row plots, four replications

Water Management: Flushed, June 21; permanent flood, June 30

Fertilization: 20-10-10 was applied at a rate of 100-50-50 with a Casaron Spreader, June 30

Herbicide(s): Propanil 4 lb ai/A by airplane, June 27

Insecticide(s): N/A

Fungicide(s): Beam 3 gm/liter, July 20

Sprayer: CO_2-driven, hand-held, 32 psi, 15 GPA, 110015 nozzles

Sampling: July 25

Harvest Date: N/A

Comments: Larvae per plant counts on Line PI412776 (J.P. 5 or Begumi) were significantly reduced (Table 1, Trt. 34) when compared with the two check varieties Cypress and Bengal. PI412914 (Suweon 258) and PI41301 (Batatais) also gave statistically significant reduced larval counts over that of Bengal. Essentially, all lines were very susceptible to the sugarcane borer which precluded obtaining plant height and maturity dates.

Table 1. World Collection 3. Rice Research Station, Crowley, LA. 1994.

Trt No	Treatment Name	Larvae/Plant
1	PI408398	49.5 a-e
2	PI408399	37.5 b-e
3	PI408400	76.3 ab
4	PI408401	50.4 a-e
5	PI408402	52.4 a-e
6	PI408403	50.8 a-e
7	PI408407	40.2 b-e
8	PI408408	45.2 a-e
9	PI408561	50.6 a-e
10	PI408562	56.9 a-e
11	PI408563	38.7 b-e
12	PI408564	29.6 cde
13	PI408565	40.9 b-e
14	PI408566	53.0 a-e
15	PI408567	32.2 cde
16	PI408568	44.2 a-e
17	PI408569	42.8 a-e
18	PI408571	53.2 a-e
19	PI408572	56.1 a-e
20	PI408573	55.8 a-e
21	PI408575	39.2 b-e
22	PI408576	36.2 b-e
23	PI408577	40.1 b-e
24	PI408578	30.1 cde
25	PI408960	29.0 cde
26	PI410949	59.5 a-e
27	PI410989	36.6 b-e
28	PI412770	70.6 abc
29	PI412771	44.5 a-e
30	PI412772	53.3 a-e
31	PI412773	39.6 b-e
32	PI412774	44.9 a-e
33	PI412775	55.3 a-e
34	PI412776	17.4 e
35	PI412777	36.0 b-e
36	PI412779	49.6 a-e
37	PI412780	38.3 b-e
38	PI412781	51.3 a-e
39	PI412782	35.5 b-e
40	PI412786	61.3 a-d
41	PI412788	48.8 a-e

Continued.

Table 1. Continued.

Trt No	Treatment Name	Larvae/Plant
42	PI412789	44.7 a-e
43	PI412792	33.7 cde
44	PI412908	*
45	PI412909	58.4 a-e
46	PI412910	31.0 cde
47	PI412911	36.8 b-e
48	PI412912	43.3 a-e
49	PI412913	64.3 a-d
50	PI412914	24.3 de
51	PI412915	32.3 cde
52	PI412916	33.8 cde
53	PI412917	43.4 a-e
54	PI413183	35.1 b-e
55	PI413735	31.3 cde
56	PI413737	33.8 b-e
57	PI413740	34.1 b-e
58	PI413797	35.0 b-e
59	PI413801	25.2 de
60	PI413806	83.3 a
61	Cypress	61.5 a-d
62	Bengal	56.6 abc
LSD (.05) =		32.6
Standard Dev.=		23.3179
CV =		52.39

Means followed by same letter do not significantly differ (P=.05, Duncan's MRT).
* Seed did not germinate.

EVALUATION OF WORLD COLLECTION LINES - SET 4

W.C. Rice, G.B. Trahan, and P.A. Bollich

Location: Rice Research Station, Crowley, LA

Soil Type: Crowley silt loam; pH: 6.2

Variety/Seeding Rate: World collection lines

Planting Method and Date: Hege Drill, June 8

Row Spacing: 10-inch

Experiment Design: 62 lines, four replications per line

Plot Size: 3-ft single row plots, four replications

Water Management: Flushed, June 21; permanent flood, June 30

Fertilization: 20-10-10 was applied at a rate of 100-50-50 with a Casaron Spreader, June 30

Herbicide(s): Propanil 4 lb ai/A by airplane, June 27

Insecticide(s): N/A

Fungicide(s): Beam 3 gm/liter, July 20

Sprayer: CO_2-driven, hand-held, 32 psi, 15 GPA, 110015 nozzles

Sampling: July 26

Harvest Date: N/A

Comments: On the basis of rice water weevil larval counts per plant, Line PI415656 (Bigldo June 6-12 Turkey) gave the best result with 15.5 larvae per plant compared with the check varieties Cypress and Bengal, which had 40.9 and 31.5 larvae per plant, respectively (Table 1, Trt. 48, 61, and 62). Essentially, all lines were very susceptible to the sugarcane borer which precluded obtaining plant height and maturity dates.

Table 1. World Collection 4. Rice Research Station, Crowley, LA. 1994.

Trt No	Treatment Name	Larvae/Plant
1	PI413830	35.2 a-f
2	PI413847	34.6 a-f
3	PI413848	54.9 a-f
4	PI413860	26.8 b-f
5	PI413955	49.8 a-f
6	PI413958	39.2 a-f
7	PI413959	33.8 a-f
8	PI413960	20.8 def
9	PI413961	48.6 a-f
10	PI413962	31.3 a-f
11	PI413963	22.0 c-f
12	PI413966	32.2 a-f
13	PI413969	35.9 a-f
14	PI413970	29.2 a-f
15	PI413978	20.5 def
16	PI413977	30.9 a-f
17	PI413979	19.4 def
18	PI413985	36.5 a-f
19	PI413986	43.3 a-f
20	PI413987	34.2 a-f
21	PI413988	31.3 a-f
22	PI413990	21.6 def
23	PI414001	30.8 a-f
24	PI414003	25.2 b-f
25	PI414005	40.0 a-f
26	PI414006	44.5 a-f
27	PI414007	49.0 a-f
28	PI414008	23.0 c-f
29	PI414220	29.6 a-f
30	PI414232	26.7 b-f
31	PI414236	20.5 def
32	PI414241	33.5 a-f
33	PI414418	58.1 a-d
34	PI414545	65.1 ab
35	PI414677	43.9 a-f
36	PI414678	38.5 a-f
37	PI414679	33.5 a-f
38	PI414680	33.8 a-f
39	PI414681	28.0 b-f
40	PI414712	48.9 a-f
41	PI414713	30.6 a-f

Continued.

Table 1. Continued.

Trt No	Treatment Name	Larvae/Plant
42	PI414714	20.2 def
43	PI414715	35.6 a-f
44	PI415199	41.6 a-f
45	PI415200	62.5 abc
46	PI415632	31.4 a-f
47	PI415633	68.7 a
48	PI415656	15.5 f
49	PI415659	46.2 a-f
50	PI415660	34.2 a-f
51	PI415661	55.8 a-f
52	PI415665	17.4 ef
53	PI415666	20.9 def
54	PI415669	57.1 a-e
55	PI415670	38.1 a-f
56	PI415671	33.3 a-f
57	PI415673	32.5 a-f
58	PI415674	29.2 a-f
59	PI415675	33.9 a-f
60	PI415676	46.5 a-f
61	Cypress	40.9 a-f
62	Bengal	31.5 a-f
LSD (.05) =		30.9
Standard Dev.=		22.0910
CV =		61.48

Means followed by same letter do not significantly differ (P=.05, Duncan's MRT).

EFFECT OF FORMULATION ON THE EFFICACY AND ENVIRONMENTAL PERSISTENCE OF FUNGAL PATHOGENS TO THE RICE WATER WEEVIL

W.C. Rice, G.B. Trahan, and P.A. Bollich

Location: Rice Research Station, Crowley, LA

Soil Type: Midland silt loam; pH: 6.2

Variety/Seeding Rate: 2218, 100 lb/A

Planting Method and Date: Kincaid Drill, May 25, 1994

Row Spacing: 7-inch

Experiment Design: Six treatments with four replications

Plot Size: 49 in x 10 ft; adjacent plots to treated plots received the same treatment to serve as a buffer.

Water Management: Flushed, June 9 and June 21; permanent flood, June 23; drained, Sept 6

Fertilization: 13-13-13 ppi was applied at a rate of 45-45-45 with a Kincaid drill, May 25; urea was applied at a rate of 69-0-0 by airplane, June 27

Herbicide(s): Propanil 4 lb ai/A by airplane, June 13;
Basagran 3 pt/A by airplane, June 17

Insecticide(s): Furadan 3G 0.6 lb ai/A, July 12

Sprayer: CO_2-driven, hand-held, 36 psi, 15 GPA, 110015 nozzles

Conidial Application: Conidia applied 6/20, 6/21 split due to weather, and 6/30

Microbial Sampling: June 20, June 21AM, June 21PM, June 22, and June 30. Leaf samples were collected at random in field plots and transferred to the lab at the time of collection. Subsequently, the center of the leaves were cut into 1/2 cm length and placed into 5 ml of an extraction buffer (Phosphate buffered saline pH 6.7) in 20 ml screw-capped vials. The sample vials were incubated at 27°C for 2 hours on a orbital shaker rotating at 250 RPM. An aliquot was removed from each vial, diluted appropriately and plated on ODTA plates. After incubation for 7 to 9 days at 27°C, the colony forming counts (CFU) were recorded. The total number of CFU/ml were determined as was the leaf surface area of the samples. This then enabled a determination of the number of CFU/cm^2 of leaf surface.

Larval Core Sampling Dates: July 11, July 18, July 27, Aug 3, and Aug 9

Harvest Date: Sept 26 (whole plots harvested with Kubota combine)

Comments: Conidial applications on June 20 and June 30 corresponded to a leaf area index of 0.7 and 2.0, respectively (Table 1). As expected, this is a relatively low value. Average temperature was approximately 80°F for approximately 3 weeks following the applications (Figure 1A). Rainfall was noted on June 23 and 24 and on July 1 (Figure 1B). Relative humidity was quite high during the day and reached 100% every night (data not shown). Solar radiation data was lost for this experiment due to electrical computer problems.

Table 1. Leaf area index.

Date	Value
6/20	0.7
6/30	2.0

It appears that the 5% oil based formulation resulted in the greatest delivery/recovery of viable conidia from the leaf surface of rice. At 24 hours post treatment, their was an 89 to 53% reduction in the number of conidia recovered, and by 48 hours, a reduction of 89 to 93% was observed in the various treatments (Table 2).

Untreated adults were collected from adjacent field plots several hundred yards removed from treated plots and placed on fungal-sprayed leaves collected from the plots. They were held for 10 days and adult mortalities were recorded. A significant increase on adult mortality was observed from leaves collected immediately after treatment versus the nontreated leaves. By 48 hours, their was no significant difference in adult mortality between treated and non-treated leaves (Figure 2A and 2B).

Adult RWW removed from treated plots gave a mortality of 45 to 80%, depending upon the treatment and time interval in which they were removed (Figure 3A and 3B) Conidia applied in neat oil formulation gave the highest adult mortalities observed. However, the neat oil disrupted normal insect behavior and served to attract additional adults to the plots.

Larvae were sampled over a 1-month period. The 5% oil formulation overlapped statistically with that of the carbofuran treatment and the UTC on the Aug 9 sampling date (Table 3) The WP treatment had an initially lower larval count than that of the untreated check.

When plant height was evaluated, all conidial applications overlapped statistically with both the UTC, oil control and carbofuran treatments (Table 4). Only the 5% oil formulation gave a yield response statistically equivalent to the carbofuran and UTC controls.

Evidence for larger scale movement for RWW adults in the field is indicated by the fact that fungal mortality levels increased in UTC plots over time even though conidial sampling indicated very low levels of drift from the spray applications. To fully assess the

potential of fungi for the control of RWW, leveed plots will need to be used to prevent crawling/swimming from plot to plot. Environmental persistence data strongly support the need for altered formulations plus ultra violet protectants to possibly extend the half-life of these biotic agents in the field. Adults may be infected via direct contact or by feeding on leaf surfaces.

Figure 1A

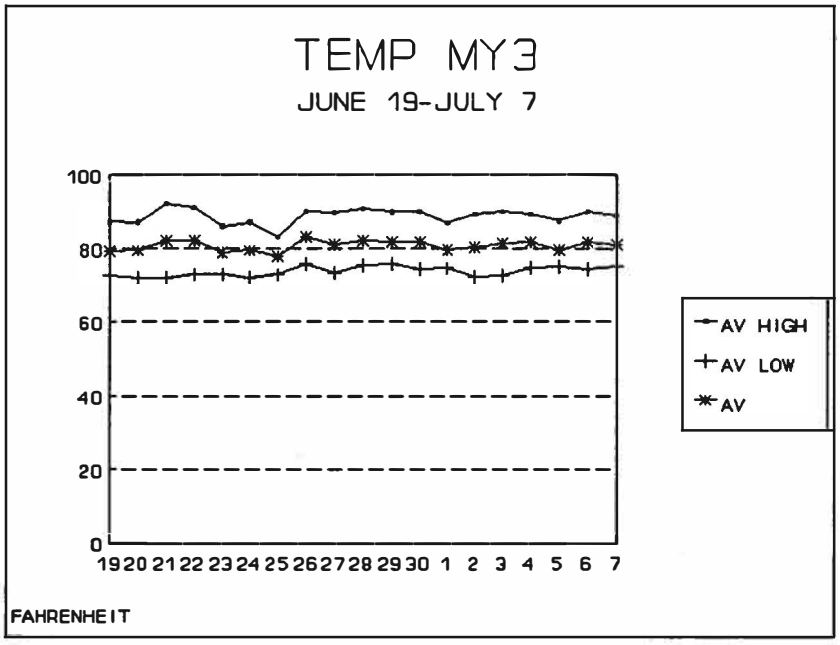


Figure 1B

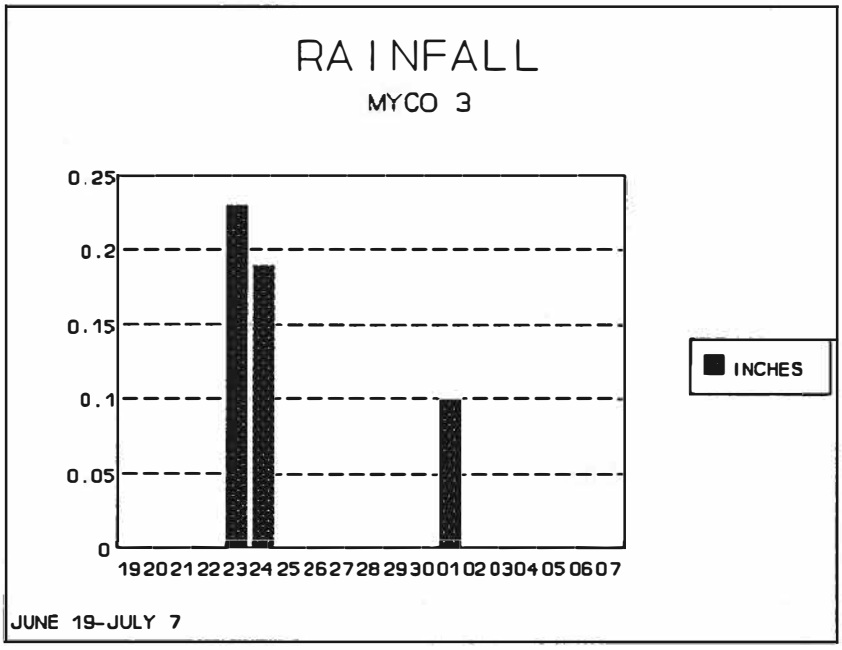


Figure 2A

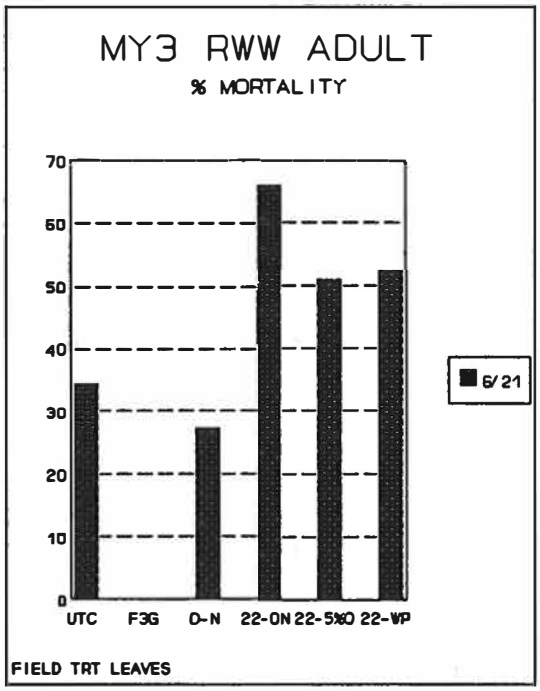


Figure 2B

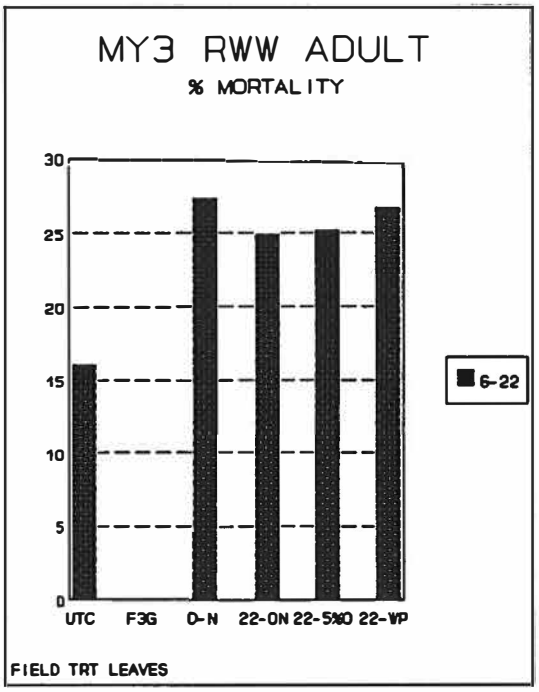


Figure 3A

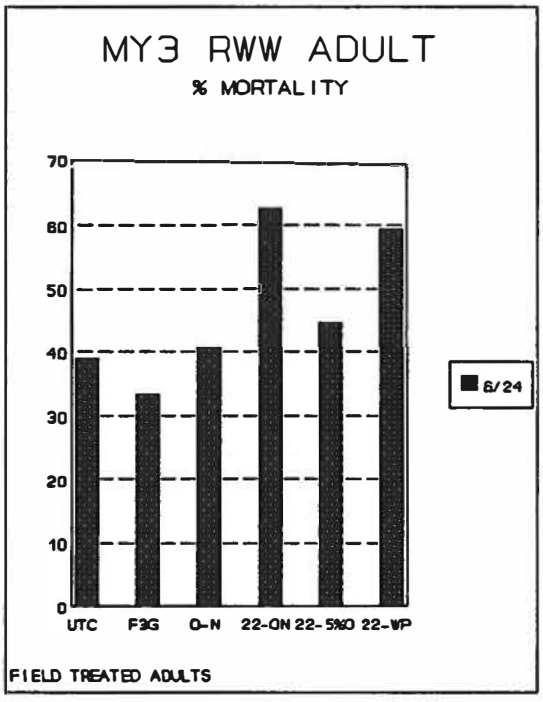


Figure 3B

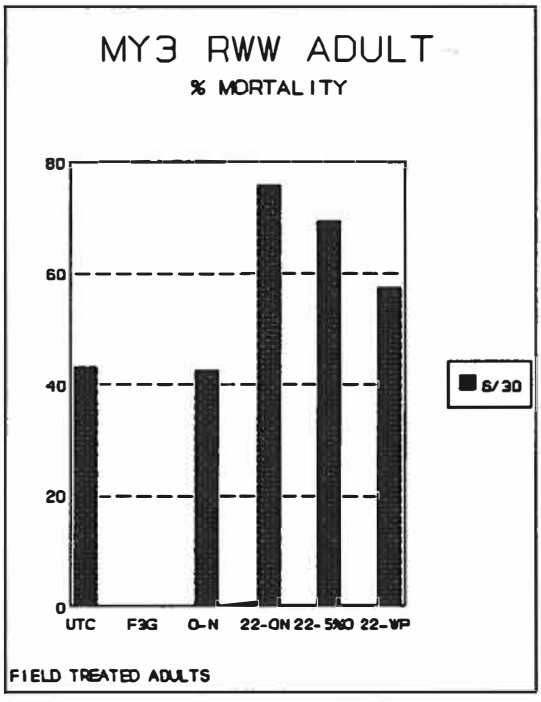


Table 2. Effect of formulation on environmental persistence of conidia applied to rice leaves. Rice Research Station, Crowley, LA. 1994.

Trt No	Treatment Name	Rate (lb/A)	Conidia per cm² 6/20	6/21A	6/21P	6/22	6/30
1	UTC	0	685.6 c	1054.9 b	88.5 c	79.0c	920.3 b
2	FUR 3G	0.6	---	---	---	---	---
3	OIL N	0	517.8 c	278.3 b	117.7 c	80.4 c	1309.1 b
4	OIL 22292AP1	5 13*	14884.2 ab	12580.5 a	1684.7 bc	3116.4 a	4991.1 a
5	22292AP1 5%O	5 13*	17372.6 a	19392.9 a	3628.9 ab	1223.5 bc	4601.1 a
6	22292AP1 WP	5 13*	10100.4 b	17104.1 a	4844.1 a	1611.3 b	3557.1 a
LSD (.05) =			6338.8	10261.8	2176.7	1266.9	2116.1
Standard Dev.=			4114	6660.08	1412.69	822.257	1373.41
CV =			47.22	66.06	68.15	67.28	44.65

Means followed by same letter do not significantly differ (P=.05, Duncan's MRT).
* 5 x 10^{13} conidia/A.

Table 3. Evaluation of fungal pathogens for the control of rice water weevil larvae. Effect of formulation. Rice Research Station, Crowley, LA. 1994.

Trt No	Treatment Name	Rate (lb/A)	Larvae/plant 7/11	7/18	7/27	8/3	8/9
1	UTC	0	18.5 a	14.6 a	15.0 a	7.3 a	3.9 a
2	FUR 3G	0.6	12.8 ab	5.4 b	1.8 b	0.7 b	0.7 b
3	OIL N	0	12.7 ab	17.0 a	13.6 a	8.9 a	4.6 a
4	OIL 22292AP1	5 13*	15.2 ab	13.3 a	12.7 a	7.6 a	4.1 a
5	22292AP1 5%O	5 13*	13.2 ab	15.2 a	14.5 a	7.8 a	2.7 ab
6	22292AP1 WP	5 13*	11.2 b	15.9 a	17.1 a	6.0 a	3.2 a
LSD (.05) =			5.5	6.1	4.9	3.5	2.0
Standard Dev.=			3.64199	4.07143	3.23859	2.33391	1.33515
CV =			26.15	30.04	26.05	36.74	41.89

Means followed by same letter do not significantly differ (P=.05, Duncan's MRT).
* 5 x 10^{13} conidia/A.

Table 4. Yield and plant height response. Rice Research Station, Crowley, LA. 1994.

Trt No	Treatment Name	Rate (lb/A)	Height -(cm)-	Yield (lb/A)
1	UTC	0	77.2 b	4163.9 b
2	FUR 3G	0.6	82.2 a	7429.0 a
3	OIL N	0	78.3 b	4903.6 b
4	OIL 22292AP1	5 13*	79.7 ab	5048.8 b
5	22292AP1 5%O	5 13*	79.8 ab	5966.1 ab
6	22292AP1 WP	5 13*	78.8 ab	5004.0 b
LSD (0.5)			3.5	2040.7
Standard Dev.			2.29266	1354.31
CV			2.89	24.99

Means followed by same letter do not significantly differ (P=.05, Duncan's MRT).
* 5 x 10^{13} conidia/A.

SPATIAL DISTRIBUTION AND SEQUENTIAL SAMPLING OF THE RICE WATER WEEVIL

M.A. Muegge, J.D. Barbour, G.B. Trahan, and P.A. Bollich

Location: Rice Research Station, Crowley, LA

Soil Type: Crowley silt loam

Seeding Rate: 100 lb/A

Planting Method and Date: Drill seeded on May 9 with 7-inch row spacing

Plot Size: 45.4 x 160 ft

Water Management: Permanent flood applied May 24

Fertilization: 45-45-45 lb/A N-P-K applied May 9 with Kincaid drill; 90 lb/A N applied May 23 by motorized gandy

Herbicides: Propanil (3 lb ai/A) applied May 20 with a CO_2 backpack sprayer delivering 15 GPA at 28 psi

Fungicides: None

Insecticides: None

Treatments: None

Experimental Design: Randomized block design with stratification

Comments: Judicious pest management decisions require accurate and efficient methods for sampling pest populations. The purpose of this study was to determine the spatial distribution and develop an accurate and efficient sequential sampling plan for rice water weevil (RWW) larvae in Louisiana. Larva data for each date and over all dates were not significantly different from the negative binomial distribution (χ^2 = 6.2, 26.9, 18.0, 9.6, and 11.25, respectively). Values of the aggregation parameter *k* derived from the negative binomial distribution indicate that RWW larva followed a near random distribution initially and became slightly clumped over time (Table 1). The common *k* (k_c) determined from our data indicate that RWW populations followed a near random distribution. The values obtained for the aggregation indices; "*b*" of Taylor's power law and "β" of Iwao's patchiness regression were not significantly different from one (Poisson slope). These results suggest that RWW larva populations

were randomly distributed regardless of RWW population densities or collection dates (Table 1). The sequential sampling plans, SPRT and 2-SPRT were developed from k_c; and the economic threshold of 5 larvae/core and 2 larvae/core (Figure 1). Kuno's fixed precision sequential sampling plan was developed using the parameters α and β from Iwao's patchiness regression (Figure 2). The SPRT and 2-SPRT perform similarly except the 2-SPRT terminates at a maximum sample number needed to make a control decision. Both sequential probability ratio tests (SPRT and 2-SPRT) require, on average, fewer samples to make a control decision than Kuno's fixed precision sampling plan. The SPRT and 2-SPRT require, on average at the RWW threshold density (5 larvae/core sample), 3 and 2 samples, respectively. Kuno's fixed precision sampling plan requires 6 and 14 samples to be within 30 and 20% of the RWW threshold, respectively.

Table 1. Aggregation indices for 1994 by date and over all dates (1993 & 1994) larva data. Rice Research Station, Crowley, LA, 1994.

Date		Aggregation Indices				
		b[1]	R^2	b[1]	R^2	$k(k_c)$[2]
June	9	1.184	0.24	1.066	0.74	29.77
	16	0.910	0.30	0.979	0.97	13.02
	23	1.016	0.24	1.000	0.92	11.62
	30	1.699	0.70	1.211	0.92	7.93
All dates(1993 & 94)		1.285	0.78	1.036	0.98	13.63[2]

[1] All slopes were not significantly different from the Poisson slope (b=1) ($p<0.05$).
[2] Indicates common k (k_c).

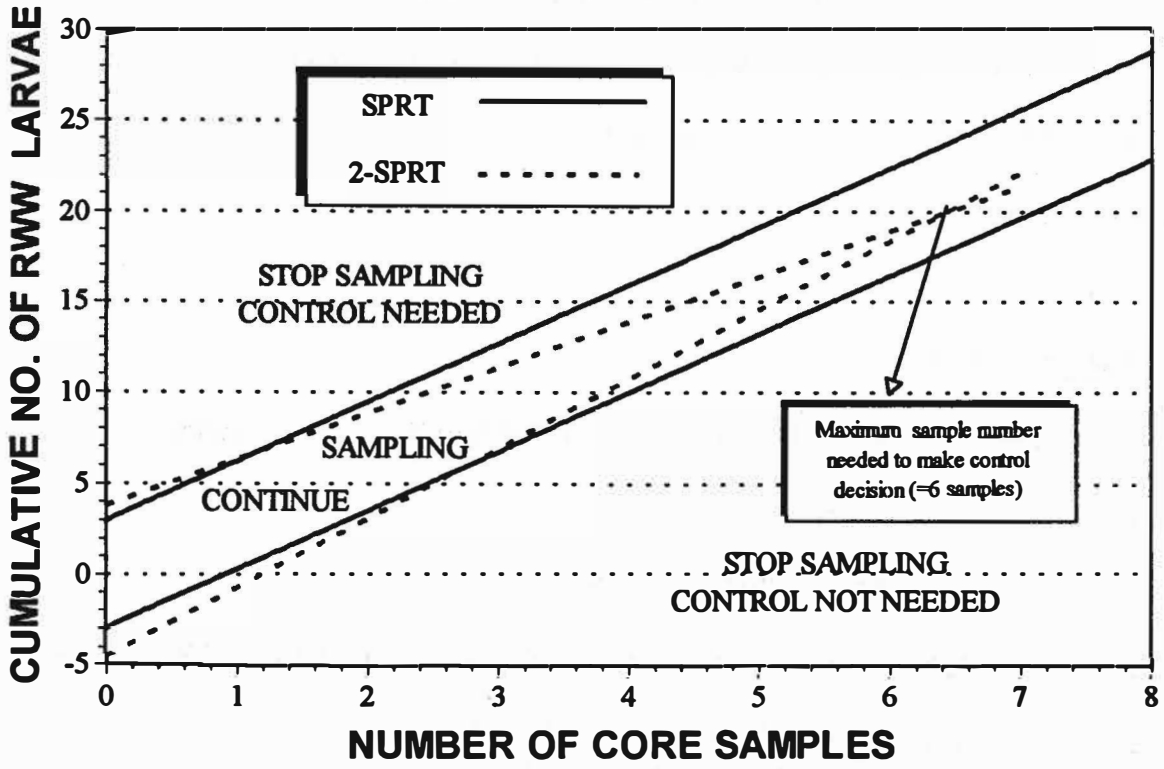


Fig. 1. SPRT & 2-SPRT for rice water weevil. Common K=13.63. Rice Research Station, Crowley, LA, 1994.

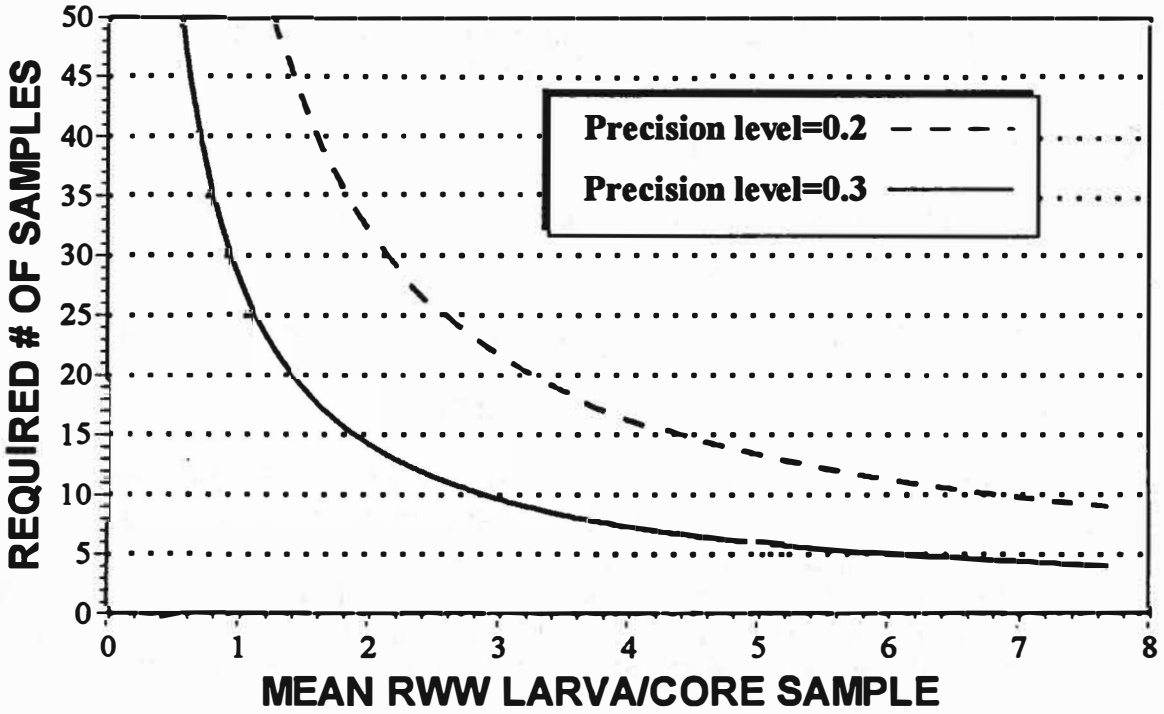


Fig. 2. Relationship between RWW larva density/core sample and the required sample size at two precision levels (Kuno's fixed precision sequential sampling plan). Rice Research Station, Crowley, LA, 1994.

CONTROL OF RICE INSECT PESTS USING ORTHENE 75S

J.D. Barbour, W.C. Rice, M.A. Muegge, G.B. Trahan, and P.A. Bollich

Location: Rice Research Station, Crowley, LA

Soil Type: Crowley silt loam

Variety: Cypress

Seeding Rate: 100 lb/A

Planting Method: Drill seeded using a Kincaid drill with 7-in. row spacing

Planting Date: May 25, 1994

Water Management: Permanent flood, June 21

Fertilizer Management: 100 lb N/A preplant incorporated (N:P:K=13:13:13), May 25

Herbicides: Propanil; 3 lb ai/A applied by air, June 17
Basagran; 1 lb ai/A applied by air, June 17

Fungicides: None applied

Insecticides: Orthene 75S, Methyl Parathion, applied using a backpack sprayer calibrated to deliver 10 gal/A @ 12 psi

Treatments:
1: Orthene 75S: 0.50 lb ai/A
2: Orthene 75S: 0.75 lb ai/A
3: Methyl Parathion: 0.50 lb ai/A or 0.75 lb ai/A
4: Untreated check

Experimental Design: Randomized complete block with three replicates (for each insect)

Harvested: Water removed, Sept 6; harvested, Sept 22

Comments: Chinch bug: In order to encourage build-up of chinch bug populations, permanent flood was not established until 4 weeks after planting. Counts for chinch bugs were performed immediately prior to treatment and 3 days post-treatment. Chinch bug counts were performed by placing a tin can with both ends cut out around a rice plant and seating into the ground. The can was filled with water and the number of chinch bugs floating to the water surface or climbing onto foliage above the water surface within

a 3-minute period was counted. Counts were conducted on five randomly selected plants per plot immediately prior to applying insecticides and 3 days post-treatment. Despite the delay in establishing permanent flood, chinch bug counts were extremely low, and no meaningful data could be obtained from this experiment.

Fall armyworm: In order to encourage build-up of fall armyworm populations, permanent flood was not established until 4 weeks after planting. Fall armyworm counts were performed immediately prior to treatment and 3 days post-treatment by searching 15 randomly selected plants per plot for the presence of fall armyworms or fall armyworm feeding damage. Despite the delay in establishing permanent flood, fall armyworm counts were very low (no fall armyworms were observed on any plot), and no meaningful data could be obtained from this experiment.

Grasshopper: Grasshopper counts were conducted by slowly walking along side of and brushing the tops of rice plants in the plots to flush grasshoppers. The number of grasshoppers flushed was counted. Counts were conducted immediately prior to and 3 and 7 days post-treatment. No statistically significant differences in grasshopper numbers were observed for pre- or post-treatment counts (Fig. 1). However, grasshopper numbers were very low in post-treatment counts for all plots.

Rice stink bug: Rice stink bugs were counted by walking along side plots and counting the number of stink bugs observed on rice plants in the nearest four rows. Counts were made immediately prior to and 3 and 7 days post-treatment. Percent of pecky grain was estimated by counting the number of discolored or damaged grains and undamaged grains in three subsamples of 100-150 grains per plot. Subsamples were taken from yield samples after obtaining yield information.

No statistically significant differences in rice stink bug numbers (Fig. 2) were observed between treatments in pre-treatment counts or in counts made 7 days post-treatment counts. However, rice stink bug numbers were significantly lower in insecticide-treated plots than in untreated plots 3 days after treatment. Numbers of stink bugs in Orthene 75S-treated plots were numerically lower than those in methyl parathion-treated and untreated plots, but this difference was not statistically significant. Although, the percentage of pecky rice was numerically lower in plots treated with Orthene 75S applied at 0.75 lb ai/A than in plots treated with Orthene 75S applied at 0.50 lb ai/A, plots treated with methyl parathion, or in untreated plots. This difference was not statistically significant (Fig. 3).

Yield: The yield was estimated by harvesting the four center rows of each plot using a Kubota combine. Harvested grain was oven dried to a constant weight, the weight corrected for plot size, and adjusted to 12% moisture. No significant differences in yield were observed among treatments or between treated and untreated plots (Fig. 4).

Figure 1. Numbers of grasshoppers per plot in insecticide treated and untreated plots. Rice Research Station, Crowley, LA, 1994.

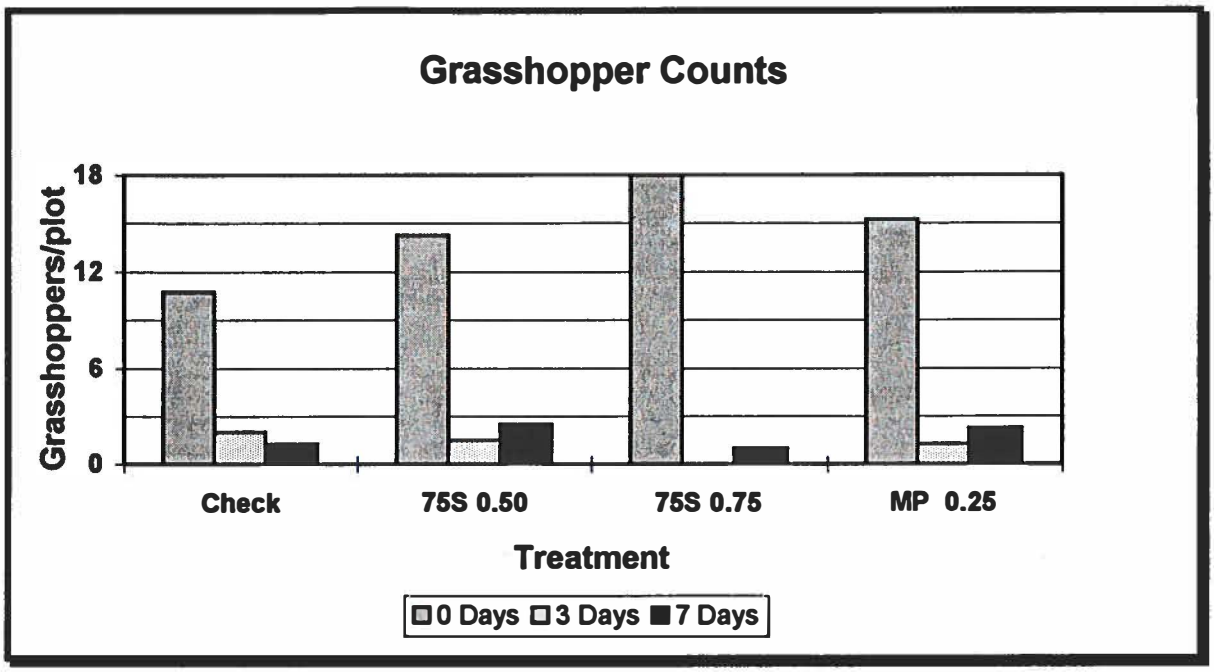


Figure 2. Numbers of rice stink bugs per plot in insecticide treated and untreated plots. Rice Research Station, Crowley, LA, 1994.

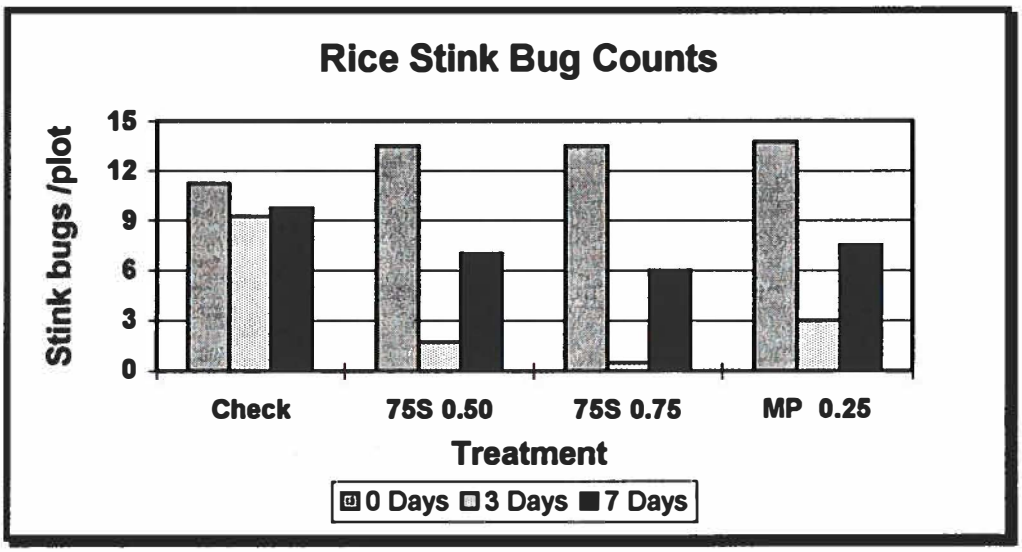


Figure 3. Mean percentage pecky rice in insecticide treated and untreated plots. Rice Research Station, Crowley, LA, 1994.

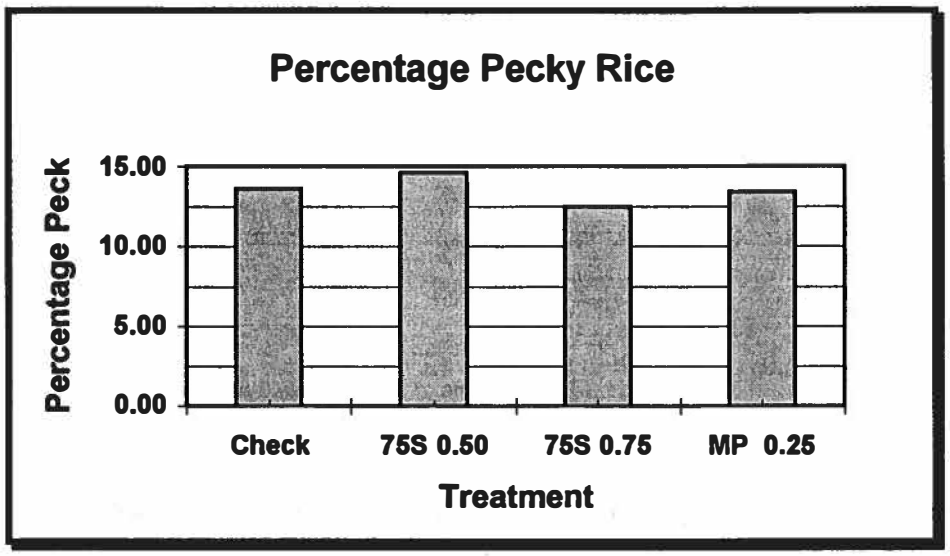
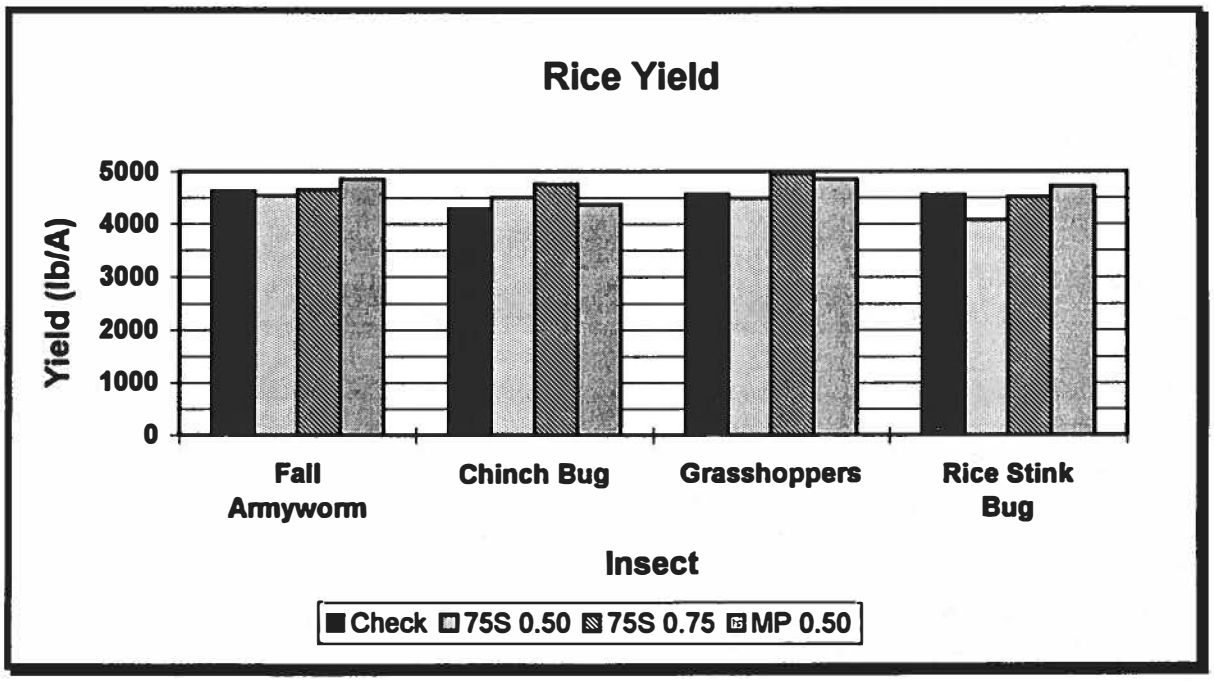


Figure 4. Mean rice yields (lb/a) estimated from insecticide treated and untreated plots. Rice Research Station, Crowley, LA, 1994.



CONTROL OF RICE WATER WEEVIL USING WATER MANAGEMENT

J.D. Barbour, M.A. Muegge, G.B. Trahan, and P.A. Bollich

Location: Rice Research Station, Crowley, LA

Soil Type: Crowley silt loam

Variety: Cypress

Seeding Rate: 140 lb/A

Plot Size: 4 x 18 ft, individually leveed

Planting Method: Water seeded into grooved plots

Planting Date: Apr 20, 1994

Water Management: Pinpoint flood, plots flushed as required until permanent flood is established

Fertilizer Management: 100 lb N/A preplant incorporated (N:P:K = 13:13:13)
50 lb N/A broadcast 4-5 weeks post flood (N:P:K = 21:13:13)

Herbicides: Gramoxone; 0.3 lb ai/A applied Apr 18 using a CO_2 backpack sprayer
Propanil; 3 lb ai/A applied May 5 using a CO_2 backpack sprayer

Fungicides: None applied

Insecticides: Carbofuran (Furadan 3G)

Treatments:

1: **Untreated check:**
Permanent flood established May 6, no drain, no insecticide
2: **Carbofuran:**
Permanent flood established May 6, no drain, Carbofuran 3G; 0.6 lb ai/A hand-broadcast post flood on May 27
3: **Threshold drain:**
Drain May 27, when RWW numbers reach five larvae/core, permanent flood established June 10, no insecticide
4: **Early Drain:**
Drain May 20, before RWW numbers reach five larvae/core, permanent flood established June 8, no insecticide
5: **Delay flood:**
Permanent flood applied June 8, no insecticides

Experimental Design: Randomized complete block with four replicates

Harvested: Water removed, Aug 6; harvested, Aug 18

Comments: Water management was evaluated for control of rice water weevil (RWW). Three core samples (3" dia. x 3" ht.) were taken from randomly selected sites in each plot beginning 2 weeks after establishment of permanent flood on control plots. Core samples were taken at 1-week intervals for 7 weeks. Core samples were washed through a funnel fitted with wire screen into a 35-mesh screen sieve. The RWW and pupae were floated in a saturated NaCl solution and counted. Yield was estimated by hand harvesting the rice in three randomly selected 1 yd^2 areas of each plot. Harvested rice was oven dried and the grain weighed and corrected to 12% moisture. Treatment effects on numbers of RWW larvae per core and yield were determined by ANOVA.

Permanent flood was established May 6 on all plots except those receiving the delay flood treatment. The first RWW core samples were taken 2 weeks later on May 20. Numbers of RWW larvae were below threshold (=5 larvae/core) for all plots, and water was removed from plots receiving the early drain treatment (Fig. 1). There were no significant differences in the numbers of RWW larvae per core between treatments. By May 26, numbers of RWW larvae had exceeded threshold on control plots, carbofuran plots, and plots receiving the late drain treatment but were well below threshold in the early drain and the delay flood plots. Carbofuran (0.6 lb ai/A) was applied to the appropriate plots and water was removed from late drain plots. Numbers of RWW/core were significantly higher in control and carbofuran plots than water management plots. Within water management plots, numbers on RWW/core were significantly higher in late drain plots than in early drain and delay flood plots. By June 3, numbers of RWW were significantly higher in control plots than in carbofuran- and water management-treated plots. Numbers of RWW larvae in late drain plots were significantly higher than those in early drain, delay flood, and carbofuran plots. The trend was similar on June 8, when delay plots were flooded and early drain plots reflooded, and on June 15, when the late drain plots were reflooded. On June 22 and 29, numbers of RWW larvae began to decrease in control plots and increase in carbofuran and water management plots. However, numbers of RWW/core were significantly lower in carbofuran-treated plots than in untreated and water management plots for both dates.

Yield was significantly higher in carbofuran-treated plots than in untreated or water management plots (Fig. 2). Yield in untreated plots was significantly higher than that in delay flood plots but not higher than that in early or late drain plots.

Figure 1. Mean number of rice water weevil per core for water management, carbofuran treated, and untreated plots. Arrows indicate timing of water management and insecticide options. Rice Research Station, Crowley, LA, 1994.

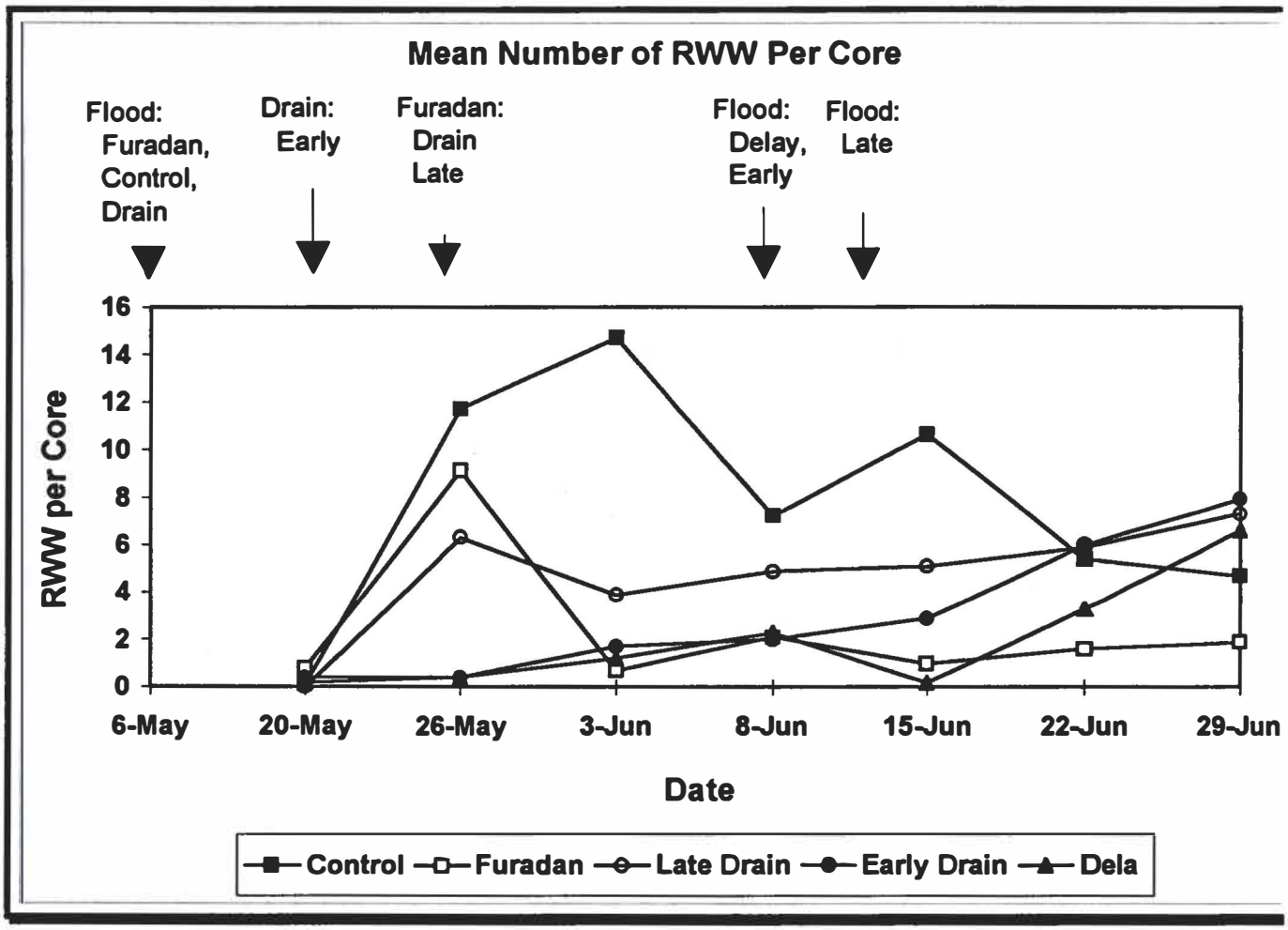
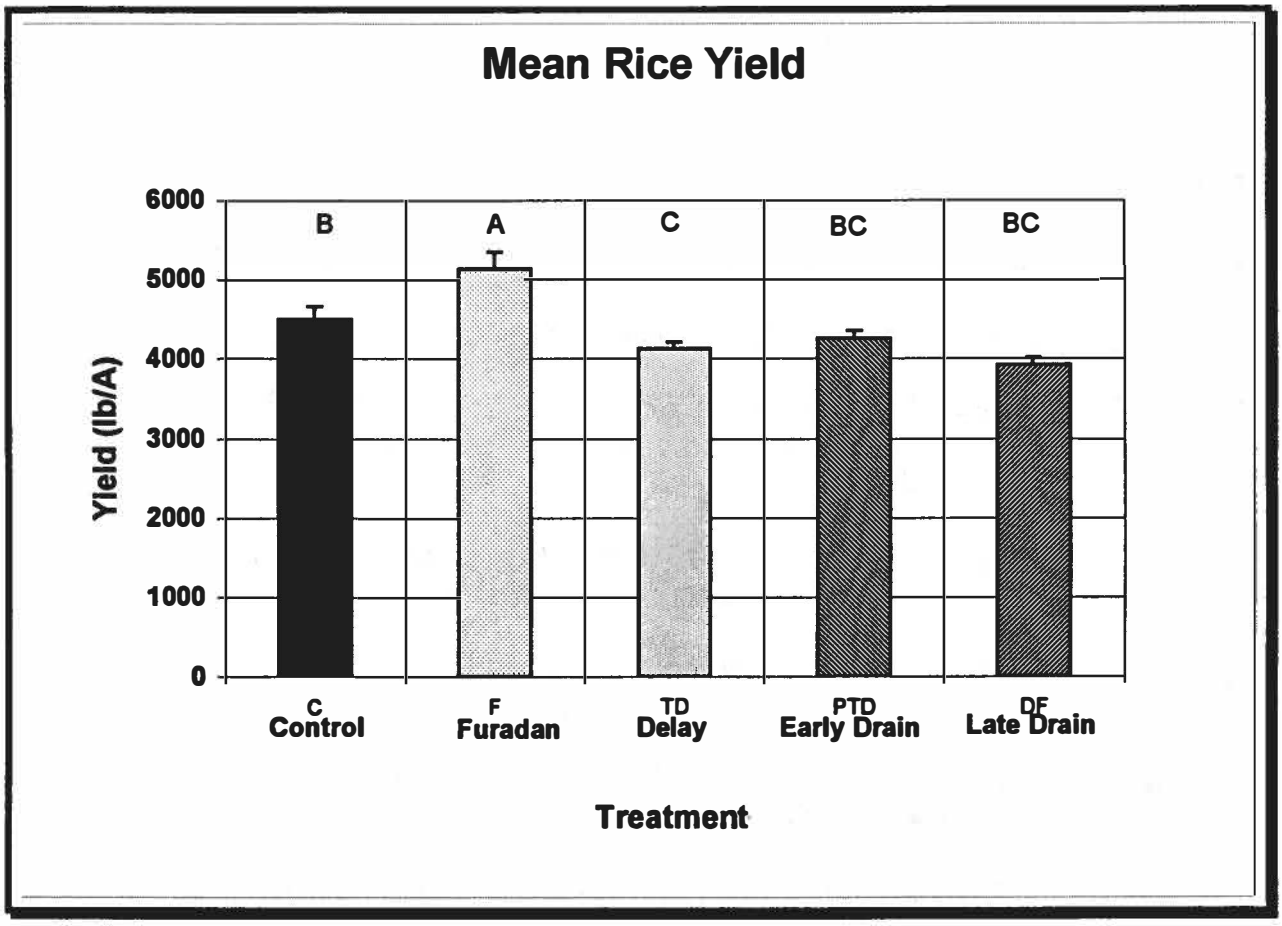


Figure 2. Mean rice yield for water management, carbofuran treated, and untreated plots. Bars with the same letters do not differ statistically Rice Research Station, Crowley, LA, 1994.



EFFECTS OF PLANTING DATE ON RICE WATER WEEVIL

J.D. Barbour, M.A. Muegge, G.B. Trahan, and P.A. Bollich

Location: Rice Research Station, Crowley, LA

Soil Type: Crowley silt loam

Variety: Cypress

Seeding Rate: 140 lb/A

Planting Method: Water seeded into grooved plots (7-in. row spacing)

Planting dates: Early planting, Apr 14; late, May 12

Water Management: Pinpoint flood: plots flushed as required until establishment of permanent flood as follows: early planting, May 6; late planting, June 8

Fertilizer Management: 100 lb 13:13:13 (N:P:K)/A preplant incorporated; 45 lb 13:13:13 (N:P:K:)/A ca 4 weeks post-flood

Herbicides: Gramoxone, 0.3 lb ai/A applied 3 days preplant
Propanil, 3.0 lb ai/A applied preflood

Insecticides: Carbofuran (Furadan 3G) @ 0.6 lb ai/A applied to insecticide plots 2 weeks after permanent flood (WAF)

Treatments: 4: 2 planting dates (early and late) x 2 insecticide plots (treated, untreated)

Experimental Design: Split-plot with three replicates (=blocks); main plot = carbofuran (2 levels); subplot = planting date (2 levels)

Harvested: Early: Water removed, July 28; harvested, Aug 11
Late: Water removed, Aug 6; harvested, Aug 18

Comments: Effects of planting date and carbofuran on numbers of rice water weevil (RWW) and yield were evaluated (Fig. 1). Numbers of RWW were similar in early- and late-planted plots 1 WAF. By 2 WAF, numbers of RWW had exceeded threshold and were significantly higher in late-planted rice than early-planted rice. Carbofuran was applied immediately after sampling 2 WAF. Three WAF, RWW numbers had exceeded threshold in early- and late-planted plots where carbofuran was not applied. However, RWW numbers were significantly higher in untreated plots planted late than in untreated plots planted early. The RWW numbers were below threshold in carbofuran-treated plots, regardless of planting date, and were significantly lower than RWW numbers in early treated not receiving carbofuran. By 4 WAF, the effects of planting date were no longer statistically significant: numbers of RWW did not differ between late- and early-planted rice in carbofuran-treated or untreated plots. Numbers of RWW in untreated plots were higher than those in carbofuran-treated plots, regardless of planting date.

There was no statistically significant affect of planting date on rice yield (Fig. 2). Rice yield was numerically higher in carbofuran-treated plots than in untreated plots for early- and late-planted rice. However, these differences were not statistically significant.

Figure 1. Mean (± SE) number of RWW larvae per core vs. number of weeks after permanent flood for planting date test. Rice Research Station, Crowley, LA, 1994.

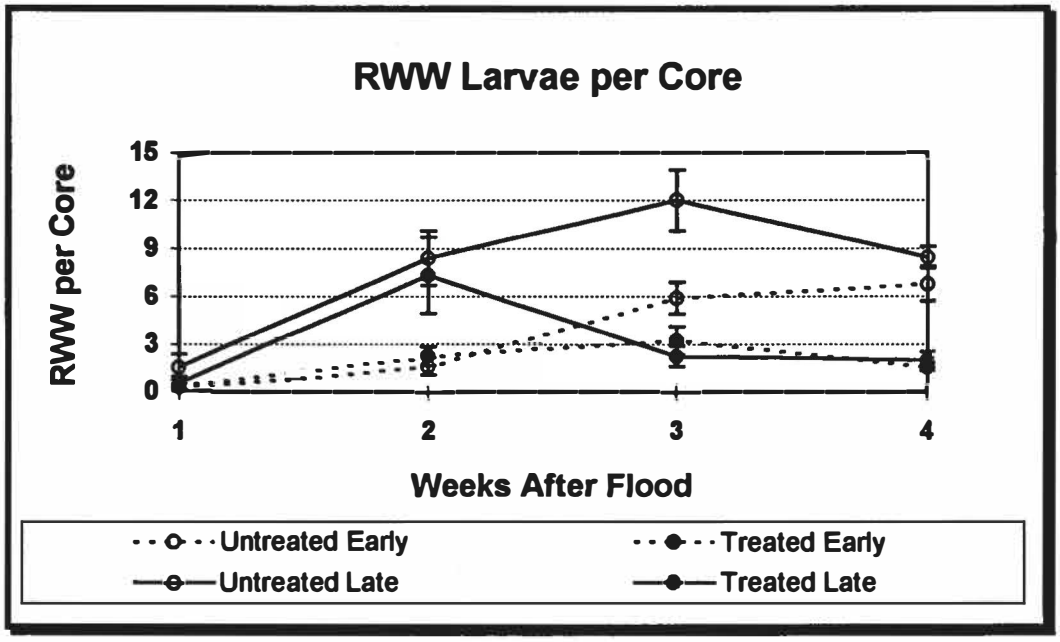
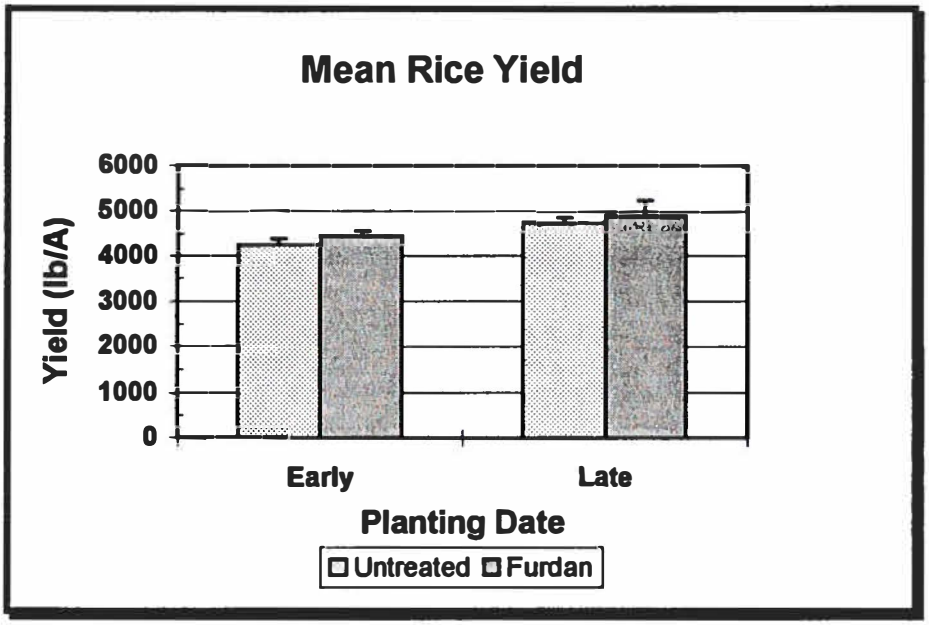


Figure 2. Mean (± SE) rice yield (lb/A) in carbofuran treated and untreated plots for planting date test. Rice Research Station, Crowley, LA, 1994.



RICE PRODUCTION ECONOMICS RESEARCH

ECONOMICS OF ENTERPRISE SELECTION AND WHOLE FARM DECISION MAKING IN THE LOUISIANA RICE GROWING AREAS AND STATEWIDE IMPACT ASSESSMENT OF ALTERNATIVE RICE PROGRAM POLICIES[1]

M.E. Salassi, H.O. Zapata, and G.G. Giesler

Enterprise budget projections for 1995 were developed for rice, soybeans, milo, corn, wheat, and wheat-soybean double-cropping systems. A summary of the enterprise budgeting analysis for rice in Louisiana is presented in Table 1. Budgeting results for the other enterprises in southwest Louisiana are shown in Table 2. Owner-operator and tenant-operator situations were budgeted for each enterprise, and other than for rice, output from all enterprises was valued solely at a projected market price. Rice income was calculated by adding the product of the projected market price of $6.50/cwt. and the actual yield to the deficiency payment, then subtracting the checkoff of $0.06/cwt. The deficiency payment was calculated by multiplying the area average proven yield times the difference between the target price and the projected market price ($4.21/cwt.).

Under these assumptions, sufficient revenue was available to cover direct expenditures for all rice enterprises. All other enterprises yielded positive returns over direct expenses with the exception of row planted and drill planted tenant-operator soybeans and tenant milo. Direct expenditures were defined to be seed, fuel, fertilizer, labor, chemicals, maintenance on equipment, and interest on operating capital. Total specified expenses include direct expenditures, the annualized cost of replacing capital assets, and interest on non-operating capital. Those enterprises that did not generate sufficient income to cover total specified expenses included all soybean enterprises except owner operator no till, all milo situations, the tenant corn enterprise, and tenant wheat and tenant wheat-soybean situations. It should be noted that total specified expenses do not include an estimation of per acre overhead costs. When these costs are included, only southwest owner-operator drill planted conventional tillage rice, drill planted "no till" rice and drill planted stale seedbed rice, Central owner-operator rice and northeast owner-operator rice (both drill and water planted) show positive returns. Detailed enterprise budgets and supporting data were published in A.E.A. Information Series Number 131, January 1995 (Department of Agricultural Economics and Agribusiness, Louisiana Agricultural Experiment Station, L.S.U. Agricultural Center).

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[1] This research is supported in part by funds provided by producers through the Louisiana Rice Research Board.

Table 1. A Summary of Projected Costs and Returns per Acre for Rice Production in Louisiana, 1995.

Crop Description	Yield Per Acre	Unit	Total Income	Direct Expenses	Returns Over Direct Expenses	Fixed Expenses	Total Expenses	Returns Over Total Expenses
			---------- Dollars per Acre ----------					
Rice Enterprises: a/								
Southwest Louisiana								
Water Plant, Owner b/	48.00	cwt.	488.72	353.92	134.80	79.22	433.14	55.58
Water Plant, Tenant c/	28.80	cwt.	293.23	235.31	57.92	47.14	282.45	10.78
Water Plant, "No Till", Owner b/	48.00	cwt.	488.72	353.87	134.85	80.92	434.79	53.93
Water Plant, Stale Seedbed, Owner b/	48.00	cwt.	488.72	355.51	133.21	82.51	438.02	50.70
Drill Plant, Owner b/	51.00	cwt.	508.04	335.58	172.46	82.45	418.03	90.01
Drill Plant, Tenant c/	30.60	cwt.	304.82	219.89	84.93	50.37	270.26	34.56
Drill Plant, "No Till", Owner b/	51.00	cwt.	508.04	342.12	165.92	85.58	427.70	80.34
Drill Plant, Stale Seedbed, Owner b/	51.00	cwt.	508.04	346.98	161.06	86.74	433.72	74.32
Second Cutting, Owner b/	16.00	cwt.	103.04	70.13	32.91	17.59	87.72	15.32
Second Cutting, Tenant c/	9.60	cwt.	61.82	43.41	18.41	17.59	61.00	.82
Northeast Louisiana								
Water Plant, Owner b/	54.50	cwt.	512.18	287.37	224.81	63.25	350.62	161.56
Water Plant, Tenant c/	32.70	cwt.	307.31	238.43	68.88	47.40	285.83	21.48
Drill Plant, Owner b/	54.50	cwt.	512.18	280.60	231.58	67.58	348.18	164.00
Drill Plant, Tenant c/	32.70	cwt.	307.31	229.79	77.52	51.73	281.52	25.79
Central Louisiana								
Water Plant, Owner b/	50.00	cwt.	483.66	309.40	174.26	60.69	370.09	113.57

* Returns over total expenses do not include estimated overhead costs.

a/ Income for rice was calculated by adding the product of the assumed market price of $6.50/cwt. and the actual yield to the deficiency payment. The deficiency payment was calculated by multiplying the proven yield times the difference between the market price and target price, $4.21/cwt.

b/ Land costs are not included for owner-operators.

c/ Rental arrangements for rice in southwest Louisiana were 1/5 crop share for land and 1/5 crop share for water with both landlord and waterlord paying 1/5 of fertilizer, chemicals, and drying and storage costs and the waterlord paying all of the irrigation fuel. Rental arrangements for rice in Northeast Louisiana were 1/5 crop share for land and 1/5 crop share for water with the waterlord paying all irrigation fuel costs and both the landlord and waterlord paying 1/5 of the drying and storage costs.

Table 2. A Summary of Projected Costs and Returns per Acre for Soybean, Corn, Milo, Wheat, and Wheat-Soybean Double Crop Production, Southwest Louisiana, 1995 a/

Crop Description	Yield Per Acre	Unit	Total Income	Direct Expenses	Returns Over Direct Expenses	Fixed Expenses	Total Expenses	Returns Over Total Expenses
			---------- Dollars per Acre ----------					
Soybean Enterprises:								
6-Row, Owner b/	24.50	bu.	140.88	119.73	21.15	33.28	153.01	-12.13
6-Row, Tenant c/	19.60	bu.	112.70	118.24	-5.54	33.28	151.52	-38.82
Drill Plant, Owner b/	27.00	bu.	155.25	127.48	27.77	32.06	159.54	-4.29
Drill Plant, Tenant c/	21.60	bu.	124.20	125.85	-1.65	32.06	157.91	-33.71
Drill Plant, No Till, Owner b/	27.00	bu.	155.25	115.23	40.02	26.01	141.24	14.01
Corn Enterprises:								
6-Row, Owner b/	100.00	bu.	240.00	177.34	62.66	39.71	217.05	22.95
6-Row, Tenant c/	80.00	bu.	192.00	173.51	18.49	39.71	213.22	-21.22
Milo Enterprises:								
Drill Plant, Owner b/	37.00	cwt.	125.80	118.11	7.69	29.17	147.28	-21.48
Drill Plant, Tenant c/	29.60	cwt.	100.64	118.11	-17.47	29.17	147.28	-46.64
Wheat Enterprises:								
Drill Plant, Owner b/	34.00	bu.	119.00	90.32	28.68	27.08	117.40	1.60
Drill Plant, Tenant c/	27.20	bu.	95.20	90.32	4.88	27.08	117.40	-22.20
Wheat-Soybean Double Crop								
Wheat-Soybean, Owner b/	34+25	bu.	262.75	185.25	77.50	49.67	234.92	27.83
Wheat-Soybean, Tenant c/	27.2+20	bu.	210.20	185.25	24.95	49.67	234.92	-24.72

* Returns over total expenses do not include estimated overhead costs.

a/ Crop prices used were $5.75/bu. for soybeans, $2.40/bu. for corn, $3.40/cwt. for milo and $3.50/bu. for wheat.

b/ Land costs are not included for owner operators.

c/ Rental arrangements for soybeans, corn, milo, and wheat were 1/5 crop share for land with the landlord paying 1/5 of any drying and storage costs.

Estimates of direct and total costs of irrigating rice were developed for several alternative rice irrigation systems in Louisiana. For southwest Louisiana, cost estimates were developed for diesel, electric, and natural gas power systems. Deep well and surface water sources for each of the above power systems were evaluated. Per acre inch direct irrigation costs for water planted rice with a deep well water source were estimated to be approximately $1.65, $2.91, and $1.54 for diesel, electric, and natural gas systems, respectively. Total per acre inch irrigation costs for deep well systems were estimated to be approximately $2.56, $3.66, and $2.45 for diesel, electric, and natural gas power units, respectively. Per acre inch direct irrigation costs for water planted rice with a surface irrigation water source were estimated to be approximately $0.73, $1.11, and $0.67 for diesel, electric, and natural gas systems, respectively. Total per acre inch irrigation costs for surface systems were estimated to be approximately $1.23, $1.51, and $1.16 for diesel, electric, and natural gas power units, respectively.

For northeast Louisiana, cost estimates were developed for diesel and electric power systems using both deep well and surface water sources. Per acre inch direct irrigation costs for drill planted rice with a deep well water source were estimated to be approximately $0.54 and $0.91 for diesel and electric systems, respectively. Total per acre inch irrigation costs for deep well systems were estimated to be approximately $0.93 and $1.21 for diesel and electric power units, respectively. Per acre inch direct irrigation costs for drill planted rice with a surface water source were estimated to be approximately $0.46 and $0.55 for diesel and electric systems, respectively. Total per acre inch irrigation costs for surface systems were estimated to be approximately $0.75 for both diesel and electric power units, respectively. For central Louisiana, cost estimates were developed for water planted rice with a deep well water source and a diesel power unit. Per acre inch direct and total irrigation costs for this system were $0.90 and $1.51, respectively. Detailed results of the irrigation cost analysis are reported in A.E.A. Information Series Number 131, January 1995 (Department of Agricultural Economics and Agribusiness, Louisiana Agricultural Experiment Station, L.S.U. Agricultural Center).

Work was initiated within the Department of Agricultural Economics and Agribusiness in 1994 to develop farm simulation models that would provide the capability of analyzing the impacts of alternative rice program policies on resource allocation and financial viability of representative Louisiana rice farming situations. The Resource Allocation and Agricultural Policy Simulator (RAAPSIM) project is a coordinated, multistate, multiyear research project that has as its goal the development of a user friendly, menu driven, fully integrated PC based modelling system that would allow analysts in individual rice states to conduct relatively straightforward analyses on a wide range of regional and statewide questions concerning the impact of various policy initiatives as the need arises. The policy initiatives RAAPSIM will be capable of analyzing in the near future include national, as well as local/regional, policies that are of concern to U.S. rice producers.

Progress made in 1994 on the RAAPSIM project included the development of a 5-year rice farm financial policy simulator that is capable of analyzing the impacts of changes in farm program policy provisions on the financial structure of representative rice farms. The input coefficients and model formulation of a one-period resource allocation model has been developed for a southwest Louisiana rice farm in GAMS (General Algebraic Modeling System) and is currently being tested.

The economic portion of an interdisciplinary analysis of the use of fungicides for controlling sheath blight was expanded in early 1994. Four different fungicides and/or application regimes were evaluated. Complete enterprise budgets for both first and ratoon crops for each treatment were constructed. First crop returns to each treatment were based on increases in quantity and quality of rice, while constant quality was assumed for the ratoon crop. The treatments in order of highest to lowest net returns (first and second crop) were 1) Benlate applied at boot and heading, 2) Tilt applied at boot, 3) Tilt applied at panicle differentiation and boot, 4) Check, and 5) Rovral applied at boot and heading. Results were published in *Louisiana Agriculture, Volume 37, No. 2,* Spring, 1994 and in the Proceedings of the 25th Rice Technical Working Group, 1994.

Total first crop returns for each treatment were estimated by using the average milling yield of the check plot for the 1987-92 period as the base level (and valuing it at the loan rate of $6.50/cwt.). Prices for first crop rice produced on the fungicide plots were then estimated based on the percentage increase in milling yield (head rice and brokens) over the base level and the factors of 2.98 and 1.33% for head rice and brokens, respectively. An increase in head rice of one percent resulted in a price increase of $0.1937/cwt. (2.98% x $6.50). However, there was often a partially countervailing price effect due to decreased brokens when an increase in head rice was present. Total returns to all treatments are composed of the market price (loan rate plus quality adjustment for first crop, loan rate only for second crop) times yield, plus the deficiency payment and minus the checkoff. First crop physical yields, milling yields, estimated market prices, and returns over total specified costs for each treatment are presented in Table 3. Figure 1 shows estimated returns for first crop, second crop, and combined total average returns over the life of the experiment (accounting for the second crop being grown in only 2 years).

In summary, Tilt @ B resulted in slightly higher physical yields than Benlate. Treatment with Rovral resulted in moderately lower physical yields than either Benlate or Tilt @ B, and yields nearly identical to Tilt @ PD and B. When quality premiums for increases in milling yield are included, treatment with Benlate impacted net returns more positively than any other fungicide currently labeled for use on rice. These results are contingent on other sound cultural management practices being followed and disease pressure being adequate to warrant fungicide application.

Table 3. Yields, Milling Yields[a/], Estimated Market Prices and Returns Over Total Specified Costs for First Crop Rice Production.

Treatment	Yield (dry cwt per acre)	Milling Yield (%) Head	Brokens	Estimated Market Price ($/cwt)	Returns Over Total Specified Costs
Check	59.13	59.2	10.9	6.50	96.06
Benlate	66.11	62.4	8.5	6.91	117.12
Rovral	64.75	61.3	9.1	6.75	90.37
Tilt @ PD and B	64.74	60.6	9.9	6.69	95.50
Tilt @ B	66.21	60.9	9.5	6.70	112.26

[a/] Milling yields based on research plot data from Rice Research Station, Crowley, LA.

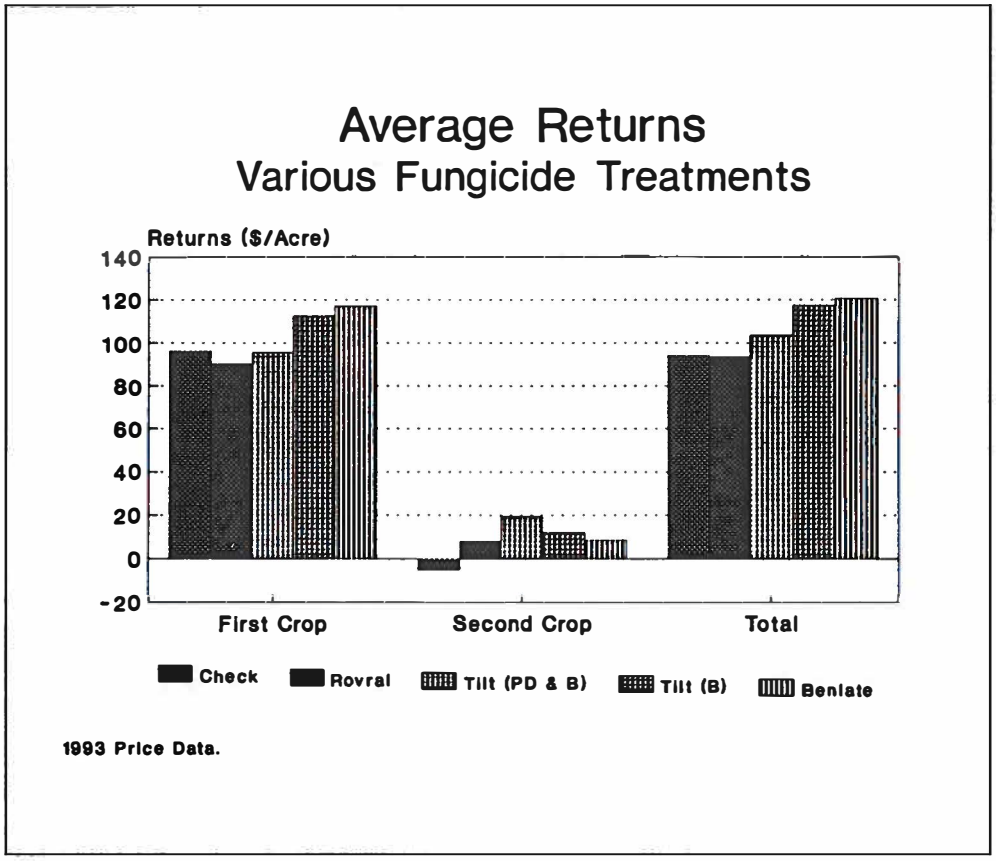


Figure 1. Returns to First Crop, Second Crop and Total Average Yearly Returns to Various Fungicide Treatments (total accounts for second crop in only 2 of 5 years).

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THE RICE RESEARCH STATION IS ESPECIALLY INDEBTED TO MR. H.F. MORRIS, JR., HERMAN E. WILSON FEED AND FERTILIZER LABORATORY, FOR THE CHEMICAL ANALYSES OF RESEARCH SAMPLES. DR. L. LAMOTTE, DEPARTMENT OF EXPERIMENT STATISTICS, AND HIS STAFF AIDED IN THE RESEARCH PROGRAM THROUGH THEIR HELP IN THE PLANNING AND STATISTICAL ANALYSES OF RESEARCH DATA.

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[9] DECEASED 06/05/95.