80th Annual Research Report
RICE RESEARCH STATION

Crowley, Louisiana
1988

LOUISIANA
AGRICULTURAL EXPERIMENT STATION
Kenneth W. Tipton, Vice Chancellor & Director

LOUISIANA STATE UNIVERSITY
AGRICULTURAL CENTER
H. Rouse Caffey, Chancellor

U.S. DEPARTMENT OF AGRICULTURE
AGRICULTURE RESEARCH SERVICE
COOPERATING

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I N T R O D U C T I O N

Research work at the Rice Research Station, Crowley, Louisiana, is conducted cooperatively by the Louisiana Agricultural Experiment Station and the United States Department of Agriculture, Agricultural Research Service. The 1988 rice research program included breeding, variety testing, production and distribution of foundation seed, fertilization, soil and water management, cultural practices, weed control, insect studies, 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 research program of the Rice Station also includes experiments in the nutrition and management of beef cattle and aquacultural experiments. 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 Baton Rouge conducted research at this station.

The research activities of this station include both fundamental and applied research, although the latter predominates due to the objectives of branch station work. Research accomplishments and general progress of the Rice Station during 1988 are presented in this report representing the 80th Annual Research Report of the Rice Research Station, Louisiana Agricultural Experiment Station, L.S.U. Agricultural Center.

In addition to research responsibilities of the Rice Research Station staff and cooperators, a large number of farmers, extension personnel, and others were trained and otherwise contacted during 1988. Approximately 700 persons attended the annual Rice Research Station field day to view plots and participate in discussions of research findings. Field days were also conducted in East Carroll, Morehouse, and Vermilion parishes. In addition, the staff participated in industry meetings, both on and off the station, and worked individually with farmers and others in solving immediate problems. Several thousand people received services from the Rice Research Station during 1988.

Projects at this station are conducted under the supervision of research workers from the Rice Research Station and also by cooperating personnel from certain departments of the Louisiana Agricultural Experiment Station. Following the reports, station personnel and cooperators in 1988 are listed.

MONTHLY RAINFALL DATA
RICE RESEARCH STATION -- CROWLEY, LA
1988

Date	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year Total
1	.38	.40			.20				.02	2.20			-
2	.41	.85		2.70					.13	.40			-
3			1.50				.02		.07				-
4		.72	.05			1.7	.04		3.90		.10		-
5		.20				1.2	.10						-
6		.75		.10			.07	.10					-
7	.90	.04					.03	.20					-
8		.01	.46				.65						-
9		.02	1.63				.14				.02		-
10			.02				.70	.50		1.1			-
11		.38		.02			.03	1.11	.10		.12	1.60	-
12		.02			.19			.23					-
13	.56				.05			.10	.40		.50		-
14													-
15		.80											-
16									.15			.23	-
17		.14					.20	.19		.10			-
18		1.49	1.62	.20		.70	2.80	.02					-
19	.17	1.70		.08			.50	.14					-
20	.02						.05					.02	-
21					1.0		.65						-
22					.5		.01			.10		.30	-
23						.25		1.01				1.20	-
24	1.20	.10	.19			.09				.10		.50	-
25	1.95		.48			.60		.68					-
26						.10							-
27										1.04	1.2		-
28							.12					.80	-
29							.22			.50			-
30			1.25	2.0								.20	-
31			.70		.04							.70	-
Mo. Total	5.59	7.62	7.90	5.10	1.98	4.64	6.33	4.28	4.77	5.54	1.94	5.55	61.24
1987	7.21	6.43	4.54	0.20	4.69	10.51	6.27	8.24	3.97	1.31	5.35	4.28	63.00

DEVELOPING IMPROVED RICE VARIETIES FOR LOUISIANA[1/]

S.D. Linscombe, F. Jodari, A.P. Fabacher, R.J. Guidry, R. Pollingue, and C.G. Gravot

The rice variety development program at the Rice Research Station (RRS) is carried out primarily under LAES Project 2288. The objectives of this project are as follows:

1. To develop improved rice varieties for Louisiana having increased yielding ability, resistance to lodging, fertilizer responsiveness, disease and insect resistance, improved seedling vigor, herbicide tolerance, and improved grain, milling, and culinary qualities.

2. To develop and/or improve methods of rice breeding, selection, and evaluation.

3. To conduct basic rice genetic studies of interest to rice varietal improvement.

This report describes the research conducted by the Louisiana rice breeding project including the results of experiments and varietal tests conducted in 1988.

SUMMARY

The 1988 rice breeding nursery covered approximately 20 acres including 21,000 breeding rows, 185 F_1 transplant populations, 8 acres of F_2 populations, 380 4 x 6 water-seeded advanced selection plots and approximately 1700 yield plots. X_2 populations of nine different lines were grown. A strong emphasis is placed on developing lodging resistant semidwarf lines with high yield potential and superior quality and cooking characteristics. Yield testing continues to include both water- and drill-seeded tests, and laboratory seedling vigor testing is conducted on all advanced progeny rows. Pest evaluation of promising selections is being conducted by cooperating research projects. Particular emphasis is being placed on trying to incorporate higher levels of disease resistance, especially to sheath blight and blast. Selections from 16 F_2 populations were subjected to anther culture by the rice tissue culture project. This may shorten the time interval for development of homozygous lines from superior crosses. On-farm tests of advanced experimentals were conducted in East Carroll, Morehouse, Rapides, and Vermilion parishes. These tests provide needed information on the performance of experimental selections in different environments. One advanced experimental was tested in N rate and timing studies by the Rice Fertilization and Cultural Management project. Experimental 8502201 is an early maturing long grain that

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

has compared favorably to Lemont and Gulfmont. Breeder seed of 8502201 was grown in 1988 and foundation seed will be produced in 1989. A decision on release of this experimental will be made prior to the 1990 season.

COOPERATIVE UNIFORM REGIONAL RICE NURSERY

Description. Public rice breeders in the U.S. conduct cooperative yield nurseries in which commercial varieties and experimental lines are grown and evaluated at experiment stations in Arkansas, Louisiana, Mississippi, and Texas. This test is coordinated through the USDA in cooperation with the state agricultural experiment stations. The nurseries are grown to test adaptation of the entries in the diverse rice growing environments in the southern U.S. The entries in the 1988 nursery included material from Arkansas, California, Louisiana, Mississippi, Texas, and some cultivars from foreign countries. Information on performance characteristics is compiled and stored in the rice data bank by the Department of Experimental Statistics, Louisiana Agricultural Experiment Station, LSU Agricultural Center.

Experimental Design. The nursery contains seven test groups organized by maturity. All groups are grown in a randomized complete block design with four replications in groups I to IV and two replications in groups V to VII. Entry numbers from each state were assigned in sequence (e.g., 1, 21, 41, 61, 81, 121, and 161 were from Arkansas; 2, 22, 42, 62, 82, 122, and 162 were from Louisiana; and 3, 23, 43, 63, 83, 123, and 163 were from Texas).

Agronomic Practices. Fertilizer was incorporated preplant at a rate of 130-68-68 lb/A total N-P_2O_5-K_2O. Experimental plots were 53 inches wide and 18 feet long. Fungicide treated, presoaked, germinating seed was hand broadcast into the water and all plots were seeded at 150 lb/A. The plots were drained to allow seedlings to anchor and a shallow permanent flood applied until harvest. Seeding dates were as follows: groups I, II, V, and VI, April 18 and groups III, IV, and VII, April 19. Visual subjective seedling vigor ratings were made as the rice emerged through the water and other agronomic data were collected during the growing season. Propanil, Londax, and Furadan were applied at recommended rates for weed and rice water weevil control, respectively. At maturity, the plots were trimmed to 14 feet and the entire plot harvested with a small plot combine. A milling sample was taken from the borders of the plots of two replications for each entry. Samples were dried to approximately 12% moisture on a small sample dryer and yields, moisture, and milling determined. All yield results are reported at 12% moisture.

Comments. Tables 1 through 7 show the mean values for the agronomic characters measured. Daily high and low temperatures were mostly above average for the first 4 weeks after seeding, thus seedling vigor differences were not large. Most entries had good stands. Blast was minor in the nursery and sheath blight was moderate. Lodging was not severe except in the named varieties CM-101, S-101, Pecos, Nato, and Della, and in the experimental entries 90 and 105. Entries 45 and 51 are the advanced experimental lines 8502201 and 8702207, respectively. Louisiana experimental entries yielded relatively well in several groups (e.g., entries 2, 5, 11, 22, 25, 31, 42, 45, 48, 51, 62, 65, 68, 143, 146, 131, 134, and 168).

TABLE 1. AGRONOMIC PERFORMANCE OF 1988 UNIFORM RICE NURSERY, GROUP I. RICE RESEARCH STATION, CROWLEY, LA.

1988 ENTRY	GRAIN TYPE*	SEEDLING VIGOR**	DAYS TO 50% HEADING	PLANT HGT(IN)	LODGING (%)	YIELD (LB/A @12%)	DUNCAN'S TEST ***	MILLING % (WHL-TOT)
14	L	2	70	40	8	8694	A	50-65
3	L	4	71	38	0	8138	B	60-68
9	L	4	72	36	0	8102	B	63-68
6	L	6	74	31	0	8099	B	58-68
2	L	5	77	35	0	8098	B	59-68
4	L	4	72	37	3	7926	BC	61-69
5	L	5	74	36	0	7746	BC	58-68
11	L	4	76	34	5	7741	BC	59-68
8	L	6	76	37	0	7601	CD	64-71
12	L	3	73	37	0	7551	CDE	62-69
10	L	6	75	41	15	7265	DEF	51-69
TEBONNET	L	6	74	50	8	7196	EF	55-66
SKYBONNET	L	4	75	46	5	6903	FG	61-68
7	L	3	74	39	0	6741	G	64-70
LABELLE	L	4	72	47	8	6739	G	62-69
1	L	5	77	40	18	6566	G	58-69
C.V.		17.6	1.2	3.5		3.4		3.5-1.9

* L = LONG GRAIN, M = MEDIUM GRAIN, S = SHORT, I = INTERMEDIATE.
** SUBJECTIVE RATING 1 TO 9, WHERE 1 = EXCELLENT, 9 = POOR.
*** NUMBERS FOLLOWED BY THE SAME LETTER ARE NOT SIGNIFICANTLY DIFFERENT AT THE 0.05 LEVEL.

TABLE 2. AGRONOMIC PERFORMANCE OF 1988 UNIFORM RICE NURSERY, GROUP II. RICE RESEARCH STATION, CROWLEY, LA.

1988 ENTRY	GRAIN TYPE*	SEEDLING VIGOR**	DAYS TO 50% HEADING	PLANT HGT(IN)	LODGING (%)	YIELD (LB/A @12%)	DUNCAN'S TEST ***	MILLING % (WHL-TOT)
22	L	4	78	36	3	7619	A	60-70
30	L	4	82	38	3	7616	A	54-68
MARS	M	2	83	43	23	7550	A	66-68
32	L	4	73	33	0	7406	AB	59-69
31	L	5	77	33	0	7224	ABC	58-69
25	L	5	78	33	0	7190	ABC	61-69
26	L	4	74	33	3	7024	BCD	60-70
28	L	4	82	35	0	6985	BCD	65-71
21	L	5	79	39	0	6976	BCD	62-69
27	L	4	81	39	0	6835	CDE	49-68
MERCURY	M	3	81	34	0	6785	CDE	65-70
24	L	5	81	41	0	6711	DE	59-69
23	L	5	74	35	3	6674	DEF	62-69
LEBONNET	L	3	80	43	28	6673	DEF	64-70
29	L	5	79	33	3	6485	EF	62-72
REXMONT	L	5	76	34	5	6248	F	57-68
C.V.		18.0	1.1	2.2		4.0		3.1-0.8

* L = LONG GRAIN, M = MEDIUM GRAIN, S = SHORT, I = INTERMEDIATE.
** SUBJECTIVE RATING 1 TO 9, WHERE 1 = EXCELLENT, 9 = POOR.
*** NUMBERS FOLLOWED BY THE SAME LETTER ARE NOT SIGNIFICANTLY DIFFERENT AT THE 0.05 LEVEL.

TABLE 3. AGRONOMIC PERFORMANCE OF 1988 UNIFORM RICE NURSERY, GROUP III. RICE RESEARCH STATION, CROWLEY, LA.

1988 ENTRY	GRAIN TYPE*	SEEDLING VIGOR**	DAYS TO 50% HEADING	PLANT HGT(IN)	LODGING (%)	YIELD (LB/A @12%)	DUNCAN'S TEST ***	MILLING % (WHL-TOT)
NEWBONNET	L	5	83	41	3	7911	A	62-69
51	L	3	81	35	5	7900	A	63-70
46	L	4	77	43	5	7592	AB	53-67
42	L	5	80	36	3	7522	ABC	63-69
43	L	5	77	37	0	7401	ABCD	61-70
GULFMONT	L	5	78	36	3	7226	BCD	63-71
50	L	3	81	43	5	7222	BCD	62-70
48	L	4	81	35	5	7198	BCD	65-71
47	L	5	78	35	3	7181	BCD	52-69
45	L	6	79	33	3	7153	BCD	60-70
LEMONT	L	4	79	34	5	7058	BCD	64-71
41	L	6	78	35	8	6934	CD	60-71
49	L	5	80	34	3	6900	CD	63-70
TORO-2	L	4	80	38	0	6873	D	63-71
44	L	4	81	41	0	6851	D	61-68
52	L	5	76	32	3	6843	D	65-71
C.V.		15.9	1.1	3.8		5.3		2.2-0.8

* L = LONG GRAIN, M = MEDIUM GRAIN, S = SHORT, I = INTERMEDIATE.
** SUBJECTIVE RATING 1 TO 9, WHERE 1 = EXCELLENT, 9 = POOR.
*** NUMBERS FOLLOWED BY THE SAME LETTER ARE NOT SIGNIFICANTLY DIFFERENT AT THE 0.05 LEVEL.

TABLE 4. AGRONOMIC PERFORMANCE OF 1988 UNIFORM RICE NURSERY, GROUP IV. RICE RESEARCH STATION, CROWLEY, LA.

1988 ENTRY	GRAIN TYPE*	SEEDLING VIGOR**	DAYS TO 50% HEADING	PLANT HGT(IN)	LODGING (%)	YIELD (LB/A @12%)	DUNCAN'S TEST ***	MILLING % (WHL-TOT)
RICO 1	M	5	82	39	0	8156	A	65-70
64	L	3	79	39	3	7591	B	49-69
70	L	3	85	40	3	7499	BC	56-67
62	L	5	78	33	0	7438	BCD	58-70
65	L	3	78	34	3	7157	CDE	60-70
74	L	4	81	34	3	7045	DEF	59-69
68	L	5	78	36	5	7032	DEF	63-72
72	L	5	79	34	0	6874	EFG	61-70
63	L	4	77	38	8	6768	EFGH	60-70
71	L	5	88	38	0	6685	FGHI	66-71
69	L	4	76	32	3	6588	GHI	51-70
STARBONNET	L	3	92	45	0	6396	HIJ	58-67
67	L	3	79	44	3	6395	HIJ	58-68
61	L	6	82	38	0	6346	HIJ	54-69
66	L	3	75	36	0	6237	IJ	57-71
73	L	2	75	34	0	6204	J	53-70
C.V.		13.9	1.4	2.6		4.1		3.3-0.9

* L = LONG GRAIN, M = MEDIUM GRAIN, S = SHORT, I = INTERMEDIATE.
** SUBJECTIVE RATING 1 TO 9, WHERE 1 = EXCELLENT, 9 = POOR.
*** NUMBERS FOLLOWED BY THE SAME LETTER ARE NOT SIGNIFICANTLY DIFFERENT AT THE 0.05 LEVEL.

TABLE 5. AGRONOMIC PERFORMANCE OF 1988 UNIFORM RICE NURSERY, GROUP V. RICE RESEARCH STATION, CROWLEY, LA.

1988 ENTRY	GRAIN TYPE*	SEEDLING VIGOR**	DAYS TO 50% HEADING	PLANT HGT(IN)	LODGING (%)	YIELD (LB/A @12%)	DUNCAN'S TEST ***	MILLING % (WHL-TOT)
108	L	4	74	41	0	8705	A	51-68
84	L	3	75	43	10	8585	AB	57-68
83	L	5	74	37	5	8240	ABC	57-68
113	L	6	75	38	0	8099	ABC	56-67
89	L	5	75	37	0	8062	ABCD	60-68
111	L	5	75	40	0	7815	ABCDE	65-70
81	L	3	75	41	0	7790	ABCDEF	64-70
109	L	5	75	34	0	7767	ABCDEF	58-69
85	L	4	75	34	0	7724	ABCDEF	57-69
91	L	4	74	37	0	7723	ABCDEF	56-68
82	L	5	73	36	0	7676	ABCDEFG	55-68
87	L	6	77	42	5	7627	ABCDEFG	53-67
106	L	5	76	38	0	7623	ABCDEFG	58-69
104	L	5	77	43	0	7545	BCDEFGH	55-68
94	L	5	79	34	10	7489	BCDEFGH	63-72
L-202	L	2	74	37	25	7463	CDEFGH	50-66
86	L	5	75	35	0	7387	CDEFGH	55-68
CM 101	M	2	70	35	75	7363	CDEFGH	68-70
97	L	4	75	41	0	7352	CDEFGH	50-68
102	L	4	73	36	0	7212	CDEFGHI	65-70
96	L	3	70	40	20	7198	CDEFGHI	62-70
103	L	6	75	35	5	7172	CDEFGHI	52-67
88	L	5	77	34	0	7155	CDEFGHI	65-71
112	L	4	81	34	0	6938	EFGHI	65-72
98	L	6	75	34	0	6874	EFGHI	60-69
100	L	3	79	40	0	6868	EFGHI	61-69
95	L	6	76	33	0	6858	EFGHI	63-70
107	L	5	73	40	0	6828	EFGHIJ	58-69
92	L	7	74	32	0	6780	EFGHIJ	54-67
114	L	7	79	44	0	6715	EFGHIJ	59-70
115	L	5	76	43	70	6680	EFGHIJ	52-67

CONTINUED.

TABLE 5. CONTINUED.

1988 ENTRY	GRAIN TYPE*	SEEDLING VIGOR**	DAYS TO 50% HEADING	PLANT HGT(IN)	LODGING (%)	YIELD (LB/A @12%)	DUNCAN'S TEST ***	MILLING % (WHL-TOT)
116	L	6	75	37	0	6666	FGHIJ	55-66
101	L	6	75	33	0	6544	GHIJ	54-67
110	L	6	73	32	5	6473	HIJ	54-68
93	L	7	80	32	0	6173	HIJ	65-72
90	L	5	76	47	65	6148	IJK	61-68
99	L	6	74	37	0	5735	IJKL	61-71
S-101	S	1	68	33	55	5407	KL	63-69
PECOS	S	5	77	40	85	5084	LM	63-68
105	S	8	70	36	75	4408	M	66-71
C.V.		12.8	1.3	2.7		6.5		2.7-1.1

* L = LONG GRAIN, M = MEDIUM GRAIN, S = SHORT, I = INTERMEDIATE.
** SUBJECTIVE RATING 1 TO 9, WHERE 1 = EXCELLENT, 9 = POOR.
*** NUMBERS FOLLOWED BY THE SAME LETTER ARE NOT SIGNIFICANTLY DIFFERENT AT THE 0.05 LEVEL.

TABLE 6. AGRONOMIC PERFORMANCE OF 1988 UNIFORM RICE NURSERY, GROUP VI. RICE RESEARCH STATION, CROWLEY, LA.

1988 ENTRY	GRAIN TYPE*	SEEDLING VIGOR**	DAYS TO 50% HEADING	PLANT HGT(IN)	LODGING (%)	YIELD (LB/A @12%)	DUNCAN'S TEST ***	MILLING % (WHL-TOT)
143	L	5	74	33	10	7706	A	66-72
148	L	4	78	40	0	7446	AB	60-70
126	L	3	73	34	5	7322	ABC	65-71
146	L	3	71	34	5	7271	ABCD	64-73
131	L	5	77	32	0	7271	ABCD	63-71
134	L	5	76	32	0	7252	ABCD	56-71
124	M	2	82	44	5	7207	ABCDE	67-70
127	M	2	81	42	5	7179	ABCDE	68-70
128	L	4	75	35	5	7160	ABCDE	62-71
140	L	5	78	35	10	7149	ABCDE	58-71
139	L	3	74	37	0	7123	ABCDE	66-72
142	L	5	74	40	5	7085	ABCDE	61-72
152	L	5	80	32	15	7021	ABCDE	55-71
130	L	4	79	41	0	7013	ABCDE	63-71
135	L	6	82	31	0	6993	ABCDE	58-71
138	L	3	72	37	15	6936	ABCDEF	60-71
141	L	4	77	43	0	6885	ABCDEF	63-71
122	L	3	82	37	0	6868	ABCDEFG	56-72
125	L	4	75	35	0	6805	ABCDEFG	61-72
153	L	4	77	32	0	6779	ABCDEFG	60-73
132	L	6	78	33	10	6764	ABCDEFG	64-74
NATO	M	2	82	46	70	6727	ABCDEFG	69-71
147	L	5	79	41	0	6705	BCDEFG	63-74
133	L	6	75	40	0	6645	BCDEFG	66-72
149	L	3	78	35	15	6640	BCDEFG	62-73
121	M	3	82	38	0	6600	BCDEFGH	65-69
BRAZOS	M	4	80	40	0	6581	BCDEFGH	65-71
137	L	5	84	32	0	6535	BCDEFGHI	67-72
150	L	5	83	39	0	6335	CDEFGHI	66-72
154	L	6	76	32	10	6303	DEFGHI	65-73
151	L	5	77	37	0	6300	DEFGHI	65-71

CONTINUED.

TABLE 6. CONTINUED.

1988 ENTRY	GRAIN TYPE*	SEEDLING VIGOR**	DAYS TO 50% HEADING	PLANT HGT(IN)	LODGING (%)	YIELD (LB/A @12%)	DUNCAN'S TEST ***	MILLING % (WHL-TOT)
145	L	6	77	35	0	6229	EFGHI	68-74
NEWREX	L	5	77	43	27	6001	FGHI	59-69
123	L	5	72	34	0	5894	GHIJ	62-71
144	L	7	77	30	0	5680	HIJ	67-72
129	L	6	76	33	5	5679	HIJ	61-71
DELLA	L	3	85	48	55	5615	IJ	63-71
155	L	6	86	38	0	5606	IJ	64-71
156	L	3	88	34	0	5017	J	54-69
C.V.		21.4	1.9	4.7		5.9		2.9-0.9

* L = LONG GRAIN, M = MEDIUM GRAIN, S = SHORT, I = INTERMEDIATE.
** SUBJECTIVE RATING 1 TO 9, WHERE 1 = EXCELLENT, 9 = POOR.
*** NUMBERS FOLLOWED BY THE SAME LETTER ARE NOT SIGNIFICANTLY DIFFERENT AT THE 0.05 LEVEL.

TABLE 7. AGRONOMIC PERFORMANCE OF 1988 UNIFORM RICE NURSERY, GROUP VII. RICE RESEARCH STATION, CROWLEY, LA.

1988 ENTRY	GRAIN TYPE*	SEEDLING VIGOR**	DAYS TO 50% HEADING	PLANT HGT(IN)	LODGING (%)	YIELD (LB/A @12%)	DUNCAN'S TEST ***	MILLING % (WHL-TOT)
GUI CHOW	M	4	92	39	0	11213	A	51-73
161	L	6	93	35	0	8307	B	67-72
168	L	3	77	32	0	7703	BC	66-74
193	L	4	76	37	10	7556	BC	47-72
173	M	3	83	41	10	7403	BC	69-70
188	M	3	81	42	5	7273	BC	69-73
JASMINE	L	3	96	38	0	7243	BC	26-70
182	L	4	77	38	0	7188	BCD	53-74
185	L	4	77	40	0	7107	BCD	60-70
189	L	3	78	32	0	7012	BCD	66-74
186	L	4	78	33	0	7002	BCD	56-71
190	L	5	81	33	0	6986	BCD	61-74
184	L	6	83	35	0	6924	BCD	61-74
165	L	3	78	34	10	6907	BCD	65-71
191	L	5	79	35	0	6900	BCD	64-74
162	L	4	77	38	10	6876	BCD	63-72
171	L	5	81	32	0	6843	BCD	66-72
179	L	4	79	42	0	6816	BCD	63-72
167	L	3	83	40	0	6810	BCD	63-71
187	L	5	78	38	0	6736	BCD	59-74
164	L	2	84	41	0	6716	BCD	70-72
170	L	5	80	36	0	6690	BCD	62-72
177	L	5	81	33	5	6654	BCD	61-69
169	L	5	79	32	5	6582	BCD	45-73
NORTAI	S	6	85	41	0	6569	BCD	69-74
175	L	4	78	33	5	6528	BCD	66-74
183	L	4	78	31	0	6516	BCD	66-73
166	L	4	76	33	5	6515	BCD	61-73
195	L	5	87	33	0	6455	BCD	64-73
174	L	4	86	36	0	6299	BCD	67-72
163	L	4	79	34	0	6288	CD	69-72

CONTINUED.

TABLE 7. CONTINUED.

1988 ENTRY	GRAIN TYPE*	SEEDLING VIGOR**	DAYS TO 50% HEADING	PLANT HGT(IN)	LODGING (%)	YIELD (LB/A @12%)	DUNCAN'S TEST ***	MILLING % (WHL-TOT)
196	L	6	85	32	0	6274	CD	56-74
192	L	4	85	37	0	6203	CD	61-71
176	L	3	76	39	15	6201	CD	63-71
178	L	6	78	34	0	6139	CD	65-74
181	L	5	81	40	0	6134	CD	67-73
A-301	L	5	78	35	0	5848	CD	54-73
172	L	6	80	27	0	5225	D	67-72
C.V.		15.7	1.3	3.5		11.9		5.1-1.7

* L = LONG GRAIN, M = MEDIUM GRAIN, S = SHORT, I = INTERMEDIATE.
** SUBJECTIVE RATING 1 TO 9, WHERE 1 = EXCELLENT, 9 = POOR.
*** NUMBERS FOLLOWED BY THE SAME LETTER ARE NOT SIGNIFICANTLY DIFFERENT AT THE 0.05 LEVEL.

COMMERCIAL VARIETY TESTS

Description. The rice breeding program annually conducts yield trials on commercial rice varieties grown in Louisiana. Included in the test are the major commercial varieties and advanced experimentals in the final stages of testing before release from the cooperating public and private breeding programs.

Experimental Design. The commercial variety test contained 30 entries divided into two maturity groups. The experimental design was a randomized complete block with four replications. The test was grown at the RRS, Crowley, LA. The entries AS 3510 and AS 3058 are from the Alexandria Seed Company, Alexandria, LA. RAX 2003, RAX 2004, RAX 2011, RAX 2215, and RAX 2217 are F_1 hybrids from the Ring-Around Seed Company, Plainview, TX. Entries V7713, V4716, V7817, and CB801 were from RiceTec, Alvin, TX.

Agronomic Practices. All entries were drill seeded at 100 lb/A at the RRS, preplant fertilizer was applied and incorporated at a rate of 60-60-60 lb/A total with 100 lb/A of N as ammonium sulfate applied preflood. Entries were seeded April 14, 1988, flushed and a permanent flood was applied as soon as seedlings were tall enough for a shallow flood. Propanil (4 lb/A), Londax (1.5 oz/A), and Furadan (20 lb/A) were applied for weed and rice water weevil control. Plots consisted of seven rows on 8-inch centers, 16 feet in length. At harvest, plots were trimmed to 12 feet in length and the entire plot harvested with a small plot combine. Harvested samples were dried to approximately 12% moisture in a sack drier. All yields are reported at 12% moisture and as means of four replications. A small sample was taken from the ends of each plot and dried to 12% moisture for milling.

Comments. Performance results for the 1988 commercial variety tests are summarized in Tables 8 and 9. Some early bird damage occurred at the RRS in the plots of AS 3510 and V7713; however, these plots were covered with bird netting shortly after heading and damage was minimal.

TABLE 8. AGRONOMIC PERFORMANCE OF 1988 COMMERCIAL VARIETY TESTS, GROUP VIII. RICE RESEARCH STATION, CROWLEY, LA.

1988 ENTRY	GRAIN TYPE*	SEEDLING VIGOR**	DAYS TO 50% HEADING	PLANT HGT(IN)	LODGING (%)	YIELD (LB/A @12%)	DUNCAN'S TEST ***	MILLING % (WHL-TOT)
RAX2011	L	5	76	35	63	8231	A	33-68
TEBONNET	L	5	75	49	3	7809	AB	66-72
L-202	L	3	76	38	0	7547	BC	55-70
BOND	L	4	76	42	0	7473	BC	62-69
8702206	L	5	79	34	0	7388	BC	60-72
RAX2004	M	5	76	35	80	7305	BC	39-68
RAX2003	L	6	75	37	75	7281	BC	47-71
8702219	L	5	80	36	0	7221	BC	66-71
SKYBONNET	L	4	78	43	5	6960	CD	66-71
LABELLE	L	4	73	45	3	6541	DE	59-70
V7713	L	4	69	37	0	6147	EF	53-70
AS3510	L	3	65	40	0	5725	F	62-68
C.V.		14.4	2.2	2.6		6.2		8.5-1.7

* L = LONG GRAIN, M = MEDIUM GRAIN, S = SHORT, I = INTERMEDIATE.
** SUBJECTIVE RATING 1 TO 9, WHERE 1 = EXCELLENT, 9 = POOR.
*** NUMBERS FOLLOWED BY THE SAME LETTER ARE NOT SIGNIFICANTLY DIFFERENT AT THE 0.05 LEVEL.

TABLE 9. AGRONOMIC PERFORMANCE OF 1988 COMMERCIAL VARIETY TESTS, GROUP IX. RICE RESEARCH STATION, CROWLEY, LA.

1988 ENTRY	GRAIN TYPE*	SEEDLING VIGOR**	DAYS TO 50% HEADING	PLANT HGT(IN)	LODGING (%)	YIELD (LB/A @12%)	DUNCAN'S TEST ***	MILLING % (WHL-TOT)
RAX2217	L	5	82	43	58	8773	A	44-71
RAX2215	L	5	83	40	35	8533	A	44-71
RICO 1	M	4	86	40	5	8529	A	68-74
8702211	L	5	83	36	3	7247	B	65-72
LEMONT	L	5	85	33	0	7188	BC	66-73
MARS	M	1	85	45	3	7033	BCD	67-70
8502201	L	5	84	34	0	6944	BCD	65-72
V4716	M	3	86	36	0	6893	BCD	71-73
NEWBONNET	L	4	87	43	0	6848	BCD	63-71
AS3058	M	3	79	42	13	6844	BCD	66-69
GULFMONT	L	5	82	36	0	6760	BCD	67-72
REXMONT	L	6	78	33	0	6607	BCD	61-70
CB801	L	5	95	32	0	6546	CD	58-71
V7817	L	6	95	33	0	6540	CD	57-71
TORO-2	L	4	85	38	0	6490	D	66-73
DELLA X2	L	5	87	39	0	5662	E	65-72
DELLA	L	4	87	48	33	5616	E	64-72
MERCURY	M	3	85	33	0	5477	E	65-72
C.V.		13.6	0.94	3.1		5.8		4.2-1.8

* L = LONG GRAIN, M = MEDIUM GRAIN, S = SHORT, I = INTERMEDIATE.
** SUBJECTIVE RATING 1 TO 9, WHERE 1 = EXCELLENT, 9 = POOR.
*** NUMBERS FOLLOWED BY THE SAME LETTER ARE NOT SIGNIFICANTLY DIFFERENT AT THE 0.05 LEVEL.

ADVANCED YIELD TESTS

Description. The rice breeding project annually conducts on-farm testing of advanced experimental lines. The goal of this activity is to sample additional environments in yield testing new promising selections from the breeding 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 is essential to provide the information needed to make decisions on releasing new varieties.

Experimental Design. Advanced yield tests were conducted at five locations in Louisiana in cooperation with commercial growers and the RRS fertilization and entomology projects. Six very early maturing entries were tested at the RRS and in East Carroll and Vermilion parishes. Sixteen early maturing entries were tested at the RRS and in East Carroll, Morehouse, Rapides, and Vermilion parishes. Plots at the RRS consisted of seven rows on 8-inch centers, 25 feet in length. Plots at the other four locations were 7 x 25 feet. Experimental design was a randomized complete block with four replications.

Agronomic Practices. Rice was water seeded (150 lb/A) at the Morehouse, Rapides, and Vermilion locations and drill-seeded (100 lb/A) at the East Carroll and RRS locations. Fertilization included 120 lb/A N preflood at the East Carroll location; 90-60-60 lb/A N-P_2O_5-K_2O preplant incorporated at the Vermilion location; 60-60-60 lb/A N-P_2O_5-K_2O preplant incorporated and 100 lb/A N preflood at the RRS; and 120 lb/A N preplant incorporated at the Morehouse and Rapides locations. Herbicides, insecticides and fungicides included Propanil (4 lb/A), Londax (1.5 oz/A), and Furadan (20 lb/A) at the RRS; Propanil (3 lb/A), basagran (1.5 lb/A), Londax (1 oz/A), Furadan (20 lb/A), Tilt (16 oz/A, 2 applications), and Benlate (2 lb/A) at the Vermilion location; Propanil (3 lb/A), basagran (1.5 lb/A), Londax (2 oz/A), Furadan (20 lb/A), Tilt (6 oz/A), and Benlate (1 lb/A) at the Morehouse location; Propanil (8 lb/A, 2 applications), Londax (1.5 oz/A), Furadan (20 lb//A), Tilt (8 oz/A), and Benlate (1 lb/A) at the East Carroll location; and Bolero (4 lb/A), Londax (1.5 oz/A), Furadan (20 lb/A), and Tilt (6 oz/A) at the Rapides location.

Comments. Tables 10 through 19 contain the mean values for the agronomic characters measured at each location. Tables 22 and 23 contain values for the agronomic characters averaged over locations. Low milling yields associated with the Vermilion location were due to the fact the milling samples were not taken and milling tests were conducted on grain harvested at a lower than optimum moisture. Low yields at the Vermilion location were due in part to excessive levels of sheath blight disease in spite of three fungicide applications. Several of the experimental lines look promising, especially when compared to the check varieties Lemont and Gulfmont. Experimental 207 will be included in the performance tests within the rice fertilization and cultural management project in 1989.

TABLE 10. AGRONOMIC PERFORMANCE OF 1988 ADVANCED YIELD TEST, EARLY GROUP. RICE RESEARCH STATION, CROWLEY, LA.

1988 ENTRY	GRAIN TYPE*	DAYS TO 50% HEADING	PLANT HGT(IN)	LODGING (%)	YIELD (LB/A @12%)	DUNCAN'S TEST **	MILLING % (WHL-TOT)
MERCURY	M	78	40	0	7284	A	67-72
MARS	M	81	51	18	7173	AB	65-71
207	L	80	39	0	7062	ABC	68-73
211	L	80	39	0	6924	ABC	66-75
204	L	78	37	0	6784	BCD	65-73
202	L	79	40	0	6587	CDE	62-72
208	L	79	36	0	6365	DEF	59-72
201	L	80	36	0	6365	DEF	58-73
203	L	80	39	0	6357	DEF	59-74
209	L	79	35	0	6318	DEF	59-73
212	L	81	35	0	6223	EF	60-72
205	L	78	36	0	6219	EF	62-72
210	L	80	37	0	6174	EF	63-73
LEMONT	L	82	36	0	5875	F	64-75
GULFMONT	L	79	36	0	5870	F	60-73
206	L	82	36	0	5403	G	66-74
C.V.		0.6	2.7		4.8		3.1-1.7

* L = LONG GRAIN, M = MEDIUM GRAIN, S = SHORT, I = INTERMEDIATE.
** NUMBERS FOLLOWED BY THE SAME LETTER ARE NOT SIGNIFICANTLY DIFFERENT AT THE 0.05 LEVEL.

TABLE 11. AGRONOMIC PERFORMANCE OF 1988 ADVANCED YIELD TEST, VERY EARLY GROUP. RICE RESEARCH STATION, CROWLEY, LA.

1988 ENTRY	GRAIN TYPE*	DAYS TO 50% HEADING	PLANT HGT(IN)	LODGING (%)	YIELD (LB/A @12%)	DUNCAN'S TEST **	MILLING % (WHL-TOT)
TEBONNET	L	74	53	8	7184	A	63-72
220	L	75	37	0	6907	A	59-71
218	L	76	35	0	6058	B	61-72
219	L	75	37	0	6041	B	69-74
217	L	77	34	0	6001	B	61-73
221	L	76	38	0	5996	B	63-71
C.V.		0.7	2.7		5.3		3.3-1.6

* L = LONG GRAIN, M = MEDIUM GRAIN, S = SHORT, I = INTERMEDIATE.
** NUMBERS FOLLOWED BY THE SAME LETTER ARE NOT SIGNIFICANTLY DIFFERENT AT THE 0.05 LEVEL.

TABLE 12. AGRONOMIC PERFORMANCE OF 1988 ADVANCED YIELD TEST, EARLY GROUP. VERMILION PARISH, LA.

1988 ENTRY	GRAIN TYPE*	SEEDLING VIGOR**	DAYS TO 50% HEADING	PLANT HGT(IN)	LODGING (%)	YIELD (LB/A @12%)	DUNCAN'S TEST ***	MILLING % (WHL-TOT)
MERCURY	M	2	80	35	0	7372	A	59-72
202	L	7	82	37	15	6935	AB	54-71
204	L	4	75	35	25	6902	AB	54-71
208	L	4	81	33	3	6731	AB	47-69
207	L	1	80	36	10	6701	AB	58-71
MARS	M	3	82	42	3	6627	BC	60-70
205	L	3	77	34	18	6598	BC	55-71
LEMONT	L	6	81	33	23	6489	BC	48-72
201	L	7	81	34	35	6441	BC	48-71
211	L	6	82	34	20	6391	BC	52-71
206	L	3	82	34	23	6347	BC	53-71
209	L	5	78	35	45	6342	BC	44-71
GULFMONT	L	6	80	35	25	6269	BC	49-72
212	L	5	82	32	15	6260	BC	50-70
210	L	3	80	34	15	6182	BC	52-70
203	L	3	81	35	15	5900	C	45-72
C.V.		23.2	1.3	3.4		7.1		5.1-1.7

* L = LONG GRAIN, M = MEDIUM GRAIN, S = SHORT, I = INTERMEDIATE.
** SUBJECTIVE RATING 1 TO 9, WHERE 1 = EXCELLENT, 9 = POOR.
*** NUMBERS FOLLOWED BY THE SAME LETTER ARE NOT SIGNIFICANTLY DIFFERENT AT THE 0.05 LEVEL.

TABLE 13. AGRONOMIC PERFORMANCE OF 1988 ADVANCED YIELD TEST, VERY EARLY GROUP. VERMILION PARISH, LA.

1988 ENTRY	GRAIN TYPE*	SEEDLING VIGOR**	DAYS TO 50% HEADING	PLANT HGT(IN)	LODGING (%)	YIELD (LB/A @12%)	DUNCAN'S TEST ***	MILLING % (WHL-TOT)
218	L	5	79	33	0	6539	A	54-69
221	L	3	77	33	0	6291	AB	55-68
220	L	4	77	34	0	6056	AB	55-68
217	L	2	78	32	13	5876	AB	59-70
TEBONNET	L	7	75	46	43	5828	AB	60-70
219	L	3	76	35	60	5287	B	61-70
C.V.		26.9	1.5	2.5		7.7		3.9-1.0

* L = LONG GRAIN, M = MEDIUM GRAIN, S = SHORT, I = INTERMEDIATE.
** SUBJECTIVE RATING 1 TO 9, WHERE 1 = EXCELLENT, 9 = POOR.
*** NUMBERS FOLLOWED BY THE SAME LETTER ARE NOT SIGNIFICANTLY DIFFERENT AT THE 0.05 LEVEL.

TABLE 14. AGRONOMIC PERFORMANCE OF 1988 ADVANCED YIELD TEST, EARLY GROUP. EAST CARROLL PARISH, LA.

1988 ENTRY	GRAIN TYPE*	DAYS TO 50% HEADING	PLANT HGT(IN)	LODGING (%)	YIELD (LB/A @12%)	DUNCAN'S TEST **	MILLING % (WHL-TOT)
MARS	M	101	45	-	7680	A	66-70
211	L	107	38	-	7675	A	67-74
208	L	104	36	-	7563	AB	62-72
209	L	106	35	-	7495	ABC	64-74
MERCURY	M	101	37	-	7396	ABCD	68-72
212	L	109	34	-	7287	ABCD	61-72
203	L	104	36	-	7255	ABCD	62-74
207	L	107	37	-	7203	ABCD	67-72
201	L	109	36	-	7187	ABCD	66-73
204	L	104	36	-	7095	BCDE	67-73
210	L	106	35	-	7079	BCDE	66-72
LEMONT	L	109	36	-	6990	BCDE	66-74
202	L	110	39	-	6952	CDE	63-72
GULFMONT	L	107	36	-	6920	CDE	62-74
205	L	104	35	-	6904	DE	66-72
206	L	109	35	-	6559	E	66-73
C.V.		1.0	3.6		4.8		3.9-1.2

* L = LONG GRAIN, M = MEDIUM GRAIN, S = SHORT, I = INTERMEDIATE.
** NUMBERS FOLLOWED BY THE SAME LETTER ARE NOT SIGNIFICANTLY DIFFERENT AT THE 0.05 LEVEL.

TABLE 15. AGRONOMIC PERFORMANCE OF 1988 ADVANCED YIELD TEST, VERY EARLY GROUP. EAST CARROLL PARISH, LA.

1988 ENTRY	GRAIN TYPE*	DAYS TO 50% HEADING	PLANT HGT(IN)	LODGING (%)	YIELD (LB/A @12%)	DUNCAN'S TEST **	MILLING % (WHL-TOT)
217	L	106	37	-	7119	A	64-72
218	L	105	34	-	6881	AB	55-71
220	L	105	36	-	6825	AB	58-70
219	L	104	37	-	6793	AB	64-71
TEBONNET	L	103	50	-	6630	AB	64-72
221	L	105	35	-	6462	B	61-71
C.V.		0.8	7.7		4.5		5.7-0.7

* L = LONG GRAIN, M = MEDIUM GRAIN, S = SHORT, I = INTERMEDIATE.
** NUMBERS FOLLOWED BY THE SAME LETTER ARE NOT SIGNIFICANTLY DIFFERENT AT THE 0.05 LEVEL.

TABLE 16. AGRONOMIC PERFORMANCE OF 1988 ADVANCED YIELD TEST, EARLY GROUP. RAPIDES PARISH, LA.

1988 ENTRY	GRAIN TYPE*	DAYS TO 50% HEADING	PLANT HGT(IN)	LODGING (%)	YIELD (LB/A @12%)	DUNCAN'S TEST **	MILLING % (WHL-TOT)
207	L	84	38	0	8511	A	66-72
204	L	82	38	0	8182	AB	63-72
210	L	85	38	0	7991	ABC	57-70
205	L	82	37	0	7927	BC	61-71
209	L	85	37	0	7914	BC	58-72
203	L	84	38	0	7895	BC	62-72
208	L	82	37	0	7771	BCD	57-70
MERCURY	M	81	39	75	7724	BCD	66-73
202	L	86	40	0	7719	BCD	62-71
206	L	86	38	0	7650	BCDE	63-72
LEMONT	L	85	36	0	7642	BCDE	64-72
201	L	87	37	0	7573	CDE	60-72
211	L	86	40	5	7549	CDE	60-71
212	L	86	35	0	7477	CDE	58-69
GULFMONT	L	85	38	0	7219	DE	64-72
MARS	M	82	44	90	7081	E	65-70
C.V.		1.2	3.5		4.6		3.3-1.3

* L = LONG GRAIN, M = MEDIUM GRAIN, S = SHORT, I = INTERMEDIATE.

** NUMBERS FOLLOWED BY THE SAME LETTER ARE NOT SIGNIFICANTLY DIFFERENT AT THE 0.05 LEVEL.

TABLE 17. AGRONOMIC PERFORMANCE OF 1988 ADVANCED YIELD TEST, EARLY GROUP. MOREHOUSE PARISH, LA.

1988 ENTRY	GRAIN TYPE*	DAYS TO 50% HEADING	PLANT HGT(IN)	LODGING (%)	YIELD (LB/A @12%)	DUNCAN'S TEST **	MILLING % (WHL-TOT)
210	L	85	34	-	9256	A	63-71
207	L	89	31	-	9037	AB	68-72
206	L	91	35	-	9019	AB	66-72
209	L	85	32	-	8737	ABC	60-72
201	L	88	33	-	8727	ABC	63-72
208	L	89	32	-	8621	ABC	60-70
LEMONT	L	90	32	-	8590	BC	63-73
212	L	91	30	-	8513	BC	62-70
203	L	88	34	-	8499	BC	64-74
211	L	85	33	-	8497	BC	65-73
205	L	83	31	-	8434	BC	65-72
MERCURY	M	88	33	-	8430	BC	69-72
GULFMONT	L	86	33	-	8252	C	63-72
202	L	90	35	-	8241	C	64-72
MARS	M	88	41	-	8176	C	69-71
204	L	82	33	-	8140	C	65-73
C.V.		1.0	4.1		4.7		1.4-1.0

* L = LONG GRAIN, M = MEDIUM GRAIN, S = SHORT, I = INTERMEDIATE.
** NUMBERS FOLLOWED BY THE SAME LETTER ARE NOT SIGNIFICANTLY DIFFERENT AT THE 0.05 LEVEL.

TABLE 18. AGRONOMIC PERFORMANCE OF 1988 ADVANCED YIELD TEST, VERY EARLY GROUP. MEAN OF FIVE LOCATIONS. RICE RESEARCH STATION, CROWLEY, LA.

1988 ENTRY	GRAIN TYPE*	DAYS TO 50% HEADING	PLANT HEIGHT (IN)	LODGING %	YIELD (LB/A @ 12%)	DUNCAN'S TEST**	MILLING % (WHL-TOT)
220	L	86	36	0	6596	A	59-70
TEBONNET	L	84	50	3	6547	A	64-72
218	L	87	34	0	6492	A	58-72
217	L	87	34	1	6332	AB	63-72
221	L	86	35	0	6250	AB	62-71
219	L	85	36	3	6040	B	66-73
C.V.		1.0	5.6		7.9		

* L = LONG GRAIN, M = MEDIUM GRAIN, S = SHORT GRAIN, AND I = INTERMEDIATE GRAIN.
** NUMBERS FOLLOWED BY THE SAME LETTER ARE NOT SIGNIFICANTLY DIFFERENT AT THE 0.05 LEVEL.

TABLE 19. AGRONOMIC PERFORMANCE OF 1988 ADVANCED YIELD TEST, EARLY GROUP. MEAN OF FIVE LOCATIONS. RICE RESEARCH STATION, CROWLEY, LA.

1988 ENTRY	GRAIN TYPE*	DAYS TO 50% HEADING	PLANT HEIGHT (IN)	LODGING %	YIELD (LB/A @ 12%)	DUNCAN'S TEST**	MILLING % (WHL-TOT)
207	L	88	36	0	7703	A	67-72
MERCURY	M	86	37	3	7641	AB	67-73
204	L	84	36	1	7420	ABC	65-73
208	L	87	35	0	7410	ABC	59-71
211	L	88	37	1	7407	ABC	65-73
209	L	86	35	2	7361	BC	60-73
MARS	M	87	45	4	7347	BC	66-71
210	L	87	36	1	7336	BC	62-72
202	L	89	38	1	7287	CD	63-72
201	L	89	35	1	7258	CD	62-72
205	L	85	35	1	7217	CDE	63-72
203	L	87	36	1	7181	CDE	62-73
212	L	90	33	1	7152	CDE	61-71
LEMONT	L	89	34	1	7117	CDE	65-73
206	L	89	36	1	6996	DE	65-73
GULFMONT	L	87	36	1	6906	E	62-73
C.V.		1.9	4.3		7.0		

* L = LONG GRAIN, M = MEDIUM GRAIN, S = SHORT GRAIN, AND I = INTERMEDIATE GRAIN.
** NUMBERS FOLLOWED BY THE SAME LETTER ARE NOT SIGNIFICANTLY DIFFERENT AT THE 0.05 LEVEL.

PRELIMINARY YIELD TESTS

Description. The preliminary yield tests provide the first stage of replicated testing of promising experimental lines in field plots. Many of these lines are discarded before harvest or after laboratory evaluation. The more promising entries will be reselected and advanced for further testing.

Experimental Design. The preliminary yield tests used a randomized complete block design with two replications. The 333 entries were grouped into 14 groups by maturity and grain type. The groups designated as XX and XXI contain aromatic experimentals. Each plot consisted of seven rows on 8-inch centers 16 feet in length. At harvest, the plots were trimmed to 12 feet, and all seven rows were harvested with a small plot combine. Samples were dried to approximately 12% moisture and yields determined and reported on a 12% moisture basis. A small sample was taken from the ends of each plot and dried to 12% moisture for milling.

Agronomic Practices. Entries were drill seeded at 100 lb/A on April 28, 1988 (Groups X-XXI) and June 3, 1988 (Groups XXII and XXIII). The latter two groups were returned from the winter nursery in Puerto Rico, thus the late planting date. Preplant fertilizer was applied and incorporated at a rate of 60-60-60 lb/A N-P_2O_5-K_2O and 100 lb/A N applied preflood. The entries were flushed to initiate germination and a permanent flood was established as soon as seedlings were tall enough to tolerate a shallow flood. Propanil (4 lb/A), Londax (1 oz/A), and Furadan (20 lb/A) were applied for weed and insect control. Zinc chelate (.45 lb/A actual zinc) was applied when bronzing was observed at mid-tillering.

Comments. Performance of the 1988 preliminary yield entries are summarized in Tables 20 through 33. Many of the entries out-performed the check varieties. Some of these selections are being considered for the advanced yield and Cooperative Uniform Regional Rice Nursery tests in 1989. All of these lines still show considerable segregation. The best are being advanced, reselected, and purified.

TABLE 20. AGRONOMIC PERFORMANCE OF 1988 PRELIMINARY YIELD TESTS, GROUP X. RICE RESEARCH STATION, CROWLEY, LA.

1988 ENTRY	GRAIN TYPE*	SEEDLING VIGOR**	DAYS TO 50% HEADING	PLANT HGT(IN)	LODGING (%)	YIELD (LB/A @12%)	DUNCAN'S TEST ***	MILLING % (WHL-TOT)
506	L	4	84	40	0	8522	A	63-70
509	L	7	84	37	0	8046	AB	60-72
510	L	5	84	39	0	7845	ABC	62-48
517	L	5	79	36	0	7740	ABCD	59-70
502	L	5	85	40	0	7730	ABCD	65-71
520	L	5	87	39	0	7696	ABCD	67-72
508	L	5	87	40	0	7350	ABCDE	62-71
505	L	4	83	41	25	7300	ABCDE	63-71
511	L	5	83	39	0	7291	ABCDE	60-73
518	L	5	82	39	0	7239	ABCDE	67-76
521	L	6	85	38	0	7166	ABCDE	63-72
513	L	5	85	35	0	7095	ABCDE	65-71
512	L	4	82	37	0	7082	ABCDE	64-72
514	L	5	84	31	0	7034	ABCDE	64-72
L-202	L	7	84	41	0	6988	ABCDE	59-70
515	L	5	73	34	0	6963	ABCDE	57-71
501	L	5	87	38	0	6698	BCDE	63-70
519	L	4	85	34	0	6571	BCDE	64-71
504	L	4	87	38	0	6558	BCDE	64-71
516	L	4	85	40	0	6445	BCDE	67-72
522	L	4	77	36	0	6356	BCDE	67-72
503	L	4	85	39	0	6058	CDE	56-71
523	L	5	77	34	0	6010	DE	65-71
507	L	4	87	39	0	5747	E	64-71
TEBONNET	L	4	83	54	50	5619	E	66-72
C.V.		13.6	1.0	2.1		10.6		2.0-1.4

* L = LONG GRAIN, M = MEDIUM GRAIN, S = SHORT, I = INTERMEDIATE.
** SUBJECTIVE RATING 1 TO 9, WHERE 1 = EXCELLENT, 9 = POOR.
*** NUMBERS FOLLOWED BY THE SAME LETTER ARE NOT SIGNIFICANTLY DIFFERENT AT THE 0.05 LEVEL.

TABLE 21. AGRONOMIC PERFORMANCE OF 1988 PRELIMINARY YIELD TESTS, GROUP XI, RICE RESEARCH STATION, CROWLEY, LA.

1988 ENTRY	GRAIN TYPE*	SEEDLING VIGOR**	DAYS TO 50% HEADING	PLANT HGT(IN)	LODGING (%)	YIELD (LB/A @12%)	DUNCAN'S TEST ***	MILLING % (WHL-TOT)
547	L	4	86	39	0	7796	A	65-72
536	L	5	87	38	5	7792	A	66-73
527	L	5	82	43	5	7609	AB	66-74
537	L	5	87	39	0	7584	AB	63-72
543	L	5	83	36	5	7400	AB	60-73
544	L	5	83	36	0	7398	AB	61-73
546	L	4	86	40	0	7139	ABC	54-69
531	L	5	84	42	0	7080	ABC	60-69
540	L	4	87	40	0	7062	ABC	67-73
542	L	3	80	39	10	6984	ABC	69-73
532	L	4	87	38	0	6848	ABCD	65-72
534	L	5	87	38	0	6830	ABCD	64-72
529	L	4	85	41	0	6809	ABCD	69-74
533	L	5	87	38	0	6759	ABCD	59-72
526	L	4	78	35	0	6717	ABCD	65-72
528	L	4	85	41	0	6694	ABCD	66-72
539	L	4	83	37	0	6570	ABCD	60-71
535	L	5	88	39	0	6465	BCD	64-72
545	L	6	86	37	0	6401	BCD	66-71
541	L	4	86	38	5	6398	BCD	66-72
538	L	5	83	35	0	6355	BCD	67-72
548	L	4	85	38	0	6112	CDE	66-73
530	L	5	86	39	0	6061	CDE	66-71
LABELLE	L	4	78	54	50	5661	DE	68-72
TEBONNET	L	3	83	55	80	5073	E	64-72
C.V.		16.8	1.2	3.0		7.6		2.1-1.0

* L = LONG GRAIN, M = MEDIUM GRAIN, S = SHORT, I = INTERMEDIATE.
** SUBJECTIVE RATING 1 TO 9, WHERE 1 = EXCELLENT, 9 = POOR.
*** NUMBERS FOLLOWED BY THE SAME LETTER ARE NOT SIGNIFICANTLY DIFFERENT AT THE 0.05 LEVEL.

TABLE 22. AGRONOMIC PERFORMANCE OF 1988 PRELIMINARY YIELD TESTS, GROUP XII, RICE RESEARCH STATION, CROWLEY, LA.

1988 ENTRY	GRAIN TYPE*	SEEDLING VIGOR**	DAYS TO 50% HEADING	PLANT HGT(IN)	LODGING (%)	YIELD (LB/A @12%)	DUNCAN'S TEST ***	MILLING % (WHL-TOT)
572	L	2	88	36	0	7640	A	67-72
551	L	4	88	36	0	7523	AB	67-73
552	L	4	86	38	0	7296	ABC	65-73
TEBONNET	L	4	84	56	40	7120	ABCD	65-72
L-202	L	5	84	41	0	6969	ABCD	60-71
569	L	4	78	40	0	6949	ABCD	66-72
563	L	5	87	38	0	6858	ABCD	67-72
570	L	5	79	42	0	6675	ABCD	65-73
573	L	4	86	39	0	6668	ABCD	59-70
564	L	6	88	33	0	6643	ABCD	66-71
554	L	3	86	39	0	6526	ABCD	67-72
571	L	4	88	38	0	6479	ABCD	68-72
555	L	4	84	40	0	6452	ABCD	65-72
567	L	5	84	39	0	6425	ABCD	62-72
560	L	5	91	35	0	6332	ABCD	68-72
566	L	6	87	37	0	6165	ABCD	65-73
553	L	4	88	38	0	6148	ABCD	68-72
565	L	6	88	34	0	6137	ABCD	67-72
561	L	5	88	33	0	6066	ABCD	67-72
557	L	4	89	38	0	5981	BCD	66-71
568	L	5	87	36	0	5966	BCD	60-72
558	L	4	85	37	0	5962	BCD	68-72
562	L	5	88	34	0	5870	CD	64-71
559	L	7	92	44	0	5721	CD	67-72
556	L	4	87	41	0	5657	D	59-71
C.V.		14.0	0.9	4.9		9.9		2.6-1.0

* L = LONG GRAIN, M = MEDIUM GRAIN, S = SHORT, I = INTERMEDIATE.

** SUBJECTIVE RATING 1 TO 9, WHERE 1 = EXCELLENT, 9 = POOR.

*** NUMBERS FOLLOWED BY THE SAME LETTER ARE NOT SIGNIFICANTLY DIFFERENT AT THE 0.05 LEVEL.

TABLE 23. AGRONOMIC PERFORMANCE OF 1988 PRELIMINARY YIELD TESTS, GROUP XIII, RICE RESEARCH STATION, CROWLEY, LA.

1988 ENTRY	GRAIN TYPE*	SEEDLING VIGOR**	DAYS TO 50% HEADING	PLANT HGT(IN)	LODGING (%)	YIELD (LB/A @12%)	DUNCAN'S TEST ***	MILLING % (WHL-TOT)
596	L	5	91	46	0	8548	A	65-70
580	L	3	90	41	0	8042	AB	67-72
586	L	3	89	40	0	8039	AB	65-71
579	L	4	90	40	0	8007	AB	67-71
GULFMONT	L	4	88	38	0	7973	AB	67-73
576	L	5	88	37	0	7962	ABC	69-73
593	L	5	91	38	0	7786	BCD	67-73
585	L	4	88	37	0	7773	BCD	65-70
588	L	4	86	40	0	7724	BCD	59-71
592	L	5	91	38	0	7633	BCD	68-73
583	L	4	86	37	0	7539	BCDE	57-71
577	L	4	87	37	10	7487	BCDEF	63-71
582	L	5	86	38	10	7361	BCDEFG	64-71
589	L	4	87	38	0	7345	BCDEFG	64-73
587	L	5	86	38	0	7245	CDEFG	63-72
595	L	7	95	38	0	7181	DEFG	61-71
594	L	4	95	38	0	7173	DEFG	63-69
581	L	4	78	43	5	7156	DEFG	56-71
591	L	6	91	39	0	7150	DEFG	67-72
584	L	4	88	36	0	7118	DEFG	66-72
597	L	4	95	38	0	7074	DEFG	65-70
598	L	4	89	37	0	6850	EFG	65-72
LEMONT	L	4	91	3	0	6801	FG	64-72
578	L	4	88	36	0	6680	G	65-72
C.V.		10.2	0.6	1.9		4.0		2.8-0.8

*   L = LONG GRAIN, M = MEDIUM GRAIN, S = SHORT, I = INTERMEDIATE.
** SUBJECTIVE RATING 1 TO 9, WHERE 1 = EXCELLENT, 9 = POOR.
*** NUMBERS FOLLOWED BY THE SAME LETTER ARE NOT SIGNIFICANTLY DIFFERENT AT THE 0.05 LEVEL.

TABLE 24. AGRONOMIC PERFORMANCE OF 1988 PERLIMINARY YIELD TESTS, GROUP XIV, RICE RESEARCH STATION, CROWLEY, LA.

1988 ENTRY	GRAIN TYPE*	SEEDLING VIGOR**	DAYS TO 50% HEADING	PLANT HGT(IN)	LODGING (%)	YIELD (LB/A @12%)	DUNCAN'S TEST ***	MILLING % (WHL-TOT)
609	L	4	86	40	0	8336	A	61-70
611	L	4	89	39	0	8178	AB	65-71
619	L	4	93	48	10	7915	ABC	67-72
613	L	5	89	39	0	7800	ABCD	55-70
606	L	4	86	40	10	7686	ABCDE	63-71
603	L	4	88	39	0	7662	ABCDE	66-72
602	L	4	87	38	0	7660	ABCDE	66-71
617	M	2	88	43	0	7466	BCDEF	63-70
GULFMONT	L	4	88	38	0	7424	BCDEFG	67-72
605	L	4	86	38	0	7329	CDEFGH	64-71
610	L	4	90	35	0	7270	CDEFGH	66-75
615	L	5	89	40	0	7173	CDEFGH	56-71
612	L	5	89	38	5	7164	CDEFGH	60-72
614	L	6	88	39	0	7082	DEFGHI	56-71
623	L	5	88	38	0	7003	EFGHIJ	64-70
601	L	5	89	36	0	6935	EFGHIJ	68-72
607	L	5	90	35	0	6857	FGHIJ	67-72
622	L	5	90	39	0	6756	FGHIJ	62-73
604	L	6	87	38	0	6724	FGHIJ	63-70
621	L	6	88	41	0	6678	GHIJ	63-71
618	L	6	87	40	0	6622	HIJ	63-68
620	L	6	88	38	0	6622	IJ	64-72
LEMONT	L	5	92	38	0	6352	IJK	66-73
608	L	4	90	34	0	6231	JK	64-72
616	L	6	88	36	0	5779	K	60-70
C.V.		11.0	1.1	2.2		4.5		3.7-2.1

* L = LONG GRAIN, M = MEDIUM GRAIN, S = SHORT, I = INTERMEDIATE.
** SUBJECTIVE RATING 1 TO 9, WHERE 1 = EXCELLENT, 9 = POOR.
*** NUMBERS FOLLOWED BY THE SAME LETTER ARE NOT SIGNIFICANTLY DIFFERENT AT THE 0.05 LEVEL.

TABLE 25. AGRONOMIC PERFORMANCE OF 1988 PRELIMINARY YIELD TESTS, GROUP XV, RICE RESEARCH STATION, CROWLEY, LA.

1988 ENTRY	GRAIN TYPE*	SEEDLING VIGOR**	DAYS TO 50% HEADING	PLANT HGT(IN)	LODGING (%)	YIELD (LB/A @12%)	DUNCAN'S TEST ***	MILLING % (WHL-TOT)
633	L	5	88	47	0	7531	A	52-72
636	L	4	88	39	0	7424	AB	67-72
645	L	5	87	40	10	7249	ABC	63-70
634	L	4	90	36	0	7222	ABCD	66-71
630	L	5	91	43	0	7091	ABCDE	61-71
632	L	4	91	37	0	7077	ABCDE	63-71
647	L	4	91	40	0	7038	ABCDEF	63-73
GULFMONT	L	4	88	39	0	6980	ABCDEFG	65-72
637	L	4	87	40	0	6899	ABCDEFGH	64-72
628	L	4	88	38	0	6858	ABCDEFGH	56-71
646	L	4	90	38	0	6759	ABCDEFGH	64-72
638	L	4	91	40	0	6669	BCDEFGH	65-71
639	L	5	88	40	0	6653	BCDEFGH	64-73
641	L	4	95	41	0	6524	CDEFGH	61-71
648	L	4	91	42	15	6490	CDEFGH	64-72
627	L	5	88	37	0	6425	CDEFGH	65-71
640	L	4	91	38	0	6399	DEFGH	62-70
643	L	3	96	42	0	6311	EFGH	64-70
629	L	4	95	38	0	6261	EFGH	57-73
626	L	5	88	38	0	6208	FGH	59-72
642	L	5	91	36	0	6198	GH	61-70
LEMONT	L	5	92	39	0	6132	HI	63-72
635	L	5	85	37	0	6128	HI	53-73
631	L	5	91	42	0	6094	HI	62-72
644	L	3	89	40	0	5387	I	57-70
C.V.		9.9	0.8	2.7		5.2		3.4-1.3

* L = LONG GRAIN, M = MEDIUM GRAIN, S = SHORT, I = INTERMEDIATE.
** SUBJECTIVE RATING 1 TO 9, WHERE 1 = EXCELLENT, 9 = POOR.
*** NUMBERS FOLLOWED BY THE SAME LETTER ARE NOT SIGNIFICANTLY DIFFERENT AT THE 0.05 LEVEL.

TABLE 26. AGRONOMIC PERFORMANCE OF 1988 PERLIMINARY YIELD TESTS, GROUP XVI, RICE RESEARCH STATION, CROWLEY, LA.

1988 ENTRY	GRAIN TYPE*	SEEDLING VIGOR**	DAYS TO 50% HEADING	PLANT HGT(IN)	LODGING (%)	YIELD (LB/A @12%)	DUNCAN'S TEST ***	MILLING % (WHL-TOT)
651	L	5	93	40	0	8167	A	51-70
672	L	6	86	41	15	7830	AB	51-70
668	L	4	89	38	0	7790	ABC	65-72
664	L	4	89	45	5	7614	ABCD	55-68
657	L	3	90	39	0	7561	ABCDE	66-71
654	L	4	87	41	0	7526	ABCDE	67-72
652	L	4	95	38	0	7488	ABCDE	66-71
669	L	3	91	36	0	7466	ABCDE	64-72
662	L	4	93	39	0	7359	ABCDEF	58-71
666	L	4	93	35	0	7290	BCDEF	62-71
653	L	4	92	39	0	7210	BCDEF	58-72
661	L	4	90	36	0	7139	BCDEF	62-71
655	L	5	87	37	0	6981	BCDEFG	63-71
667	L	4	90	40	5	6945	CDEFG	68-73
660	L	4	91	36	0	6922	DEFG	65-72
673	L	5	85	39	5	6907	DEFG	59-71
LEMONT	L	4	93	38	0	6832	DEFG	66-72
GULFMONT	L	4	89	39	5	6721	EFGH	63-72
656	L	4	90	36	0	6721	EFGH	66-72
665	L	3	87	39	0	6534	FGH	63-70
670	L	2	89	38	0	6503	FGH	66-72
659	L	3	89	36	0	6275	GHI	66-71
671	M	4	85	37	0	6272	GHI	63-70
658	L	4	102	39	0	5971	HI	64-71
663	L	3	83	45	90	5661	I	61-70
C.V.		11.3	0.7	2.3		5.0		4.3-0.9

* L = LONG GRAIN, M = MEDIUM GRAIN, S = SHORT, I = INTERMEDIATE.
** SUBJECTIVE RATING 1 TO 9, WHERE 1 = EXCELLENT, 9 = POOR.
*** NUMBERS FOLLOWED BY THE SAME LETTER ARE NOT SIGNIFICANTLY DIFFERENT AT THE 0.05 LEVEL.

TABLE 27. AGRONOMIC PERFORMANCE OF 1988 PRELIMINARY YIELD TESTS, GROUP XVII, RICE RESEARCH STATION, CROWLEY, LA.

1988 ENTRY	GRAIN TYPE*	SEEDLING VIGOR**	DAYS TO 50% HEADING	PLANT HGT(IN)	LODGING (%)	YIELD (LB/A @12%)	DUNCAN'S TEST ***	MILLING % (WHL-TOT)
688	L	3	85	49	0	7760	A	61-71
683	L	5	93	38	0	7239	AB	65-71
676	L	4	92	37	0	7221	AB	67-73
698	M	5	96	44	90	6966	AB	37-69
680	L	5	94	36	0	6938	AB	69-72
LEMONT	L	4	93	37	0	6917	AB	63-71
686	L	3	92	37	0	6775	ABC	55-70
687	L	4	89	42	0	6770	BC	62-71
677	L	6	92	38	0	6725	BC	67-71
697	L	4	93	38	0	6696	BC	68-72
684	L	4	91	37	0	6675	BC	65-71
699	L	5	93	36	0	6623	BC	65-72
691	L	4	88	39	0	6610	BC	66-72
679	L	4	93	37	0	6602	BC	67-70
696	L	4	93	38	0	6579	BC	61-71
681	L	5	93	37	0	6571	BC	68-71
694	L	4	92	40	0	6569	BC	58-70
678	L	5	94	38	0	6517	BC	67-71
692	L	4	89	36	0	6462	BC	57-70
685	L	4	92	37	0	6446	BC	68-71
693	L	5	85	40	0	6418	BC	56-70
695	L	4	87	40	0	6347	BC	67-71
689	L	4	86	42	90	5849	C	44-70
682	L	5	99	38	0	5844	C	64-70
690	L	4	92	39	0	5843	C	58-70
C.V.		13.9	0.7	2.9		6.0		5.4-0.9

* L = LONG GRAIN, M = MEDIUM GRAIN, S = SHORT, I = INTERMEDIATE.
** SUBJECTIVE RATING 1 TO 9, WHERE 1 = EXCELLENT, 9 = POOR.
*** NUMBERS FOLLOWED BY THE SAME LETTER ARE NOT SIGNIFICANTLY DIFFERENT AT THE 0.05 LEVEL.

TABLE 28. AGRONOMIC PERFORMANCE OF 1988 PRELIMINARY YIELD TESTS, GROUP XVIII, RICE RESEARCH STATION, CROWLEY, LA.

1988 ENTRY	GRAIN TYPE*	SEEDLING VIGOR**	DAYS TO 50% HEADING	PLANT HGT(IN)	LODGING (%)	YIELD (LB/A @12%)	DUNCAN'S TEST ***	MILLING % (WHL-TOT)
710	M	4	86	37	0	7207	A	60-70
705	M	5	88	45	10	6861	AB	66-AB
702	M	4	81	39	50	6461	ABC	63-69
706	M	3	89	39	0	6443	ABC	65-70
704	M	4	85	41	0	6380	ABC	66-71
707	M	5	84	44	0	6165	ABC	60-71
713	M	3	78	38	45	6139	ABC	62-70
703	M	3	86	45	90	5750	ABC	66-71
717	M	3	76	42	85	5701	ABC	69-71
701	M	4	86	33	0	5652	ABC	65-71
M-202	M	3	79	41	90	5542	ABC	68-71
715	M	3	81	43	90	5310	ABC	64-71
712	M	5	78	43	90	5300	ABC	57-72
708	M	3	85	45	85	5281	ABC	57-70
711	M	4	82	44	65	5129	BCD	65-69
716	M	4	84	42	25	4933	BCD	65-68
M-201	M	2	76	39	80	4801	CD	62-69
718	M	4	74	40	90	4657	CD	61-71
714	M	3	83	47	90	4522	CD	51-69
709	M	4	86	43	90	3332	D	54-70
C.V.		13.1	1.0	2.4		14.8		2.8-1.1

* L = LONG GRAIN, M = MEDIUM GRAIN, S = SHORT, I = INTERMEDIATE.
** SUBJECTIVE RATING 1 TO 9, WHERE 1 = EXCELLENT, 9 = POOR.
*** NUMBERS FOLLOWED BY THE SAME LETTER ARE NOT SIGNIFICANTLY DIFFERENT AT THE 0.05 LEVEL.

TABLE 29. AGRONOMIC PERFORMANCE OF 1988 PRELIMINARY YIELD TESTS, GROUP XIX, RICE RESEARCH STATION, CROWLEY, LA.

1988 ENTRY	GRAIN TYPE*	SEEDLING VIGOR**	DAYS TO 50% HEADING	PLANT HGT(IN)	LODGING (%)	YIELD (LB/A @12%)	DUNCAN'S TEST ***	MILLING % (WHL-TOT)
730	M	4	89	38	0	8739	A	63-69
723	M	4	92	41	0	7690	AB	61-72
725	M	3	94	38	0	7405	BC	67-72
722	M	3	89	42	0	7394	BC	66-73
724	M	3	93	39	0	7146	BCD	64-71
729	M	3	102	44	0	6463	BCDE	65-69
MERCURY	M	3	87	42	10	6103	CDE	67-72
732	M	7	87	34	0	5994	DE	61-70
RICO 1	M	4	91	47	90	5900	DEF	65-70
728	S	4	89	42	0	5808	DEF	52-70
727	S	5	92	42	0	5726	EF	61-71
731	M	3	90	38	80	5583	EF	66-69
726	M	3	89	48	85	5558	EF	64-69
721	M	3	99	52	65	4602	FG	63-68
MARS	M	2	88	48	85	3859	G	67-71
C.V.		12.2	0.6	2.1		9.2		5.5-2.3

* L = LONG GRAIN, M = MEDIUM GRAIN, S = SHORT, I = INTERMEDIATE.
** SUBJECTIVE RATING 1 TO 9, WHERE 1 = EXCELLENT, 9 = POOR.
*** NUMBERS FOLLOWED BY THE SAME LETTER ARE NOT SIGNIFICANTLY DIFFERENT AT THE 0.05 LEVEL.

TABLE 30. AGRONOMIC PERFORMANCE OF 1988 PRELIMINARY YIELD TESTS, GROUP XX (AROMATICS), RICE RESEARCH STATION, CROWLEY, LA.

1988 ENTRY	GRAIN TYPE*	SEEDLING VIGOR**	DAYS TO 50% HEADING	PLANT HGT(IN)	LODGING (%)	YIELD (LB/A @12%)	DUNCAN'S TEST ***	MILLING % (WHL-TOT)
A-301	L	4	91	44	0	6913	A	63-72
737	L	4	87	39	0	6775	A	66-72
754	L	4	87	41	0	6637	A	66-73
752	L	4	87	41	0	6517	A	63-71
749	L	5	88	41	0	6507	A	60-72
753	L	5	87	43	0	6506	A	67-73
756	L	4	87	44	0	6500	A	62-71
748	L	5	88	42	0	6430	A	65-73
JASMINE	L	2	101	46	70	6319	A	58-68
744	L	4	89	40	0	6232	AB	60-73
745	L	4	86	43	0	6131	AB	60-74
738	L	4	87	41	5	6100	AB	61-71
746	L	4	86	42	10	5800	AB	61-73
736	L	5	84	41	55	5770	AB	66-72
742	L	5	90	45	65	5762	AB	62-72
755	L	4	88	47	70	5706	AB	58-71
747	L	5	90	42	0	5697	AB	57-71
751	L	5	87	42	85	5618	AB	55-71
739	L	4	86	43	40	5515	AB	66-72
740	L	4	85	42	25	5467	AB	66-72
750	L	4	91	39	0	5465	AB	66-73
741	L	5	86	45	90	5464	AB	62-72
743	L	5	88	45	90	5410	AB	58-72
757	L	5	85	43	90	4707	B	62-71
DELLA	L	3	94	57	90	3085	C	64-71
C.V.		8.2	0.7	4.0		10.6		3.8-1.2

* L = LONG GRAIN, M = MEDIUM GRAIN, S = SHORT, I = INTERMEDIATE.
** SUBJECTIVE RATING 1 TO 9, WHERE 1 = EXCELLENT, 9 = POOR.
*** NUMBERS FOLLOWED BY THE SAME LETTER ARE NOT SIGNIFICANTLY DIFFERENT AT THE 0.05 LEVEL.

TABLE 31. AGRONOMIC PERFORMANCE OF 1988 PRELIMINARY YIELD TESTS, GROUP XXI (AROMATICS), RICE RESEARCH STATION, CROWLEY, LA.

1988 ENTRY	GRAIN TYPE*	SEEDLING VIGOR**	DAYS TO 50% HEADING	PLANT HGT(IN)	LODGING (%)	YIELD (LB/A @12%)	DUNCAN'S TEST ***	MILLING % (WHL-TOT)
A-301	L	5	91	44	0	7351	A	54-71
767	L	5	89	41	5	6695	AB	68-73
778	L	4	96	45	0	6430	ABC	59-70
777	L	5	96	42	0	6303	ABC	64-72
764	L	5	93	40	0	6299	ABC	57-69
761	L	5	91	41	10	6297	ABC	64-72
765	L	4	90	40	10	6266	ABC	58-71
776	L	5	96	44	0	6228	ABC	60-70
781	L	4	97	44	0	6216	ABC	63-69
772	L	4	98	41	0	6210	ABC	60-71
763	L	5	92	40	0	6052	BCD	59-72
779	L	4	96	45	0	5985	BCD	60-69
766	L	5	90	40	0	5961	BCD	64-71
769	L	5	89	41	0	5958	BCD	55-70
774	L	4	96	43	0	5891	BCD	61-71
780	L	6	93	45	0	5719	BCDE	60-70
775	L	5	93	41	0	5700	CDE	66-71
773	L	5	89	44	15	5668	CDE	52-72
768	L	4	95	41	0	5623	CDE	57-70
770	L	4	96	43	20	5603	CDE	58-71
762	L	6	89	45	45	5519	CDE	67-72
771	L	4	100	44	0	5424	CDE	61-71
DELLA X2	L	4	95	49	90	4933	DE	63-70
JASMINE	L	3	102	45	85	4561	E	54-66
DELLA	L	3	92	56	90	3076	F	65-72
C.V.		10.6	1.0	2.5		8.4		4.9-1.4

* L = LONG GRAIN, M = MEDIUM GRAIN, S = SHORT, I = INTERMEDIATE.
** SUBJECTIVE RATING 1 TO 9, WHERE 1 = EXCELLENT, 9 = POOR.
*** NUMBERS FOLLOWED BY THE SAME LETTER ARE NOT SIGNIFICANTLY DIFFERENT AT THE 0.05 LEVEL.

TABLE 32. AGRONOMIC PERFORMANCE OF 1988 PRELIMINARY YIELD TESTS, GROUP XXII, RICE RESEARCH STATION, CROWLEY, LA.

1988 ENTRY	GRAIN TYPE*	DAYS TO 50% HEADING	PLANT HGT(IN)	LODGING (%)	YIELD (LB/A @12%)	DUNCAN'S TEST **	MILLING % (WHL-TOT)
796	L	80	40	0	6576	A	54-69
791	L	82	41	0	6541	AB	61-70
801	L	80	46	0	6378	ABC	64-70
792	L	78	41	0	6280	ABCD	60-71
793	L	74	42	0	6237	ABCD	60-70
803	L	84	38	0	5869	BCDE	63-71
798	L	81	43	0	5755	CDEF	63-70
797	L	78	38	0	5689	CDEF	64-72
804	L	82	39	0	5635	DEF	62-71
795	L	75	38	0	5590	DEF	53-69
789	M	75	39	0	5579	DEF	64-69
LEMONT	L	82	37	0	5506	EFG	63-72
786	L	78	41	0	5481	EFG	63-71
805	L	85	39	0	5478	EFG	61-71
787	M	73	41	0	5417	EFG	59-68
790	M	76	40	0	5307	EFG	65-70
802	L	84	43	0	5289	EFGH	62-71
TEBONNET	L	72	53	20	5266	EFGH	60-69
788	M	76	39	0	5208	EFGH	64-69
800	M	82	38	0	5163	EFGH	67-70
806	L	72	47	0	5145	EFGH	58-69
799	M	69	35	0	5032	FGH	63-69
794	M	75	41	0	4799	GH	59-68
807	L	76	41	0	4587	H	57-70
C.V.		1.3	2.3		5.4		5.2-1.5

* L = LONG GRAIN, M = MEDIUM GRAIN, S = SHORT, I = INTERMEDIATE.
** NUMBERS FOLLOWED BY THE SAME LETTER ARE NOT SIGNIFICANTLY DIFFERENT AT THE 0.05 LEVEL.

TABLE 33. AGRONOMIC PERFORMANCE OF 1988 PRELIMINARY YIELD TESTS, GROUP XXIII, RICE RESEARCH STATION, CROWLEY, LA.

1988 ENTRY	GRAIN TYPE*	DAYS TO 50% HEADING	PLANT HGT(IN)	LODGING (%)	YIELD (LB/A @12%)	DUNCAN'S TEST **	MILLING % (WHL-TOT)
8702211	L	80	41	0	6722	A	65-71
811	L	81	39	0	6638	AB	60-70
819	L	79	40	0	6223	ABC	63-71
815	L	84	38	0	6186	ABC	62-71
830	L	79	40	0	6057	ABCD	64-72
821	L	80	42	0	6029	ABCD	62-71
816	L	84	38	0	5996	ABCD	63-71
828	L	79	41	0	5961	ABCDE	62-72
822	L	79	41	0	5915	ABCDEF	63-70
820	L	79	39	0	5879	ABCDEF	64-72
825	L	82	39	0	5873	ABCDEF	63-71
827	L	81	40	0	5856	ABCDEF	65-72
814	L	81	39	0	5835	BCDEF	64-72
829	L	80	39	0	5825	BCDEF	63-72
818	L	81	41	0	5822	BCDEF	62-71
817	L	78	40	0	5809	BCDEF	64-72
824	L	81	40	0	5761	BCDEF	63-71
823	L	82	40	0	5697	CDEF	63-71
810	L	85	40	0	5696	CDEF	60-71
832	L	84	40	0	5554	CDEF	63-72
831	L	82	39	0	5539	CDEF	64-71
813	L	76	40	0	5236	DEF	62-70
826	L	80	39	0	5087	EF	62-71
812	L	87	40	0	5073	F	62-70
C.V.		0.6	2.0		6.1		2.0-1.3

* L = LONG GRAIN, M = MEDIUM GRAIN, S = SHORT, I = INTERMEDIATE.
** NUMBERS FOLLOWED BY THE SAME LETTER ARE NOT SIGNIFICANTLY DIFFERENT AT THE 0.05 LEVEL.

MULTIPLE GENERATION RICE BREEDING NURSERY[1/][2/]

S.D. Linscombe, F. Jodari, A.P. Fabacher, L.M. White, and L. Aviles

INTRODUCTION

In order to maintain a prosperous Louisiana rice industry, it is essential to carry out an ongoing program to increase production and quality through plant breeding. Genetic potential to elevate yields of adapted Louisiana rice cultivars exists and is currently being used by the rice breeding project. Sources of resistance to environmental stresses, as well as to disease and insect pests, are available for use in rice breeding. Development of high yielding rice cultivars that efficiently utilize plant nutrients, are resistant to pests and lodging, and have good milling and cooking qualities will greatly improve the profitability of rice production in Louisiana.

A major limitation to the speed at which desirable genetic characters can be transferred into adapted lines in inbred crops, such as rice, is the number of generations that can be produced per year. For many complex and economically important characters, it may require four or more generations before breeding lines have reached a significant level of homozygosity to allow even a preliminary evaluation. Production of only one generation of breeding material per year after the initial hybridization makes varietal development a very slow process. The production of two or more generations of breeding material per year decreases the time required to advance breeding lines to the point where they can be evaluated for complex characteristics, such as yield, milling quality, and other important varietal characteristics.

A winter nursery is an essential and integral feature of a modern rice breeding program. The nursery allows the production of additional generations of breeding material per year thus decreasing the time required to develop new varieties. The winter nursery also permits an opportunity to practice disruptive selection in another environment and the growing of elite selections of germplasm not adapted to the Louisiana environment.

The Agricultural Experiment Stations of Arkansas, Louisiana, Texas, and Puerto Rico have a cooperative agreement to operate a year-round rice nursery on the Puerto Rico Experiment Station located at Lajas for the purpose of advancing and seed increase of breeding lines. This cooperative venture has made possible the expansion of nursery facilities, equipment, and labor and is allowing these rice breeding programs to grow more breeding lines to expedite the development and release of improved rice varieties for the southern United States.

1/ Cooperative investigations, Louisiana Agricultural Experiment Station, Crowley, LA; University of Puerto Rico Agricultural Experiment Station, Lajas, PR; Texas Agricultural Experiment Station, Beaumont, TX; and Arkansas Agricultural Experiment Station, Stuttgart, AR.

2/ This research is supported in part by funds provided by rice producers through the Louisiana Rice Research Board.

1988-89 ACTIVITIES

The September 1987 nursery planting by Louisiana, Arkansas, and Texas was successful and harvested in January 1988. The Louisiana nursery included a seed increase of an experimental semidwarf aromatic line, breeding lines, sheath blight resistant lines from the Rice Research Station Genetics and Pathology projects and rice water weevil tolerant lines from the Entomology project. A second planting of an additional 9,000 rows was made by the Louisiana, Arkansas, and Texas breeding programs in January 1988. This nursery contained 1,500 rows from the Rice Research Station and 1,500 rows replanted from the September 1987 nursery. In May 1988, the January 1988 nursery was harvested and approximately 4,500 selections from that nursery were returned for planting at the Rice Research Station.

A September 1988 nursery of 6,000 rows was planted by the Louisiana and Texas breeding programs. This nursery was harvested in January 1989 and 2,200 selections were returned to the Rice Research Station. The January 1989 nursery was planted and contained 1,800 rows from the Rice Research Station and 1,200 replanted from the September 1988 nursery.

This sequence of selection and replanting of the nursery allows the production of three successive generations in one year. This rapid advancement of breeding material should be beneficial in hastening rice variety development.

FISSURING SUSCEPTIBILITIES OF CURRENT RICE VARIETIES

F. Jodari and S.D. Linscombe

High milling quality is an essential characteristic for any successful rice variety and milling quality itself is mainly determined by the percentage of whole kernel or head rice yield. Part of the grain breakage that occurs during the milling process is preceded by fissuring or cracking of the individual grains. Fissuring occurs when relatively dry rice grains absorb moisture from the air. It is known that rice varieties have different susceptibilities to fissuring.

In 1988, preliminary studies were initiated in cooperation with the Texas A&M University Agricultural Engineering department to develop standard procedures for determining the degree of susceptibility of current rice varieties to fissuring. All of the varieties tested are currently being used in the rice breeding program.

Series of experiments were conducted using eight long-grain and seven medium- or short-grain varieties. Milling samples were taken at optimum harvest moisture to minimize their exposure to severe temperature and humidity fluctuations. After slow drying the samples to 12% moisture, their milling yields were determined using the standard milling procedures. Equilibrated subsamples in the form of brown and rough rice were then taken and exposed to various static temperature, humidity, and timing that would produce fissures in the range of 10 and 90% for the resistant and susceptible varieties, respectively. A temperature of 26 to 28°C was chosen. Exposure time was 45 minutes for brown rice and 20 hours for rough rice. Grain length, width, and length/width ratio of brown rice were also determined.

Distinct differences in fissuring were found among varieties for both brown and rough rice (Table 1). Among long-grain varieties, Lemont produced the highest fissured grains at 47% for rough rice and 74% for brown rice. Newbonnet and Labelle were most resistant with 9% each for rough rice and 22 and 14% for brown rice, respectively. Medium and short grains showed considerably higher fissured grains than long grains. The short-grain variety S-201 had the highest fissured grains at 74%. Varieties Mercury, Nortai, and Mars were among the most susceptible medium grains. Nato was the most resistant with only 15% fissured grains. Although the California medium grain M-202 has the widest grain among the medium grains, it produced the least amount of fissured grains in its group. This suggests that factors other than grain configuration are also influencing the fissuring.

Table 1. Milling yield, grain dimension, and fissuring of 15 rice varieties. Rice Research Station, Crowley, LA. 1988.

Variety	Milling yield	Grain length (L)	Grain width (W)	L/W Ratio	Fissuring Rough rice	Fissuring Brown rice
	(%)	---(mm/15 KL)----			------(%)-------	
Long grains						
Lemont	62	112	36	3.14	47	74
Labelle	58	102	31	3.34	9	14
Tebonnet	60	108	32	3.36	23	35
Newbonnet	58	108	32	3.38	9	22
TORO 2	65	119	34	3.49	16	14
Rexmont	55	110	33	3.39	19	28
IRGA 409	59	111	33	3.36	20	31
L-202	49	120	34	3.58	20	45
Medium and short grains						
Mars	68	93	39	2.39	56	78
M-202	66	94	44	2.16	25	30
Nato	68	88	39	2.24	15	15
Mercury	67	93	39	2.39	69	72
Nortai	65	82	42	1.94	67	78
S-201	60	83	48	1.73	74	74
S-101	64	82	44	1.85	43	31

No significant correlation was found between milling yield and fissuring (Table 2). For long-grain varieties, a high correlation of 0.82 was found between grain width and fissuring of rough rice. Among medium grains, there was no correlation between grain size and fissuring. Apparently other factors such as chemical composition are influencing fissuring. This was especially true with medium- or short-grain varieties.

Starch composition and other related chemical components of the grain will be correlated with fissuring to determine their individual or combined influence. Possible use of fissuring information for screening of breeding lines for higher milling qualities will also be evaluated.

Table 2. Correlation coefficients between milling yield, grain size, and fissuring of rough rice.

	Fissuring		
	Long-, medium- and short-grain varieties	Long-grain varieties	Medium- and short-grain varieties
Milling yield	0.40	0.21	-0.48
	0.14*	0.62	0.28
Grain length (L)	-0.62	0.24	-0.27
	0.01	0.57	0.56
Grain width (W)	0.71	0.82	0.23
	0.01	0.01	0.62
L/W ratio	-0.71	-0.62	-0.26
	0.01	0.10	0.58
Fissuring (brown rice)	0.91	0.93	0.93
	0.01	0.01	0.01

* Significant probability of Pearson correlation.

DEVELOPMENT OF LONG-GRAIN SHEATH BLIGHT RESISTANT GERMPLASM

E.M. Nowick and D.E. Groth

In 1986, progeny lines from the first through fourth backcross of Lemont to Tetep were screened for resistance to sheath blight in replicated field tests. Individual plants were selected from those progeny lines which were significantly more resistant to sheath blight caused by Rhizoctinia solani (Kuhn) than the susceptible parent Lemont. All selected plants were progeny tested for sheath blight resistance in 1987 in replicated field tests. Any plants with improved resistance, shorter plant height, and early maturity were again tested in 1988.

MATERIALS AND METHODS

Individual plants were harvested from the rows which fell into the most resistant category in a Duncan's multiple range test in the 1986 field trials. In addition, any short early plants having disease ratings of 4 or better were harvested and advanced one generation in the winter nursery in Puerto Rico. Individual panicles were harvested from the plant rows in the winter nursery for testing in the F_4 generation.

For those plants selected only on the basis of disease rating, F_3 progeny from individual F_2 plants were drill-seeded into 1-m rows with 25 cm between rows in 1987. Each F_3 progeny line was tested in three replicates. Plants were inoculated by spreading infected rice hull mixture on the plants near the water surface at the late-tillering stage. For the plants selected for plant type, as well as for resistance, the test was similar except that F_4 panicle rows were planted and separate panicles from F_3 winter nursery rows served as replicates. Rows were rated on a scale of 0-9 where 0 indicated no infection and 9 indicated that the entire plant row was dead.

For the 1988 test, lines harvested from the 1987 tests were planted and tested for resistance as in previous years.

RESULTS

The germplasm line PR6555 has been released from the Tetep X Lemont backcross program based on 3 years of testing for resistance to sheath blight. This line has moderate resistance to sheath blight, is somewhat earlier than Lemont, and has a semidwarf growth habit.

REFERENCES

Nowick, E.M. and D.E. Groth. 1989. Registration of PR6555 rice germplasm with moderate resistance to sheath blight. Crop Sci. 29:(in press).

EVALUATION OF *ORYZA* SP. FOR RESISTANCE TO THE RICE WATER WEEVIL

E.M. Nowick and J.F. Robinson

INTRODUCTION

Because no cultivars with a high level of resistance to the rice water weevil have been identified despite considerable screening efforts, the search was extended several years ago to the species related to cultivated rice. Since the rice water weevil is native to the Americas, the *Oryza* species native to S. America are being collected and evaluated for resistance.

MATERIALS AND METHODS

Fifty-five accessions of *Oryza* native to the lower Amazon basin were evaluated in 1988. Dormancy was broken in each accsesion and plantlets transplanted to the field at the five-leaf growth stage. Four replicates were grown with three plants per replicate. In each rep, one plant was treated with carbofuran and two plants were left untreated. Plants were evaluated for number of larvae feeding on the roots and the roots were visually rated for feeding damage and regrowth 30 days after transplanting. Height and weight of both the treated and untreated plants were also determined.

RESULTS

Lower larval counts in the untreated than in the treated plants in some of the lines may indicate the presence of antibiosis, while the lack of stunting in the untreated as compared to the treated plants may indicate some level of tolerance (Table 1). A second year's data is needed to confirm these results.

Table 1. Evaluation of *Oryza* accessions for rice water weevil resistance. Rice Research Station, Crowley, LA. 1988.

Line	CF	L/C	FRR	RRR	Weight	Height
51	T	39	8	6	104.20	75.23
51	UT	14*	7	6	52.80	66.65
50	T	16	8	7	221.50	76.00
50	UT	15*	9	.	.	.
28	T	38	8	6	227.50	75.65
28	UT	17*	9	.	.	.
37	T	26	6	7	164.10	89.80
37	UT	17*	8	7	197.25*	81.75
44	T	51	9	7	271.10	79.00
44	UT	18*	9	.	.	.
35	T	52	6	4	149.05	72.10
35	UT	20*	9	6	.	.
24	T	32	8	8	293.00	80.75
24	UT	23*	7	5	126.00	65.00
42	T	26	7	6	225.27	71.45
42	UT	23*	8	7	299.45*	62.38
45	T	53	6	7	350.15	73.85
45	UT	24*	9	8	485.60*	73.85
2	T	33	6	6	134.60	67.35
2	UT	25*	9	7	147.50*	60.50
17	T	40	9	7	246.40	89.83
17	UT	26*	9	7	168.70	65.10
23	T	30	8	7	293.30	82.33
23	UT	30	8	7	233.60	83.15
13	T	49	8	8	414.43	84.87
13	UT	33*	9	7	173.70	59.80
19	T	12	8	5	197.40	81.70
19	UT	33	9	.	.	.
26	T	62	7	6	388.35	93.80
26	UT	33*	7	6	576.83*	101.50*

Continued.

Table 1. Continued.

Line	CF	L/C	FRR	RRR	Weight	Height
30	T	42	6	7	135.30	84.00
30	UT	34*	9	7	206.20*	77.40
15	T	40	8	7	231.55	55.75
15	UT	35*	9	.	.	.
16	T	14	3	.	.	.
16	UT	35	9	.	.	.
43	T	54	6	7	468.95	66.00
43	UT	35*	8	5	307.00	63.00
29	T	49	8	6	199.90	83.20
29	UT	37*	9	8	197.23	85.30*
39	T	63	7	6	216.10	85.25
39	UT	37*	9	5	215.30	90.10*
9	T	38	7	5	116.65	60.25
9	UT	38	9	9	102.40	48.00
10	T	24	5	5	73.65	71.00
10	UT	38	4	.	.	.
54	T	44	7	6	530.15	89.00
54	UT	40*	8	7	684.87*	86.50
32	T	39	8	6	327.73	86.67
32	UT	41	8	6	336.43*	80.40
36	T	63	7	6	153.47	86.93
36	UT	42*	7	6	332.00*	94.75*
6	T	51	8	5	211.80	76.50
6	UT	43*	9	.	.	.
22	T	39	6	6	198.10	89.10
22	UT	43	9	7	435.17*	92.67*
47	T	31	8	6	792.85	92.30
47	UT	43	9	7	564.83	78.13
31	T	48	7	6	310.93	97.40
31	UT	44*	6	6	325.45*	92.25

Continued.

Table 1. Continued.

Line	CF	L/C	FRR	RRR	Weight	Height
20	T	50	6	5	158.20	75.00
20	UT	45*	9	7	143.40	81.70*
21	T	46	8	7	307.15	76.45
21	UT	45*	8	7	351.10*	83.00*
38	T	50	7	7	332.53	96.17
38	UT	47*	6	5	171.60	82.60
18	T	24	7	7	172.37	63.83
18	UT	48	8	6	255.70*	73.00*
25	T	27	6	5	179.00	101.00
25	UT	48	9	7	184.95*	87.25
5	T	42	8	7	637.20	68.10
5	UT	49	8	7	507.90	74.15*
11	T	63	7	7	422.10	76.60
11	UT	49*	9	6	640.13*	79.07*
34	T	30	9	7	142.10	75.00
34	UT	50	9	7	257.90*	91.00*
8	T	48	8	7	339.73	71.50
8	UT	51	9	8	282.40	80.35*
12	T	54	8	7	536.00	81.57
12	UT	52*	9	7	722.07*	90.00*
27	T	41	7	7	379.00	102.37
27	UT	52	7	6	268.35	95.80
40	T	67	8	8	523.83	74.13
40	UT	52*	9	7	388.95	83.50*
46	T	70	8	6	660.50	82.03
46	UT	52*	9	7	960.63*	82.00
14	T	43	7	7	419.43	85.63
14	UT	53	8	7	546.60*	82.93
52	T	45	8	8	330.77	92.07
52	UT	53	9	7	310.83	82.00

Continued.

Table 1. Continued.

Line	CF	L/C	FRR	RRR	Weight	Height
49	T	52	6	5	753.30	90.40
49	UT	57	8	5	693.73	83.50
53	T	49	8	6	298.80	81.43
53	UT	57	9	8	486.93*	77.53
7	T	28	8	8	114.60	70.70
7	UT	58	9	8	212.30*	62.80
41	T	39	7	7	386.23	73.40
41	UT	58	9	8	427.00*	74.30*
55	T	19	6	6	134.40	62.80
55	UT	58	9	8	446.92*	93.12*
4	T	33	8	6	404.60	71.33
4	UT	59	9	6	613.45*	67.90
33	T	47	8	7	292.77	97.10
33	UT	62	9	9	201.35	89.60
56(MARS)	T	54	7	8	575.60	88.25
56(MARS)	UT	64	8	8	555.33	93.67*
1	T	64	8	7	347.33	88.73
1	UT	65	9	6	434.87*	81.20
3	T	59	7	5	471.10	84.13
3	UT	73	8	4	693.40*	84.65*
48	T	48	7	7	505.80	79.95
48	UT	85	8	6	965.85*	90.55*

CF = Carbofuran treated or untreated; FFR = Feeding damage rating: 0 = no damage and 9 = high damage; RRR = Recovery rating: 0 = high recovery and 9 = no recovery; Weight = Wet weight plant and roots; Height = Height at maturity.

CEREAL CROPS BIOTECHNOLOGY RESEARCH

IMPROVEMENT OF WHEAT AND FORAGE CROPS THROUGH TISSUE CULTURE

T.P. Croughan, S.A. Harrison, D.E. Groth, J.L. Griffin, and M.M. Meche

Activities in this project have included: 1) the initiation of callus cultures from immature embryos of the wheat cultivars Coker 762, Coker 916, Coker 93-23, Roy, Omega 78, McNair 1003, Milburn, Probrand 812, and Florida 302; 2) the development of over 10,000 regenerated plants from these varieties; 3) field evaluations of progeny rows from approximately 5,000 regenerated lines; 4) identification of lines exhibiting improved agronomic characters and disease resistance; and 5) approximately 3 hectares of yield testing of the most promising lines in replicated yield plots. Evaluation for disease resistance identified several lines showing improved resistance to leaf rust for three years, having been evaluated in one location the first two years and two locations the third year. Yield testing identified several high yielding lines which are currently in advanced testing. Two of these high yielding lines also exhibited improved tillering characteristics and increased leaf size, and their performance as a forage wheat is currently under evaluation. Recent expansion of activities with wheat have included the initiation of wheat anther culture utilizing material from Louisiana's wheat breeding program.

PROTOPLAST REGENERATION FROM ANTHER CALLI OF INDICA X U.S. HYBRID RICE (*Oryza sativa* L.)[1/]

T.P. Croughan and Q.R. Chu

Regeneration of haploid, diploid, and tetraploid plants was obtained from protoplasts isolated from cell suspension cultures of anther calli of the *indica* x U.S. rice hybrid, Short Tetep/Lemont (*Oryza sativa* L.). Cell suspensions in SA and AA2 media containing amino acids grew rapidly and produced finely dispersed suspensions. Protoplasts isolated from these cells were cultured using agarose bead nurse culture. High plating efficiencies were obtained at cell densities of 5×10^5 cells/ml. Among 245 regenerated plants, 73.9% were haploid, 15.3% were diploid, and 0.8% were tetraploid.

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

CHARACTERISTIC VARIATION AND SEGREGATION IN F_2 POPULATIONS DERIVED FROM IMMATURE PANICLE CULTURE OF RICE HYBRIDS[1/]

T.P. Croughan, H.J. Huang, and Q.R. Chu

An evaluation was made to determine the effect of immature panicle culture on rice hybrids. Ten characters were evaluated in conventional F_2 populations and the corresponding SCF_2 populations derived from immature panicle culture of Lemont/IR36, Lemont/Short Tetep, Lemont/Gui Chow, and Short Tetep/Gui Chow. Significant differences were found for variance and mean performance. Characters such as leaf length, panicle length, plant height, threshability, and apiculus color were significantly more variable in the SCF_2 populations. Analysis of variance of the 10 traits and mean comparison by L.S.D. indicated that individuals in the SCF_2 populations tended to resemble the parent of higher culturability. Based on the evaluation of overall characters, more recombinants resembling Lemont were obtained in SCF_2's than the corresponding F_2's derived from Lemont/IR36, Lemont/Short Tetep, and Lemont/Gui Chow, suggesting that immature panicle culture of hybrids tends to produce populations more like the parent with higher culturability.

IMMATURE PANICLE CULTURE OF RICE: GENETICS OF PLANT REGENERATION[1/]

Q.R. Chu, X.H. Wang, M.M. Meche, and T.P. Croughan

A total of 6,332 immature rice panicles derived from 10 cultivars representing various geographic origins were tested for genotypic differences in plant regeneration. Significant differences in plant regeneration rates were found among the 10 cultivars. The four cultivars Lemont, IR36, Short Tetep, and Gui Chow were selected as representing different plant regeneration rates and used as parents in a diallel cross. The parents (P) and their 12 F_2's, 12 F_3's, 12 P_1F_1's (backcross to parent 1), and 12 P_2F_1's (backcross to parent 2) were cultured *in vitro* to conduct a study on the genetics of plant regeneration from immature panicle culture of rice.

The cultivar Lemont possessed a high regeneration rate and this character was inherited by its progenies. In contrast, the *indica* rice cultivar IR36 and its progenies had low rates of regeneration. The heritability estimate calculated by parent-offspring regression was 0.25. Generation mean analysis of regeneration reveals larger relative magnitudes and significance for the estimates of dominance gene effects (d), additive x additive (aa), and dominance x dominance (dd). Hybridization is therefore an efficient method for transferring high regeneration rates into germplasm lacking this character.

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

THE RELATIONSHIP BETWEEN HARVEST MOISTURE AND MILLING YIELD FOR COMMERCIAL AND EXPERIMENTAL RICE LINES

M.F. Miller, S.D. Linscombe, and F. Jodari

INTRODUCTION

The objectives of this project are as follows:

1. To determine what effect harvest moisture has on milling yield.

2. To determine what effect drying, rewetting, and redrying of rice in the field has on milling yield.

3. To determine the optimum harvest moisture and milling characteristics of commercial and experimental rice lines.

MATERIALS AND METHODS

This project is conducted in cooperation with the plant breeding program at the Rice Research Station. Two experimental lines were sampled in 1988. They were 201 and 211, both long-grain lines. Two years of data were combined for the 201 report and 1 year for the 211. Harvesting was done by hand over an extended period of time, starting when the grain moisture was at approximately 27% for 201 and 28% for 211 and continuing until it was down to 12.5%. During this interval, there was drying in the field by sun and wind, rewetting of the grain due to rain and dew and then redrying. After harvesting the samples were threshed and cleaned before the bushel weight and grain moisture were taken. Samples were then dried to approximately 12% using heated air. Grain temperature was not allowed to go above 105°F. When dry, the samples were sealed in pint jars and allowed to equilibrate until they were milled. The milling was done using standard laboratory equipment. USDA approved procedures were used to obtain yield data.

RESULTS AND DISCUSSION

Milling yield for variety 201 is shown by Figure 1 and variety 211 by Figure 2. The percent brown rice and total and the bushel weight for 201 showed a linear relationship with harvest moisture. The maximum head yield appeared to occur when grain moisture was near 19.5%.

The maximum head yield for 211 occurred when the grain moisture was around 21.5%. Maximum bushel weight was obtained when the harvest moisture was near 17%. The percent of brown rice changed very little in relation to time of harvest. Bushel weight increased as harvest moisture decreased, with the maximum occurring when harvested at 17 to 18% grain moisture.

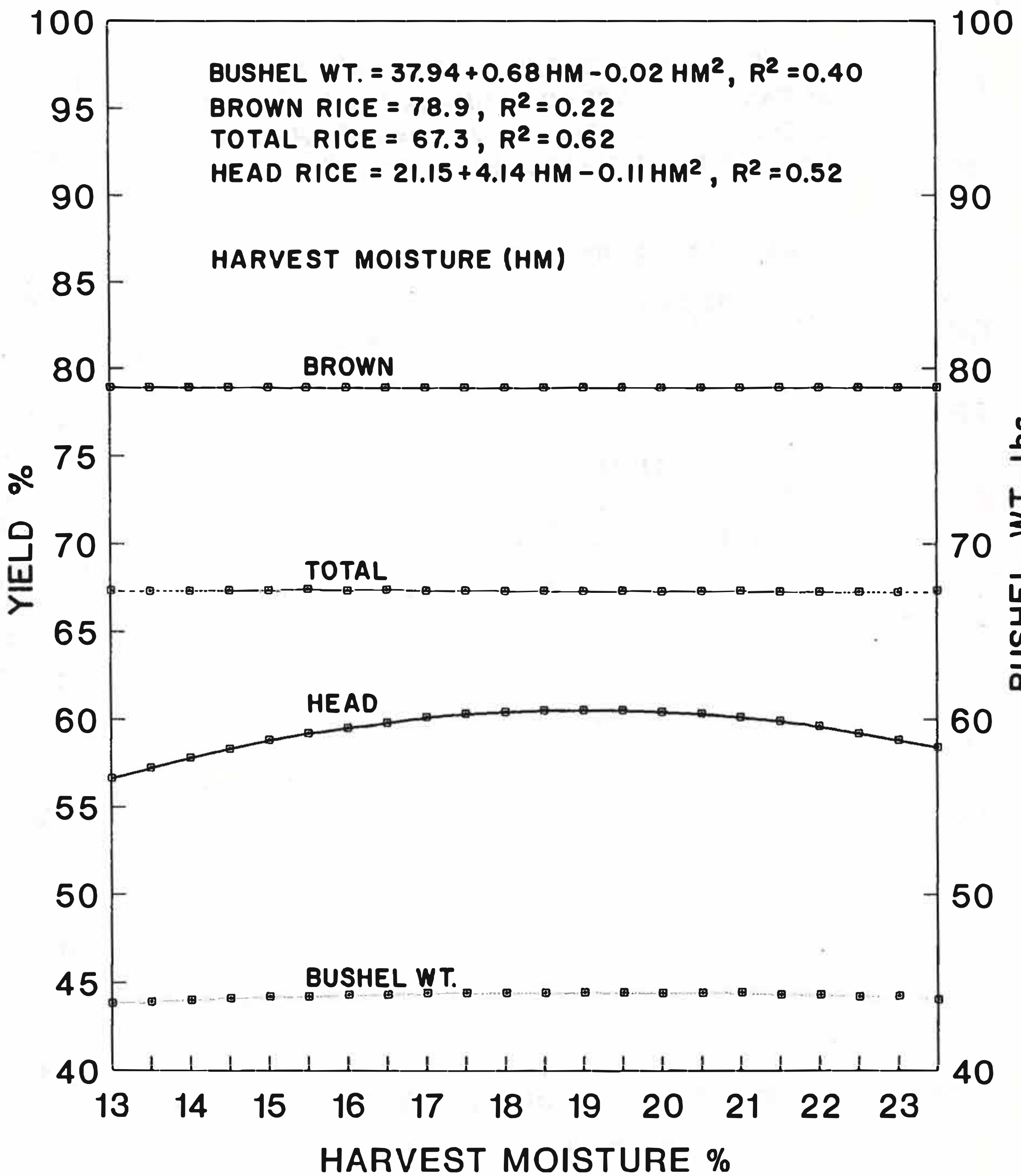

Figure 1. Effect of grain moisture at harvest on milling yield and bushel weight for 201.

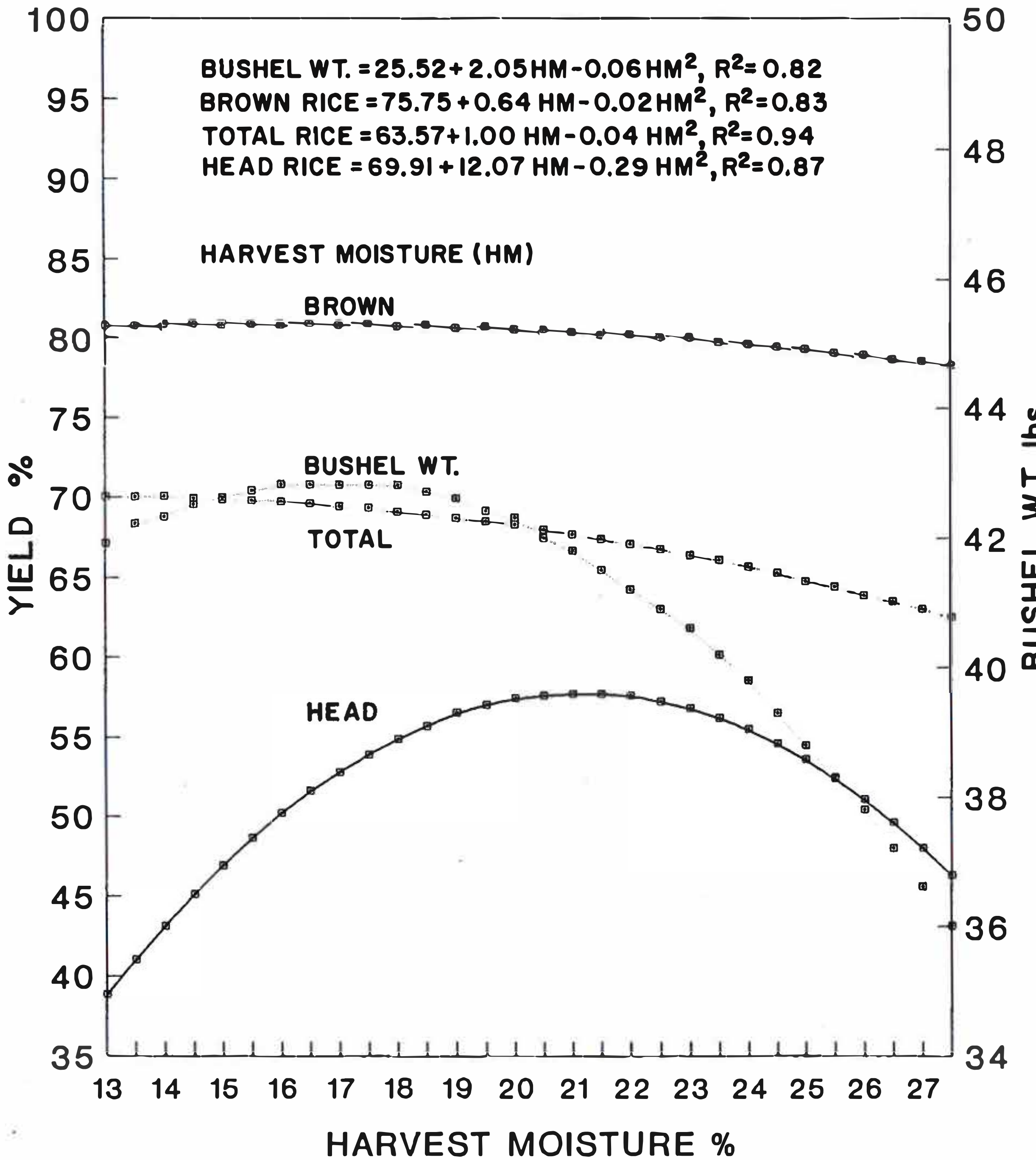

Figure 2. Effect of grain moisture at harvest on milling yield and bushel weight for 211.

RICE FERTILIZATION AND CULTURAL MANAGEMENT[1/]

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

P.K. Bollich, W.J. Leonards, Jr., S.M. Rawls, 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 applying split applications, 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

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

rice producing areas of Louisiana provides valuable information for developing fertilization and management strategies for new varieties.

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 and time of N application for each variety.

MATERIALS AND METHODS

Fifteen rice varieties and/or advanced experimental lines were grouped by grain type and/or maturity for testing:

1. Early medium grain: Mars, Mercury (MERC), Rico 1, V4716

2. Very early long grain: Tebonnet (TBNT), Skybonnet (SKBT), V7713, 3083, 3113

3. Early long grain: Lemont (LMNT), Gulfmont (GFMT), CB801, V7817, 2201, 1179

Mars is a tall, early season medium-grain variety with good yield potential. It is susceptible to lodging, especially at high rates of N fertilization. Mercury is a semidwarf medium grain released from the breeding program in Louisiana in 1987. Straw strength of Mercury is similar to that of Mars but is more resistant to lodging at high N rates, due mainly to its shorter height. Yield potential of Mars and Mercury appear to be similar, with each displaying good second crop potential. Rico 1 is a tall mid-season medium grain released from the breeding program in Texas in 1987. It is susceptible to lodging, but appears to have higher yield potential than either Mars or Mercury. The variety V4716 is a semidwarf medium grain released from Ricetec (Alvin, Texas) in 1987. First and second crop yield potential appear to be similar to Mars and Mercury.

Tebonnet is a tall variety developed in Arkansas. It has displayed high yield potential and is susceptible to lodging. Skybonnet, a Texas variety, is later maturing and has displayed somewhat less yield potential than Tebonnet in previous tests. Skybonnet is shorter than Tebonnet, has better lodging resistance, and has excellent second crop yield potential. V7713 is a very early maturing long grain variety developed by Ricetec. This variety matures approximately 3 weeks earlier than Tebonnet. Although short in stature, straw strength appears to be weak, and V7713 is susceptible to lodging.

The early long-grain group includes the Texas semidwarf varieties Lemont and Gulfmont. Lemont has consistently shown excellent yield potential, is resistant to lodging, and responds well to high levels of fertilizer N. Gulfmont is very similar to Lemont in growth habit, and is 2 to 3 days earlier. It has yield potential similar to Lemont, and both have produced good second crop yields in previous tests. CB801 is a Ricetec mid-season semidwarf variety that is resistant to lodging and appears to have very good yield potential, responding to high levels of fertilizer N. The variety V7817 was also developed by Ricetec and is very similar in characteristics to CB801. These two varieties mature later than Lemont and are somewhat shorter in height. Advanced experimental line 2201 was developed in the Louisiana breeding program. It is a semidwarf with good lodging resistance and has displayed good yield potential in the first and second crops. Height and maturity are similar to that of Lemont and Gulfmont. Advanced experimental line 1179 was developed in the Arkansas breeding program. This is a tall, mid-season line that is susceptible to lodging.

Varieties and advanced experimental lines were tested in two different studies. Not all materials were included in each test. The variety by N trials included eight N rates ranging from 0 to 150 lb/A in 30 lb/A increments, with N being applied as single and split applications. Varieties were grouped according to maturity and grain type. The performance trials included three N rates ranging from 90 to 150 lb/A in 30 lb/A increments, with N being applied as a single application. Varieties were grouped according to maturity only.

Fertilizer nitrogen was banded approximately 2 inches deep 1 to 2 days prior to flooding in the water-seeded experiments. In soils requiring P and K, approximately 60 lb/A P_2O_5 and K_2O were also banded with N as ammonium sulfate. The 90 lb N/A rate was also split to provide 60 lb N/A preplant with 30 lb N/A applied at either panicle initiation (green ring) or panicle differentiation (panicle 2 mm) growth stages. In drill-seeded experiments, basal N treatments were applied as a broadcast application prior to establishment of the permanent flood, with split applications of the 90 lb N/A rate applied as in the water-seeded experiments.

Water-seeded experiments were seeded at the rate of 150 lb/A with presoaked seed. After 3 to 4 days, some 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 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), when necessary, was practiced according to current recommendations. Individual whole plots were combine-harvested at field maturity. Days to 50% heading, plant height, lodging, grain moisture, grain yield, and milling yield were measured.

Second crop data were generated in the Vermilion Parish and Rice Research Station variety evaluations. Following main crop harvest, the stubble was clipped to a uniform height (8 to 12 inches, depending on trial). Either 45 or 60 lb N/A was 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 moisture and grain yield were determined.

Plant growth stages were determined in the performance trials at the Rice Research Station and in East Carroll Parish for use in updating or establishing predictions in the DD50 Rice Management Program (Tables 15 and 16).

SUMMARY AND CONCLUSIONS

Field experiments were conducted at the Rice Research Station and in East Carroll and Vermilion parishes to determine N response and agronomic performance of commercial varieties and advanced experimental lines when grown in different environments.

Seedling vigor was generally very good for most of the medium-grain varieties that were water seeded at the Rice Research Station. Vigor was poor, however, for the medium-grain Rico 1. Many of the long grains were considered to be fair to poor in seedling vigor when water seeded. V7713 displayed very good vigor, while vigor of Skybonnet was poor. In Vermilion Parish, seedling vigor was very poor for Tebonnet and Skybonnet, and resulted in slow early-season growth and stand establishment. Mars and Mercury, and Lemont, Gulfmont, and 2201 displayed good to moderate vigor, respectively. Seedling vigor was moderate to poor for all drill-seeded varieties in East Carroll Parish.

Lodging was severe for many of the taller entries at high rates of N in the water-seeded evaluations. Although short in stature, V7713 lodged severely at moderate levels of N. Most of the susceptible varieties lodged at rates of N above 90 lb/A. Tebonnet and Skybonnet lodged severely in Vermilion Parish at low levels of N. These same varieties responded well to high levels of N in the drill-seeded evaluations in East Carroll Parish.

Nitrogen rates ranging from 90 to 120 lb/A were considered to be optimum for most entries at the Rice Research Station. V7817 and experimental lines 2201 and 3113 required 150 lb N/A for optimum yield. Average grain yields based on optimum N fertilization for all varieties ranged from 6800 to 9200 lb/A. Yield potential for V7713 appears to be significantly less than all other entries. Yield potential was similar for Lemont, Gulfmont, Mercury, Tebonnet, 2201, 3083, 3113, V4716, CB801, and V7817. Less N was required for optimum grain yields in Vermilion Parish. Mars, Mercury, Tebonnet, and Skybonnet produced optimum grain yields at 90 lb N/A. Lemont, Gulfmont, and experimental line 2201 required only 60 lb N/A. The lower N requirement was probably due to a severe sheath blight infestation at higher levels of applied N. Mars, Mercury, Lemont, and 2201 were similar in yield potential, with an average of 7000 lb/A. Nitrogen rates ranging from 90 to 150 lb/A were required for optimum grain yields in East Carroll Parish, even for the taller, lodging susceptible varieties. Difficulty in stand establishment, slow plant growth, and a delayed permanent flood resulted in somewhat lower yields than in previous years. Rico 1 appears to have very high yield potential, since average yield for this variety was approximately 1000 lb/A higher than the other entries. Grain yields were generally higher for the medium-grain varieties. Yields of Lemont, Gulfmont, 2201, CB801, and V7817 were similar.

Head rice milling yields for Tebonnet, V7817, and V4716 were significantly lower than the other entries at the Rice Research Station (Table 14). Total and head rice yields were generally higher in East Carroll Parish for most entries with the exception of V7713.

Second crop grain yields were generally good at the Rice Research Station. Tebonnet, Skybonnet, and Gulfmont averaged over 2300 lb/A. Yields of Mars, Mercury, Lemont, 2201, 3083, and 3113 yielded somewhat less. Regrowth of V7713 stubble was poor, and was probably due to severe lodging of the main crop. Second crop production for this variety was actually the result of a seed crop, which originated from shattering loss in the main crop. Second crop yields in Vermilion Parish were also above 2000 lb/A for the varieties Skybonnet, Mars, and Mercury. Regrowth of Tebonnet was influenced by lodging in the first crop, and yields were decreased when main crop N was above 30 lb/A. Slow growth and cool temperatures during reproductive growth inhibited grain formation for Lemont, Gulfmont, and 2201.

Experiment: Early medium grain x nitrogen trial

Location: Rice Research Station

Soil Type/Analysis: Crowley silt loam; ph: 6.8; O.M.: 0.78%; extractable nutrients (mg/kg): P-8, Na-57, K-83, Ca-1261, Mg-272, Zn-1.03, S-4.90, As-2.71

Variety/Seeding Rate: MARS, MERC, 150 lb/A

Planting Method/Date: Water-seeded, Apr 13

Fertilization: 60 lb/A P_2O_5 and K_2O ppi; nitrogen source, ammonium sulfate; second crop, 60 lb N/A

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

Emergence Date: MERC, Apr 18; MARS, Apr 19

Water Management: Flooded, Apr 12; drained, June 7; reflooded, June 9; harvest drainage, July 27; second crop flooded, Aug 17; harvest drainage, Oct 31

Herbicides: 0.6 oz ai/A Londax (bensulfuron-methyl), May 13; 1.0 lb ai/A Basagran (bentazon), June 8

Insecticides: 0.6 lb ai/A Furadan (carbofuran), May 23

Fungicides: 0.28 lb ai/A Tilt (propiconazol), June 23; 0.5 lb ai/A Benlate (benomyl), July 7

Harvest: Main crop, Aug 15; second crop, Nov 14

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

Comments: MARS and MERC both displayed good seedling vigor and fast emergence under very cool weather conditions. Moderate N deficiency occurred 4 weeks after emergence at 0 and 30 lb/A. Days to 50% heading was influenced only slightly (Table 1). MERC displayed excellent lodging resistance. The taller MARS variety lodged at N rates of 120 lb/A and greater. Optimum grain yield of MARS occurred at a N rate of 90 lb/A, while MERC required 120 lb/A. Main crop grain yields of the two varieties were similar.

Both varieties produced good regrowth and second crop grain yields. High main crop N rates for MARS decreased second crop grain yields, due to lodging in the main crop. Grain yields of MERC were constant across main crop N.

Table 1. Effect of N rate and timing in main crop on performance of main crop, second crop, and total grain yields of water-seeded early medium-grain rice varieties. Rice Research Station, Crowley, LA. 1988.

Time of N*				Days to 50% heading			Plant height			% Lodging /type**		Main crop grain yield at 12% moisture			Second crop grain yield at 12% moisture			Total grain yield at 12% moisture		
Total N	PP	PI	PD	MARS	MERC	N Mean	MARS	MERC	N Mean	MARS	MERC	MARS	MERC	N Mean	MARS	MERC	N Mean	MARS	MERC	N Mean
-------(lb/A)------							-------(cm)-------					---------------------------(lb/A)---------------------------								
0	--	--	--	81	77	79	69	63	66	0/0	0/0	4223	3989	4106	2263	1833	2048	6486	5822	6154
30	30	--	--	78	76	77	80	67	74	0/0	0/0	5531	5328	5429	1899	1608	1753	7430	6936	7183
60	60	--	--	78	76	77	91	74	82	0/0	0/0	7164	6954	7059	2137	1743	1940	9300	8697	8999
90	90	--	--	79	76	78	95	82	89	0/0	0/0	8043	8213	8128	1686	1651	1668	9729	9864	9797
90	60	30	--	78	76	77	93	77	85	0/0	0/0	7824	7688	7756	1889	1720	1804	9713	9408	9560
90	60	--	30	78	76	77	89	77	83	0/0	0/0	7238	7032	7135	2100	1790	1945	9338	8822	9080
120	120	--	--	79	77	78	110	82	96	13/2	0/0	7874	8807	8341	1622	1420	1521	9496	10227	9862
150	150	--	--	80	78	79	109	87	98	72/4	0/0	7453	9055	8254	1460	1523	1491	8913	10578	9746
Variety mean				79	77		92	76				6919	7133		1882	1661		8801	8794	
C.V., %					0.48			4.54					3.70			10.45			4.17	
LSD (0.01):																				
Nitrogen								5					480			ns			778	
Variety								3					182			129			ns	
Varieties within N								8					514			ns			725	
Varieties across N								7					581			ns			931	

* Time of N: PP = preplant; PI = panicle initiation; PD = panicle differentiation.

** Lodging rate in percent/lodging type on a scale of 0 to 5, where 1 = leaning and 5 = complete.

Experiment: Very early long grain x nitrogen trial

Location: Rice Research Station

Soil Type/Analysis: Crowley silt loam; ph: 6.8; O.M.: 0.78%; extractable nutrients (mg/kg): P-8, Na-57, K-83, Ca-1261, Mg-272, Zn-1.03, S-4.90, As-2.71

Variety/Seeding Rate: TBNT, SKBT, 150 lb/A

Planting Method/Date: Water-seeded, Apr 13

Fertilization: 60 lb/A P_2O_5 and K_2O ppi; nitrogen source, ammonium sulfate; second crop, 60 lb N/A

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

Emergence Date: TBNT, SKBT, Apr 20

Water Management: Flooded, Apr 12; drained, June 7; reflooded, June 9; harvest drainage, July 22; second crop flooded, Aug 2; harvest drainage, Oct 24

Herbicides: 0.6 oz ai/A Londax (bensulfuron-methyl), May 13; 1.0 lb ai/A Basagran (bentazon), June 8

Insecticides: 0.6 lb ai/A Furadan (carbofuran), May 23

Fungicides: 0.28 lb ai/A Tilt (propiconazol), June 23; 0.5 lb ai/A Benlate (benomyl), July 7

Harvest: Main crop, July 29; second crop, Nov 2

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

Comments: TBNT and SKBT displayed moderate and poor seedling vigor, respectively. A N response was noted 3 weeks after emergence, and deficiency symptoms appeared after 5 weeks at low rates of N. Days to 50% heading increased with increasing rate of N (Table 2). No lodging occurred in this test. Optimum grain yield of TBNT occurred at a N rate of 120 lb/A, while SKBT required 90 lb/A. Main crop grain yields of the two varieties were similar.

Both varieties produced good regrowth and second crop grain yields. Grain yields of both varieties were constant across main crop N rates, with SKBT showing a slight yield advantage over TBNT.

Table 2. Effect of N rate and timing in main crop on performance of main crop, second crop, and total grain yields of water-seeded very early long-grain rice varieties. Rice Research Station, Crowley, LA. 1988.

Time of N*				Days to 50% heading			Plant height			% Lodging /type**		Main crop grain yield at 12% moisture			Second crop grain yield at 12% moisture			Total grain yield at 12% moisture		
Total N	PP	PI	PD	TBNT	SKBT	N Mean	TBNT	SKBT	N Mean	TBNT	SKBT	TBNT	SKBT	N Mean	TBNT	SKBT	N Mean	TBNT	SKBT	N Mean
-------(lb/A)------							-------(cm)-------					---------------------------(lb/A)---------------------------								
0	--	--	--	63	68	66	69	68	69	0/0	0/0	3542	3748	3645	2476	2602	2539	6018	6350	6184
30	30	--	--	64	67	65	76	75	75	0/0	0/0	4591	4977	4784	2310	2885	2598	6901	7862	7382
60	60	--	--	65	69	67	87	86	87	0/0	0/0	6259	6636	6447	2199	3230	2715	8458	9866	9162
90	90	--	--	67	72	69	98	93	96	0/0	0/0	7940	7760	7850	2586	2286	2436	10526	10046	10286
90	60	30	--	65	69	67	91	91	91	0/0	0/0	7688	7343	7516	2514	2789	2652	10202	10133	10167
90	60	--	30	65	70	68	91	88	90	0/0	0/0	7259	7325	7292	2352	2960	2656	9611	10285	9948
120	120	--	--	71	73	72	109	102	106	0/0	0/0	8495	7915	8205	2442	2513	2478	10937	10428	10683
150	150	--	--	72	74	73	110	107	109	0/0	0/0	8536	8024	8280	2225	2815	2520	10761	10840	10800
Variety mean				67	70		92	89				6789	6716		2388	2760		9177	9476	
C.V., %					1.07			3.61					3.36			14.74			3.85	
LSD (0.01):																				
Nitrogen								3					328			ns			669	
Variety								2					ns			ns			251	
Varieties within N								ns					449			ns			710	
Varieties across N								ns					455			ns			836	

* Time of N: PP = preplant; PI = panicle initiation; PD = panicle differentiation.

** Lodging rate in percent/lodging type on a scale of 0 to 5, where 1 = leaning and 5 = complete.

Experiment: Early long grain x nitrogen trial

Location: Rice Research Station

Soil Type/Analysis: Crowley silt loam; ph: 6.9; O.M.: 0.69%; extractable nutrients (mg/kg): P-12, Na-40, K-112, Ca-1270, Mg-255, Zn-1.12, S-4.24, As-3.28

Variety/Seeding Rate: LMNT, GFMT, 2201, 150 lb/A

Planting Method/Date: Water-seeded, Apr 13

Fertilization: 60 lb/A P_2O_5 and K_2O ppi; nitrogen source, ammonium sulfate; second crop, 60 lb N/A

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

Emergence Date: LMNT, GFMT, 2201, Apr 20

Water Management: Flooded, Apr 12; drained, June 7; reflooded, June 9; harvest drainage, July 27; second crop flooded, Aug 17; harvest drainage, Oct 31

Herbicides: 0.6 oz ai/A Londax (bensulfuron-methyl), May 13; 1.0 lb ai/A Basagran (bentazon), June 8

Insecticides: 0.6 lb ai/A Furadan (carbofuran), May 23

Fungicides: 0.28 lb ai/A Tilt (propiconazol), June 23; 0.5 lb ai/A Benlate (benomyl), July 7

Harvest: Main crop, Aug 15; second crop, Nov 14

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

Comments: Seedling vigor was fair for all materials. A moderate N deficiency was noted 4 weeks after emergence at 0 and 30 lb/A. Days to 50% heading increased slightly as rate of N increased (Table 3). Optimum grain yields of LMNT and GFMT occurred at a N rate of 120 lb/A, and at 150 lb/A for 2201. Main crop grain yields were similar.

Regrowth of all materials was good. Sheath blight in the main crop decreased second crop stand where main crop N was high. Second crop grain yields were similar among the three entries.

Table 3. Effect of N rate and timing in main crop on performance of main crop, second crop, and total grain yields of water-seeded early long-grain rice varieties and advanced experimental lines. Rice Research Station, Crowley, LA. 1988.

Time of N*				Days to 50% heading				Plant height				Main crop grain yields at 12% moisture				Second crop grain yields at 12% moisture				Total grain yields at 12% moisture			
Total N	PP	PI	PD	LMNT	GFMT	2201	N Mean	LMNT	GFMT	2201	N Mean	LMNT	GFMT	2201	N Mean	LMNT	GFMT	2201	N Mean	LMNT	GFMT	2201	N Mean
-----(lb/A)-----								---------(cm)---------				------------------------------(lb/A)------------------------------											
0	--	--	--	74	72	74	73	54	55	61	56	4241	4376	3581	4066	2732	2762	2262	2585	6973	7137	5843	6651
30	30	--	--	73	72	73	73	59	61	61	60	5578	5593	5157	5443	2503	2770	2542	2605	8081	8364	7700	8048
60	60	--	--	73	72	73	73	65	68	67	67	7214	6893	6975	7028	2102	2419	2291	2271	9317	9313	9267	9299
90	90	--	--	74	73	74	74	76	78	76	77	8519	8227	7835	8194	1952	2055	2091	2033	10471	10281	9926	10226
90	60	30	--	73	72	73	73	66	65	65	66	7588	7340	6804	7244	2187	2341	2137	2222	9775	9681	8941	9466
90	60	--	30	73	72	73	73	68	70	70	70	7951	7684	7224	7620	2210	2363	2128	2234	10162	10047	9351	9853
120	120	--	--	76	74	75	75	79	81	77	79	8942	8740	8784	8822	1580	2108	1675	1787	10522	10847	10458	10609
150	150	--	--	78	75	77	77	83	85	81	83	8981	8809	9250	9013	1472	1847	1227	1516	10454	10656	10477	10529
Variety mean				74	73	74		69	70	70		7377	7208	6951		2093	2333	2044		9469	9541	8995	
C.V., %					0.87				3.37				4.00				7.32				3.59		
LSD (0.01):																							
Nitrogen										7				680				320				709	
Variety										2				193				106				225	
Varieties within N										4				546				300				637	
Varieties across N										8				811				402				880	

* Time of N: PP = preplant; PI = panicle initiation; PD = panicle differentiation.

Experiment: Very early variety x nitrogen trial

Location: Rice Research Station

Soil Type/Analysis: Crowley silt loam; ph: 6.2; O.M.: 0.99%; extractable nutrients (mg/kg): P-10, Na-65, K-80, Ca-1140, Mg-232, Zn-0.90, S-8.63, As-2.55

Variety/Seeding Rate: TBNT, 3083, 3113, V7713, 150 lb/A

Planting Method/Date: Water-seeded, Apr 20

Fertilization: 60 lb/A P_2O_5 and K_2O ppi; nitrogen source, ammonium sulfate; second crop, 60 lb N/A

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

Emergence Date: TBNT, 3083, 3113, V7713, Apr 25

Water Management: Flooded, Apr 19; drained, Apr 24; reflooded, Apr 26; drained, May 12; reflooded, May 14; drained, June 7; permanent flood, June 9; harvest drainage, July 29; second crop flooded, Aug 17; harvest drainage, Nov 4

Herbicides: 3.0 lb ai/A Stam (propanil) + 0.5 lb ai/A Basagran (bentazon), May 13; 0.6 oz ai/A Londax (bensulfuron-methyl), May 20; 1.0 lb ai/A Basagran, June 8

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

Fungicides: 0.28 lb ai/A Tilt (propiconazol), June 28; 0.5 lb ai/A Rovral (iprodione), July 14

Harvest: Main crop, Aug 15; second crop, Nov 15

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

Comments: V7713 displayed very good seedling vigor, while vigor of other entries was fair. Days to 50% heading was relatively constant across rates of N (Table 4). Lodging was severe for V7713 and TBNT. 3083 and 3113 did not lodge. Optimum grain yields of TBNT and V7713 occurred at a N rate of 90 lb/A, at 120 lb/A for 3083, and at 150 lb/A for 3113. Main crop grain yields of 3083 and 3113 were significantly higher than those of TBNT and V7713.

Both 3083 and TBNT produced good regrowth and second crop grain yields, with 3113 yielding slightly less.

Table 4. Effect of N rate and timing in main crop on performance of main crop, second crop, and total grain yields of water-seeded very early rice varieties and advanced experimental lines. Rice Research Station, Crowley, LA. 1988.

	N rate (lb/A)																						
	Days to 50% heading				Plant height				% Lodging /type*			Main crop grain yield at 12%				Second crop grain yield at 12%				Total grain yield at 12%			
Variety	90	120	150	Mean	90	120	150	Mean	90	120	150	90	120	150	Mean	90	120	150	Mean	90	120	150	Mean
					--------(cm)-------							----------(lb/A)----------											
TBNT	74	75	75	75	115	120	124	120	10/3	43/3	76/5	7733	7520	6526	7260	2575	1368	1778	1907	10308	8888	8305	9167
3083	71	73	73	72	88	86	91	88	0/0	0/0	0/0	8327	8765	8591	8561	2187	1840	2351	2126	10515	10605	10942	10687
3113	71	71	72	71	100	97	103	100	0/0	0/0	0/0	8458	8502	9060	8674	1595	1554	1789	1646	10053	10056	10849	10320
V7713	63	64	66	64	83	91	92	89	33/3	77/5	90/5	6799	4498	3529	4942	1913	2253	1643	1936	8712	6751	5172	6878
N																							
Mean	70	71	71		96	98	103					7829	7321	6927		2068	1754	1890		9897	9075	8817	
C.V., %		1.02				5.01							6.50				37.08				8.80		
LSD (0.01):																							
Nitrogen		1				ns							482				ns				ns		
Variety		1				7							650				ns				1106		
V within N		ns				ns							1125				ns				1916		
V across N		ns				ns							1073				ns				2625		

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

Experiment: Early variety x nitrogen trial

Location: Rice Research Station

Soil Type/Analysis: Crowley silt loam; ph: 6.3; O.M.: 0.96%; extractable nutrients (mg/kg): P-16, Na-66, K-163, Ca-1293, Mg-262, Zn-1.01, S-8.07, As-3.48

Variety/Seeding Rate: LMNT, MARS, MERC, RICO 1, 1179, CB801, V7817, V4716, 150 lb/A

Planting Method/Date: Water-seeded, Apr 20

Fertilization: 60 lb/A P_2O_5 and K_2O ppi; nitrogen source, ammonium sulfate; second crop, 0 lb N/A

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

Emergence Date: MERC, MARS, Apr 24; LMNT, RICO 1, 1179, V4716, Apr 25; CB801, V7817, Apr 26

Water Management: Flooded, Apr 19; drained, Apr 24; reflooded, Apr 26; drained, May 12; reflooded, May 14; drained, June 7; permanent flood, June 9; harvest drainage, Aug 12; second crop flooded, Aug 30; harvest drainage, Nov 4

Herbicides: 3.0 lb ai/A Stam (propanil) + 0.5 lb ai/A Basagran (bentazon), May 13; 0.6 oz ai/A Londax (bensulfuron-methyl), May 20; 1.0 lb ai/A Basagran, June 8

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

Fungicides: 0.28 lb ai/A Tilt (propiconazol), June 28; 0.5 lb ai/A Rovral (iprodione), July 14

Harvest: Main crop, Aug 29; second crop was not harvested

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

Comments: MERC and MARS displayed very good seedling vigor, V4716 and 1179 good vigor, while vigor of other entries was fair. Days to 50% heading was relatively constant across rates of N (Table 5). Lodging was severe at all rates of N for MARS, MERC, and RICO 1. Lodging for 1179 was severe only at the highest rate of N. Optimum grain yields of LMNT, MARS, MERC, RICO 1, 1179, and CB801 occurred at a N rate of 90 lb/A, at 120 lb/A for V4716, and at 150 lb/A for V7817. Main crop grain yields were similar for LMNT, CB801, V7817, and V4716. Grain yields were less for the other entries, especially those of Mars, RICO 1, and 1179, due to severe lodging.

None of the entries in this test produced any significant amount of regrowth due to late main crop maturity. Second crop grain yields were not determined.

Table 5. Effect of N rate on performance and grain yields of water-seeded early rice varieties and advanced experimental lines. Rice Research Station, Crowley, LA. 1988.

	N rate (lb/A)														
	Days to 50% heading				Plant height				% Lodging/type*			Grain yield at 12%			
Variety	90	120	150	Mean	90	120	150	Mean	90	120	150	90	120	150	Mean
					----------(cm)----------							-----------(lb/A)-----------			
LMNT	81	82	84	83	84	87	88	86	0/0	0/0	0/0	8797	9028	8122	8649
MARS	81	81	83	82	104	106	105	105	83/5	87/5	90/5	6315	5819	5012	5715
MERC	79	80	82	80	88	87	90	88	53/4	33/3	90/5	8559	8514	6801	7958
RICO 1	82	83	85	83	97	100	105	101	87/4	90/5	90/5	7933	7152	6061	7049
1179	80	81	84	82	102	106	105	104	13/2	27/2	70/5	7957	7401	5917	7092
CB801	87	87	88	87	81	80	80	80	0/0	0/0	0/0	8583	8366	8268	8406
V7817	89	89	89	89	82	83	85	83	0/0	0/0	0/0	8190	8148	8585	8308
V4716	80	80	81	80	83	87	88	86	0/0	0/0	0/0	7752	8353	8353	8221
N Mean	82	83	84		90	92	93					8011	7848	7166	
C.V., %		1.67				2.92							6.89		
LSD (0.01):															
Nitrogen			2				ns						ns		
Variety			2				3						672		
V within N			ns				ns						1165		
V across N			ns				ns						1308		

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

Experiment: Early medium grain x nitrogen trial

Location: East Carroll Parish, Buford Perry Farm

Soil Type/Analysis: Sharkey clay; ph: 6.5; O.M.: 1.25%; extractable nutrients (mg/kg): P-20, Na-131, K-484, Ca-5450, Mg-1476, Zn-6.03, S-9.98, As-6.68

Variety/Seeding Rate: MARS, MERC, 100 lb/A

Planting Method/Date: Drill-seeded, Apr 27

Fertilization: Nitrogen source, urea

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

Emergence Date: MARS, May 15; MERC, May 16

Water Management: Flushed, May 2, May 9, May 16, May 24, May 31; permanent flood, June 17; harvest drainage, Sep 7

Herbicides: 4.0 lb ai/A Stam (propanil), May 21; 4.0 lb ai/A Stam, June 12; 0.9 oz ai/A Londax (bensulfuron-methyl), July 1

Insecticides: 0.6 lb ai/A Furadan (carbofuran), July 12

Fungicides: 0.22 lb ai/A Tilt (propiconazol), July 18; 0.5 lb ai/A Benlate (benomyl), Aug 6

Harvest: Main crop, Sep 23

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

Comments: Emergence, vigor, and stand establishment for both entries were fair. Days to 50% heading increased slightly as N rate increased (Table 6). Lodging was observed only at the highest rates of N for MARS, while lodging for MERC was insignificant. Optimum grain yield for MARS occurred at 90 lb/A, and at 120 lb/A for MERC. Main crop grain yields were similar for MARS and MERC.

Table 6. Effect of N rate and timing in main crop on performance and grain yields of drill-seeded early medium-grain rice varieties. Buford Perry Farm, East Carroll Parish, LA. 1988.

Time of N*				Days to 50% heading			Plant height			% Lodging /type**		Main crop grain yields at 12% moisture		
Total N	PF	PI	PD	MARS	MERC	N Mean	MARS	MERC	N Mean	MARS	MERC	MARS	MERC	N Mean
-------(lb/A)------							--------(cm)-------					-------(lb/A)-------		
0	--	--	--	80	78	79	75	69	72	0/0	0/0	5117	4785	4951
30	30	--	--	79	78	79	86	77	81	0/0	0/0	6398	5709	6054
60	60	--	--	79	79	79	91	80	86	0/0	0/0	7432	6731	7082
90	90	--	--	80	80	80	99	86	93	0/0	0/0	7503	7516	7510
90	60	30	--	80	79	79	97	80	89	0/0	0/0	7672	6898	7285
90	60	--	30	79	78	79	99	81	90	0/0	0/0	7528	7401	7465
120	120	--	--	83	81	82	105	84	95	15/3	0/0	7589	8074	7832
150	150	--	--	84	83	84	106	86	96	22/4	5/1	7806	7989	7897
Variety mean				81	80		95	80				7131	6888	
C.V., %					0.72			3.67					4.72	
LSD (0.01):														
Nitrogen								5					465	
Variety								2					232	
Varieties within N								6					655	
Varieties across N								7					655	

* Time of N: PF = preflood; PI = panicle initiation; PD = panicle differentiation.

** Lodging rate in percent/lodging type on a scale of 0 to 5, where 1 = leaning and 5 = complete.

Experiment: Very early long grain x nitrogen trial

Location: East Carroll Parish, Buford Perry Farm

Soil Type/Analysis: Sharkey clay; ph: 6.7; O.M.: 1.02%; extractable nutrients (mg/kg): P-20, Na-141, K-452, Ca-5399, Mg-1449, Zn-5.04, S-12.98, As-6.80

Variety/Seeding Rate: TBNT, SKBT, 100 lb/A

Planting Method/Date: Drill-seeded, Apr 26

Fertilization: Nitrogen source, urea

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

Emergence Date: TBNT, May 14; SKBT, May 15

Water Management: Flushed, May 3, May 9, May 16, May 24, May 31; permanent flood, June 17; harvest drainage, Sep 2

Herbicides: 4.0 lb ai/A Stam (propanil), May 21; 4.0 lb ai/A Stam, June 12; 0.9 oz ai/A Londax (bensulfuron-methyl), July 1

Insecticides: 0.6 lb ai/A Furadan (carbofuran), July 12

Fungicides: 0.22 lb ai/A Tilt (propiconazol), July 18; 0.5 lb ai/A Benlate (benomyl), Aug 6

Harvest: Main crop, Sep 22

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

Comments: Emergence, vigor, and stand establishment for both entries were poor. Days to 50% heading increased as N rate increased (Table 7). No lodging was observed in this test. Optimum grain yield for TBNT occurred at a N rate of 120 lb/A, and for SKBT at 150 lb/A. Main crop grain yields were similar for TBNT and SKBT.

Table 7. Effect of N rate and timing on performance and grain yields of drill-seeded very early long-grain rice varieties. Buford Perry Farm, East Carroll Parish, LA. 1988.

Time of N*				Days to 50% heading			Plant height			% Lodging /type**		Main crop grain yields at 12% moisture		
Total N	PF	PI	PD	TBNT	SKBT	N Mean	TBNT	SKBT	N Mean	TBNT	SKBT	TBNT	SKBT	N Mean
-------(lb/A)------							-------(cm)-------					-------(lb/A)-------		
0	--	--	--	80	81	81	78	74	76	0/0	0/0	3407	3822	3614
30	30	--	--	80	81	81	92	81	86	0/0	0/0	4457	4504	4481
60	60	--	--	81	83	82	99	93	96	0/0	0/0	5469	5480	5474
90	90	--	--	83	83	83	114	93	104	0/0	0/0	6357	5944	6151
90	60	30	--	82	83	82	97	93	95	0/0	0/0	6041	5679	5860
90	60	--	30	81	82	82	103	93	98	0/0	0/0	5843	5943	5893
120	120	--	--	84	86	85	111	108	109	0/0	0/0	6656	6155	6405
150	150	--	--	86	86	86	123	104	114	10/1	0/0	6420	6506	6463
Variety mean				82	83		102	92				5581	5504	
C.V., %					0.75			8.65					10.82	
LSD (0.01):														
Nitrogen								7					644	
Variety								6					ns	
Varieties within N								ns					ns	
Varieties across N								ns					ns	

* Time of N: PF = preflood; PI = panicle initiation; PD = panicle differentiation.

** Lodging rate in percent/lodging type on a scale of 0 to 5, where 1 = leaning and 5 = complete.

Experiment: Early long grain x nitrogen trial

Location: East Carroll Parish, Buford Perry Farm

Soil Type/Analysis: Sharkey clay; ph: 6.4; O.M.: 1.20%; extractable nutrients (mg/kg): P-22, Na-127, K-828, Ca-5394, Mg-1424, Zn-5.94, S-8.38, As-7.17

Variety/Seeding Rate: LMNT, GFMT, 2201, 100 lb/A

Planting Method/Date: Drill-seeded, Apr 26

Fertilization: Nitrogen source, urea

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

Emergence Date: LMNT, May 15; GFMT, 2201, May 16

Water Management: Flushed, May 2, May 9, May 16, May 24, May 31; permanent flood, June 17; harvest drainage, Sep 7

Herbicides: 4.0 lb ai/A Stam (propanil), May 21; 4.0 lb ai/A Stam, June 12; 0.9 oz ai/A Londax (bensulfuron-methyl), July 1

Insecticides: 0.6 lb ai/A Furadan (carbofuran), July 12

Fungicides: 0.22 lb ai/A Tilt (propiconazol), July 18; 0.5 lb ai/A Benlate (benomyl), Aug 6

Harvest: Main crop, Sep 22

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

Comments: Emergence, vigor, and stand establishment for all entries were poor. Days to 50% heading increased as N rate increased (Table 8). Optimum grain yields for all entries occurred at 120 lb N/A. Main crop grain yields were similar for LMNT and 2201, while GFMT yielded slightly less.

Table 8. Effect of N rate and timing on performance and grain yields of drill-seeded early long-grain rice varieties and advanced experimental lines. Buford Perry Farm, East Carroll Parish, LA. 1988.

Time of N*				Days to 50% heading				Plant height				Main crop grain yields at 12% moisture			
Total N	PF	PI	PD	LMNT	GFMT	2201	N Mean	LMNT	GFMT	2201	Mean	LMNT	GFMT	2201	N Mean
-------(lb/A)------								-----------(cm)----------				----------(lb/A)---------			
0	--	--	--	87	81	85	84	66	68	68	67	5267	5192	4940	5133
30	30	--	--	86	82	84	84	66	72	71	70	6134	5899	5983	6005
60	60	--	--	88	84	86	86	72	75	75	74	6500	6226	6379	6368
90	90	--	--	89	85	87	87	74	73	78	75	7076	6671	7179	6975
90	60	30	--	88	84	86	86	76	80	78	78	6825	6677	6751	6751
90	60	--	30	87	83	86	85	76	78	77	77	6806	6434	6753	6664
120	120	--	--	91	87	88	89	79	82	82	81	7281	6938	7427	7216
150	150	--	--	92	88	89	90	83	85	84	84	6991	7174	7496	7211
Variety mean				88	84	86		74	77	77		6610	6398	6614	
C.V., %					0.84				2.85				3.33		
LSD (0.01):															
Nitrogen										9				679	
Variety										1				146	
Varieties within N										ns				413	
Varieties across N										ns				758	

* Time of N: PF = preflood; PI = panicle initiation; PD = panicle differentiation.

Experiment: Very early variety x nitrogen trial

Location: East Carroll Parish, Buford Perry Farm

Soil Type/Analysis: Sharkey clay; ph: 6.5; O.M.: 1.02%; extractable nutrients (mg/kg): P-20, Na-127, K-464, Ca-5289, Mg-1436, Zn-4.61, S-8.79, As-6.60

Variety/Seeding Rate: TBNT, 3083, 3113, V7713, 100 lb/A

Planting Method/Date: Drill-seeded, Apr 26

Fertilization: Nitrogen source, urea

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

Emergence Date: TBNT, May 14; V7713, May 15; 3113, May 16; 3083, May 17

Water Management: Flushed, May 3, May 9, May 16, May 24, May 31; permanent flood, June 17; harvest drainage, Sep 2

Herbicides: 4.0 lb ai/A Stam (propanil), May 21; 4.0 lb ai/A Stam, June 12; 0.9 oz ai/A Londax (bensulfuron-methyl), July 1

Insecticides: 0.6 lb ai/A Furadan (carbofuran), July 12

Fungicides: 0.22 lb ai/A Tilt (propiconazol), July 18; 0.5 lb ai/A Benlate (benomyl), Aug 6

Harvest: Main crop, Sep 22

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

Comments: Emergence, vigor, and stand establishment for all entries were poor. Days to 50% heading was relatively constant across N rates (Table 9). No lodging was observed in this test. Optimum grain yields for all entries occurred at a N rate of 150 lb/A. Main crop grain yields were similar for TBNT, 3083, and 3113, and all of these entries significantly outyielded V7713.

Table 9. Effect of N rate on performance and grain yields of drill-seeded very early rice varieties and advanced experimental lines. Buford Perry Farm, East Carroll Parish, LA. 1988.

	N rate (lb/A)														
	Days to 50% heading				Plant height				% Lodging/type*			Grain yield at 12%			
Variety	90	120	150	Mean	90	120	150	Mean	90	120	150	90	120	150	Mean
					----------(cm)----------							-----------(lb/A)-----------			
TBNT	83	85	86	85	114	116	120	117	0/0	0/0	0/0	6007	6723	7015	6582
3083	78	79	80	79	75	80	81	78	0/0	0/0	0/0	6338	6871	7320	6843
3113	78	78	78	78	89	95	96	94	0/0	0/0	0/0	5653	6538	7228	6473
V7713	72	73	73	73	83	86	85	85	0/0	0/0	0/0	3860	4575	5517	4651
N															
Mean	78	79	79		90	94	95					5465	6177	6770	
C.V., %		1.19				7.92							6.78		
LSD (0.01):															
Nitrogen		ns				5							412		
Variety		1				10							565		
V within N		ns				ns							ns		
V across N		ns				ns							ns		

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

Experiment: Early variety x nitrogen trial

Location: East Carroll Parish, Buford Perry Farm

Soil Type/Analysis: Sharkey clay; ph: 6.3; O.M.: 1.56%; extractable nutrients (mg/kg): P-26, Na-120, K-467, Ca-5393, Mg-1400, Zn-6.38, S-10.39, As-7.41

Variety/Seeding Rate: LMNT, MARS, MERC, RICO 1, 1179, CB801, V7817, V4716, 100 lb/A

Planting Method/Date: Drill-seeded, Apr 27

Fertilization: Nitrogen source, urea

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

Emergence Date: MARS, May 15; LMNT, MERC, RICO 1, 1179, V4716, May 16; CB801, May 17; V7817, May 18

Water Management: Flushed, May 2, May 9, May 16, May 24, May 31; permanent flood, June 17; harvest drainage, Sep 7

Herbicides: 4.0 lb ai/A Stam (propanil), May 21; 4.0 lb ai/A Stam, June 12; 0.9 oz ai/A Londax (bensulfuron-methyl), July 1

Insecticides: 0.6 lb ai/A Furadan (carbofuran), July 12

Fungicides: 0.22 lb ai/A Tilt (propiconazol), July 18; 0.5 lb ai/A Benlate (benomyl), Aug 6

Harvest: Main crop, Sep 23

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

Comments: Emergence, vigor, and stand establishment for all entries were poor. Days to 50% heading was relatively constant for most entries, but did increase with higher N for RICO 1 and 1179 (Table 10). Lodging was observed only at the higher rates of N for MARS and RICO 1, and had no influence on grain yields. Optimum grain yields of LMNT, MARS, RICO 1, CB801, and V7817 occurred at a N rate of 120 lb/A, at 150 lb/A for MERC and 1179, and at 90 lb/A for V4716. Main crop grain yields were similar for CB801, V7817, V4716, LMNT, 1179, MARS, and MERC. RICO 1 yielded significantly higher than all other entries.

Table 10. Effect of N rate on performance and grain yields of drill-seeded early rice varieties and advanced experimental lines. Buford Perry Farm, East Carroll Parish, LA. 1988.

	N rate (lb/A)														
	Days to 50% heading				Plant height				% Lodging/type*			Grain yield at 12%			
Variety	90	120	150	Mean	90	120	150	Mean	90	120	150	90	120	150	Mean
					----------(cm)----------							-----------(lb/A)-----------			
LMNT	87	89	90	89	75	84	85	81	0/0	0/0	0/0	6863	7220	7403	7162
MARS	80	82	83	82	98	109	109	105	0/0	13/2	23/2	7683	7974	7599	7752
MERC	80	81	83	82	86	89	96	90	0/0	0/0	0/0	7476	7918	8438	7944
RICO 1	84	87	88	86	98	104	97	99	0/0	3/1	23/2	8815	9452	9124	9130
1179	87	91	93	90	100	105	115	107	0/0	0/0	0/0	6940	7171	7410	7174
CB801	87	88	90	88	77	74	80	77	0/0	0/0	0/0	6767	7510	7624	7300
V7817	86	88	89	88	75	81	76	77	0/0	0/0	0/0	7186	7634	7465	7428
V4716	82	82	83	82	81	83	89	84	0/0	0/0	0/0	7558	7522	7596	7559
N Mean	84	86	87		86	91	93					7411	7800	7832	
C.V., %		1.34				5.86							5.82		
LSD (0.01):															
Nitrogen		3				5							469		
Variety		1				7							569		
V within N		ns				ns							ns		
V across N		ns				ns							ns		

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

Experiment: Early medium grain x nitrogen trial

Location: Vermilion Parish, Errol Lounsberry Farm

Soil Type/Analysis: Crowley silt loam; ph: 5.8; O.M.: 0.73%; extractable nutrients (mg/kg): P-13, Na-25, K-223, Ca-689, Mg-159, Zn-2.89, S-9.74, As-2.75

Variety/Seeding Rate: MARS, MERC, 150 lb/A

Planting Method/Date: Water-seeded, Apr 15

Fertilization: 60 lb/A P_2O_5 and K_2O ppi; nitrogen source, ammonium sulfate; second crop, 45 lb N/A

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

Emergence Date: MERC, MARS, Apr 19

Water Management: Flooded, Apr 14; drained, Apr 19; reflooded, Apr 21; drained, May 7; reflooded, May 10; harvest drainage, July 27; second crop flooded, Aug 22; harvest drainage, Nov 3

Herbicides: 3.0 lb ai/A Stam (propanil) + 0.75 lb ai/A Basagran (bentazon), May 9; 0.6 oz ai/A Londax (bensulfuron-methyl), May 25

Insecticides: 0.6 lb ai/A Furadan (carbofuran), May 25

Fungicides: 0.28 lb ai/A Tilt (propiconazol), June 19; 0.17 lb/A Tilt, July 6; 1.0 lb ai/A Benlate (benomyl), July 18

Harvest: Main crop, Aug 19; second crop, Nov 17

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

Comments: MARS and MERC both displayed good seedling vigor and fast emergence. A moderate N deficiency was noted 6 weeks after emergence at 0 and 30 lb/A. Days to 50% heading was influenced only slightly (Table 11). MERC displayed excellent lodging resistance, especially at high N rates. The taller MARS variety lodged at a N rate above 120 lb/A. Optimum grain yield of MARS and MERC occurred at a N rate of 90 lb/A. Main crop grain yields of MERC was slightly higher than that of MARS.

Both varieties produced good regrowth and second crop grain yields, with yields constant across main crop N.

Table 11. Effect of N rate and timing in main crop on performance of main crop, second crop, and total grain yields of water-seeded early medium-grain rice varieties. Errol Lounsberry Farm, Vermilion Parish, LA. 1988.

Time of N*				Days to 50% heading			Plant height			% Lodging /type**		Main crop grain yield at 12% moisture			Second crop grain yield at 12% moisture			Total grain yield at 12% moisture		
Total N	PP	PI	PD	MARS	MERC	N Mean	MARS	MERC	N Mean	MARS	MERC	MARS	MERC	N Mean	MARS	MERC	N Mean	MARS	MERC	N Mean
-------(lb/A)------							-------(cm)-------					--------------------------(lb/A)--------------------------								
0	--	--	--	81	76	79	84	76	80	0/0	0/0	5066	5568	5317	2145	1962	2053	7211	7530	7371
30	30	--	--	78	76	77	86	82	84	0/0	0/0	6336	6401	6369	2292	1973	2133	8629	8375	8502
60	60	--	--	79	76	77	98	81	90	0/0	0/0	6461	6820	6641	1893	2216	2054	8354	9036	8695
90	90	--	--	81	76	79	101	84	93	0/0	0/0	6784	7382	7083	2094	2218	2156	8878	9600	9239
90	60	30	--	79	76	78	97	84	91	0/0	0/0	6877	7269	7073	2158	2337	2247	9034	9607	9320
90	60	--	30	80	76	78	98	85	92	0/0	0/0	6997	7291	7144	2223	2216	2220	9220	9507	9364
120	120	--	--	83	77	80	105	86	96	0/0	0/0	7085	7549	7317	2123	2293	2208	9209	9841	9525
150	150	--	--	84	79	81	107	87	97	50/5	0/0	6071	7414	6743	2441	2467	2454	8512	9881	9196
Variety mean				81	77		97	83				6460	6962		2171	2210		8631	9172	
C.V., %					1.16			4.60					3.15			19.66			5.21	
LSD (0.01):																				
Nitrogen								4					681			ns			888	
Variety								3					148			ns			324	
Varieties within N								8					311			ns			ns	
Varieties across N								7					741			ns			ns	

* Time of N: PP = preplant; PI = panicle initiation; PD = panicle differentiation.

** Lodging rate in percent/lodging type on a scale of 0 to 5, where 1 = leaning and 5 = complete.

Experiment: Very early long grain x nitrogen trial

Location: Vermilion Parish, Errol Lounsberry Farm

Soil Type/Analysis: Crowley silt loam; ph: 5.8; O.M.: 0.78%; extractable nutrients (mg/kg): P-11, Na-28, K-84, Ca-765, Mg-170, Zn-2.80, S-14.04, As-2.71

Variety/Seeding Rate: TBNT, SKBT, 150 lb/A

Planting Method/Date: Water-seeded, Apr 15

Fertilization: 60 lb/A P_2O_5 and K_2O ppi; nitrogen source, ammonium sulfate; second crop, 45 lb N/A

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

Emergence Date: TBNT, Apr 20; SKBT, Apr 21

Water Management: Flooded, Apr 14; drained, Apr 19; reflooded, Apr 21; drained, May 7; reflooded, May 10; harvest drainage, July 27; second crop flooded, Aug 22; harvest drainage, Nov 3

Herbicides: 3.0 lb ai/A Stam (propanil) + 0.75 lb ai/A Basagran (bentazon), May 9; 0.6 oz ai/A Londax (bensulfuron-methyl), May 25

Insecticides: 0.6 lb ai/A Furadan (carbofuran), May 25

Fungicides: 0.28 lb ai/A Tilt (propiconazol), June 19; 0.17 lb/A Tilt, July 6; 1.0 lb ai/A Benlate (benomyl), July 18

Harvest: Main crop, Aug 17; second crop, Nov 17

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

Comments: TBNT and SKBT both displayed poor seedling vigor and slow emergence. A moderate N deficiency was noted 6 weeks after emergence at 0 and 30 lb/A. Days to 50% heading increased as rate of N increased (Table 12). Both varieties lodged above 30 lb N/A. Lodging of TBNT was severe. Optimum grain yields of TBNT and SKBT occurred at a N rate of 90 lb/A. Main crop grain yields were similar.

Regrowth of TBNT was influenced by lodging in the main crop. Grain yield of TBNT decreased as lodging severity increased. Grain yields for SKBT were constant across main crop N. A slight yield advantage was observed for SKBT.

Table 12. Effect of N rate and timing in main crop on performance of main crop, second crop, and total grain yields of water-seeded very early long-grain rice varieties. Errol Lounsberry Farm, Vermilion Parish, LA. 1988.

Time of N*				Days to 50% heading			Plant height			% Lodging /type**		Main crop grain yield at 12% moisture			Second crop grain yield at 12% moisture			Total grain yield at 12% moisture		
Total N	PP	PI	PD	TBNT	SKBT	N Mean	TBNT	SKBT	N Mean	TBNT	SKBT	TBNT	SKBT	N Mean	TBNT	SKBT	N Mean	TBNT	SKBT	N Mean
-------(lb/A)------							-------(cm)-------					--------------------------(lb/A)--------------------------								
0	--	--	--	73	74	74	100	90	95	0/0	10/1	5379	5453	5416	2293	2383	2338	7673	7836	7755
30	30	--	--	73	73	73	110	96	103	0/0	0/0	6133	5845	5989	2188	2352	2270	8321	8197	8259
60	60	--	--	77	75	76	118	107	113	32/4	17/3	6440	5893	6166	1777	1980	1878	8217	7873	8045
90	90	--	--	78	76	77	117	107	112	55/4	25/3	5885	5985	5935	1348	1807	1577	7232	7793	7512
90	60	30	--	74	76	75	116	104	110	35/4	12/2	6285	6158	6221	1743	2237	1990	8028	8395	8212
90	60	--	30	77	75	76	120	110	115	42/3	10/2	6096	6230	6163	1730	1835	1783	7826	8065	7946
120	120	--	--	80	79	80	118	115	117	57/4	7/2	5598	5723	5660	1209	1846	1527	6806	7569	7187
150	150	--	--	80	83	82	119	110	115	85/5	22/1	5542	5363	5452	1177	2255	1716	6719	7618	7169
Variety mean				77	77		115	105				5920	5831		1683	2087		7603	7918	
C.V., %					2.40			3.38					5.91			12.92			5.62	
LSD (0.01):																				
Nitrogen								5					375			314			541	
Variety								3					ns			170			305	
Varieties within N								ns					ns			482			ns	
Varieties across N								ns					ns			463			ns	

* Time of N: PP = preplant; PI = panicle initiation; PD = panicle differentiation.

** Lodging rate in percent/lodging type on a scale of 0 to 5, where 1 = leaning and 5 = complete.

Experiment: Early long grain x nitrogen trial

Location: Vermilion Parish, Errol Lounsberry Farm

Soil Type/Analysis: Crowley silt loam; ph: 5.8; O.M.: 0.73%; extractable nutrients (mg/kg): P-11, Na-30, K-146, Ca-724, Mg-166, Zn-2.71, S-11.92, As-3.04

Variety/Seeding Rate: LMNT, GFMT, 2201, 150 lb/A

Planting Method/Date: Water-seeded, Apr 15

Fertilization: 60 lb/A P_2O_5 and K_2O ppi; nitrogen source, ammonium sulfate; second crop, 45 lb N/A

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

Emergence Date: LMNT, GFMT, 2201, Apr 21

Water Management: Flooded, Apr 14; drained, Apr 19; reflooded, Apr 21; drained, May 7; reflooded, May 10; harvest drainage, July 27; second crop flooded, Aug 22; harvest drainage, Nov 3

Herbicides: 3.0 lb ai/A Stam (propanil) + 0.75 lb ai/A Basagran (bentazon), May 9; 0.6 oz ai/A Londax (bensulfuron-methyl), May 25

Insecticides: 0.6 lb ai/A Furadan (carbofuran), May 25

Fungicides: 0.28 lb ai/A Tilt (propiconazol), June 19; 0.17 lb/A Tilt, July 6; 1.0 lb ai/A Benlate (benomyl), July 18

Harvest: Main crop, Aug 17; second crop was not harvested

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

Comments: Seedling vigor was moderate for all materials. A moderate N deficiency was noted 6 weeks after emergence at 0 and 30 lb/A. Days to 50% heading increased as rate of N increased (Table 13). Optimum grain yields of LMNT, GFMT, and 2201 occurred at a N rate of 60 lb/A. Main crop grain yields were similar.

Regrowth of all materials was slow and nonuniform. Severe sheath blight in the main crop decreased second crop stand. Late maturity resulted in poor grain production. Second crop yield determinations were not made.

Table 13. Effect of N rate and timing in main crop on performance and grain yields of water-seeded early long-grain rice varieties and advanced experimental lines. Errol Lounsberry Farm, Vermilion Parish, LA. 1988.

Time of N*				Days to 50% heading				Plant height				Main crop grain yields at 12% moisture			
Total N	PP	PI	PD	LMNT	GFMT	2201	N Mean	LMNT	GFMT	2201	N Mean	LMNT	GFMT	2201	N Mean
-------(lb/A)------								-----------(cm)----------				----------(lb/A)---------			
0	--	--	--	77	74	74	75	66	71	68	68	5395	5127	5266	5263
30	30	--	--	76	74	74	75	71	75	73	73	6090	6268	6387	6248
60	60	--	--	79	77	76	77	73	77	76	76	6578	6611	6882	6690
90	90	--	--	79	77	77	78	78	80	79	79	6573	6406	6938	6639
90	60	30	--	78	76	75	76	74	80	78	77	6939	6569	6940	6816
90	60	--	30	79	76	76	77	76	75	77	76	6819	6594	7162	6858
120	120	--	--	81	80	77	79	77	82	79	80	6241	6354	6613	6403
150	150	--	--	83	81	80	81	81	82	83	82	6389	6213	6503	6369
Variety mean				79	77	76		75	78	77		6378	6268	6586	
C.V., %						1.28				3.04				4.67	
LSD (0.01):															
Nitrogen										2				597	
Variety										2				201	
Varieties within N										ns				ns	
Varieties across N										ns				ns	

* Time of N: PP = preplant; PI = panicle initiation; PD = panicle differentiation.

Table 14. Milling yields for very early and early rice varieties and advanced experimental lines. 1988.

Entry	Location: Rice Research Station	Location: East Carroll Parish
Very early	(% head - % total)	(% head - % total)
Tebonnet	52 - 66	62 - 70
V7713	65 - 71	51 - 70
3083	58 - 69	61 - 71
3113	64 - 70	60 - 70
Early		
Lemont	63 - 72	59 - 73
CB801	61 - 70	63 - 71
V7817	56 - 69	65 - 72
Mars	61 - 70	63 - 70
Mercury	70 - 72	68 - 72
Rico 1	63 - 69	67 - 73
V4716	55 - 70	69 - 73
1179	66 - 71	66 - 70

Milling samples were hand-harvested at 20-22% moisture (5 ft^2) for each entry at 90 lb N/A (three replications).

Table 15. Growth stage information for the DD-50 Rice Management Program. Water-seeded rice varieties and advanced experimental lines, Rice Research Station, Crowley, LA. 1988.

Variety	Emergence date	First tiller	Panicle initiation	Panicle differentiation	Days to 50% heading
Tebonnet	4-25	5-16	6-05	6-11	7-03
3083	4-25	5-16	6-04	6-11	6-30
3113	4-25	5-16	6-04	6-13	6-30
V7713	4-25	5-16	6-02	6-06	6-22
Lemont	4-25	5-14	6-08	6-19	7-10
Mars	4-24	5-14	6-09	6-20	7-10
Mercury	4-24	5-14	6-11	6-20	7-08
Rico 1	4-25	5-16	6-14	6-21	7-11
1179	4-25	5-14	6-10	6-19	7-09
CB801	4-26	5-14	6-14	6-22	7-16
V7817	4-26	5-16	6-13	6-22	7-18
V4716	4-25	5-13	6-09	6-21	7-09

Table 16. Growth stage information for the DD-50 Rice Management Program. Drill-seeded rice varieties and advanced experimental lines, East Carroll Parish. 1988.

Variety	Emergence date	First tiller	Panicle initiation	Panicle differentiation	Days to 50% heading
Tebonnet	5-14	6-11	7-07	7-13	8-05
3083	5-17	6-11	7-08	7-14	8-03
3113	5-16	6-12	7-07	7-14	8-02
V7713	5-15	6-11	7-08	7-14	7-26
Lemont	5-16	6-10	7-10	7-23	8-11
Mars	5-15	6-10	7-09	7-17	8-03
Mercury	5-16	6-10	7-12	7-16	8-41
Rico 1	5-16	6-08	7-12	7-18	8-08
1179	5-16	6-10	7-11	7-21	8-11
CB801	5-17	6-10	7-12	7-23	8-12
V7817	5-18	6-10	7-12	7-23	8-12
V4716	5-16	6-10	7-10	7-17	8-06

EVALUATION OF COMMERCIAL VARIETIES, HYBRIDS, AND ADVANCED EXPERIMENTAL LINES FOR STRAIGHTHEAD

P.K. Bollich, W.J. Leonards, Jr., S.M. Rawls, and D.M. Walker

INTRODUCTION

A straighthead evaluation nursery was established at the Rice Research Station, Crowley, LA, in 1988. Forty-three entries were screened for reaction to arsenic (As)-induced straighthead. Included in the nursery were 25 commercial varieties, both public and private, 3 private hybrid lines, 2 private advanced experimental lines, and 13 advanced experimental lines from Louisiana.

MATERIALS AND METHODS

The nursery was established on a Crowley silt loam soil. Approximately 120 lb/A N and 60 lb/A P_2O_5 and K_2O were banded 2 inches deep prior to planting. Arsenic as MSMA was surface applied at the rate of 2 lb As/A, and the test area was flooded 4 days later. Presoaked seed of each entry was seeded at the rate of 150 lb/A. The test area was drained for 3 days to encourage seedling anchorage. A shallow, permanent flood was then established. Pest control (weeds, insects, disease), when necessary, was practiced according to current recommendations. Evaluations for straighthead reaction were 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 1.

Experiment: Straighthead evaluation

Location: Rice Research Station

Soil Type/Analysis: Crowley silt loam; ph: 6.7; O.M.: 0.67%; extractable nutrients (mg/kg): P-6, Na-83, K-159, Ca-1417, Mg-350, Zn-1.68, S-7.09, As-2.92

Variety/Seeding Rate: 43 entries, 150 lb/A

Planting Method/Date: Water-seeded, May 11

Fertilization: 60 lb/A P_2O_5 and K_2O + 120 lb/A N ppi

Plot Size: 4 x 6 ft (24 ft^2)

Emergence Date: May 17

Water Management: Flooded, May 10; drained, May 13; reflooded, May 16; drained, June 7; reflooded, June 9; harvest drainage, Aug 30

Herbicides: 1.0 lb ai/A Basagran (bentazon), June 8;
3.5 lb ai/A Ordram (molinate), June 14

Insecticides: 0.6 lb ai/A Furadan (carbofuran), May 22

Fungicides: 0.17 lb ai/A Tilt (propiconazol), June 21

Harvest: Straighthead evaluation, Aug 31

Experimental Design: Completely randomized with 43 entries and 2 replications

Comments: Straighthead reaction ranged from resistant to very susceptible, with most entries exhibiting some degree of susceptibility to straighthead.

Table 1. Straighthead evaluation for commercial rice varieties, hybrids, and advanced experimental lines. Rice Research Station, Crowley, LA. 1988.

Entry	Grain type*	Rating**
CB801	L	9.0
V7817	L	9.0
Skybonnet	L	8.5
V4716	M	8.5
Della	L	8.0
A301	L	8.0
8502186	L	8.0
IRGA 409	L	8.0
Starbonnet	L	8.0
Leah	L	8.0
8802210	L	8.0
Mars	M	8.0
Toro-2	L	8.0
8802208	L	8.0
Nato	M	7.5
87AS3058	M	7.5
Tebonnet	L	7.5
8802206	L	7.5
RAX2003	L	7.5
8802202	L	7.0
8502201	L	7.0
8802204	L	7.0
8802211	L	7.0
Lemont	L	6.5
Lebonnet	L	6.0
Newbonnet	L	6.0
8802217	L	5.5
RAX2011	L	5.5
Mercury	M	5.5
RAX2215	L	5.0
8802205	L	5.0
8802218	L	5.0
8802219	L	5.0
8802207	L	5.0
Gulfmont	L	4.5
Saturn	M	3.5
L202	L	3.5
Rico 1	M	3.0
Pecos	M	2.5
Rexmont	L	1.5
V7713	L	1.0
87AS3510	L	1.0
Labelle	L	0.0

* L = long grain, M = medium grain.

** Rating based on a scale from 0 to 9, where 0 = resistant and 9 = highly susceptible.

EFFECT OF N RATE AND TIMING ON PERFORMANCE, GRAIN YIELD, AND YIELD COMPONENTS OF LEMONT RICE

P.K. Bollich, W.J. Leonards, Jr., S.M. Rawls, and D.M. Walker

INTRODUCTION

Nitrogen (N) fertilization greatly influences the yield potential of rice. The N requirement varies among rice varieties and may be affected by environmental influences and management practices. Placement and timing of fertilizer N application and water management both impact N efficiency.

Numerous approaches to fertilizer N management are available to the producer, depending on the cultural system used. The total N requirement can be applied preplant incorporated prior to flooding in the water-seeded, continuous or pinpoint flood cultural system, or preflood in the dry-seeded cultural system. In some situations it is desirable to apply a split application of N in either system. Split applications may be necessary when there is a lack of precision in placement of large amounts of fertilizer product. Difficulties or delays in flooding large areas in a short period of time could also necessitate the use of split applications. Research, however, has shown that there is generally no advantage to using split applications when proper management practices are followed. Inadequate amounts of basal N or improperly timed topdress applications could actually lead to decreased grain yield. When applying split applications, supply enough basal N should be applied to maintain the rice plant through the tillering stage and into early reproductive growth. Topdress applications of N need to be applied before severe N deficiency occurs. This approach usually results in grain yields comparable to those of the single preplant or preflood N application. Multiple topdress applications should be avoided in order to reduce N inefficiency and input cost.

Single preplant or preflood N applications and two-way or multiple split applications have been practiced commercially in rice producing areas of the southern United States. The objectives of this study are to 1) determine the effect of N rate and time of application on performance, grain yield, and grain yield components of Lemont rice in different environments and in both cultural systems, and 2) compare the various approaches to fertilizer management.

MATERIALS AND METHODS

The long-grain semidwarf variety Lemont was used in all experiments. Nitrogen rates of 0, 30, 60, 90, 120, 150, and 180 lb/A were banded approximately 2 inches deep 1 to 2 days prior to flooding in the water-seeded experiments. In soils requiring P and K, approximately 60 lb/A P_2O_5 and K_2O were also banded with N as ammonium sulfate. The 90 and 120 lb N/A rates were also split to provide two-thirds to three-fourths preplant with the remaining N being applied at panicle initiation (green ring). The 180 lb N/A rate was also applied as a three-way split, providing two-thirds preplant, with the remaining one-third being applied in two applications of 30 lb each at panicle differentiation (panicle 2 mm) and 10 days after panicle differentiation. In drill-seeded experiments, basal N treatments were applied as a broadcast application prior to establishment of the permanent flood, and the split applications were applied as in the water-seeded experiments.

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 3 days after drainage, never allowing the soil to dry.

In drill-seeded experiments, Lemont was 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), when necessary, was practiced according to current recommendations. Individual whole plots were combine-harvested at field maturity. Days to 50% heading, plant height, lodging, grain moisture, and grain yield were measured. Yield components were determined.

SUMMARY AND CONCLUSIONS

Field experiments were conducted at the Rice Research Station and in East Carroll, Morehouse, and Rapides parishes to determine the influence of N rate and timing on performance, grain yield, and yield components of Lemont rice.

Nitrogen requirements for optimum grain yield in all water- and drill-seeded experiments were similar. Optimum range of N was between 90 and 150 lb/A, with little difference being observed when N was applied as either a single preplant application in water-seeded culture or a preflood application in drill-seeded culture across these three rates. A single application of the optimum rate of N compared favorably with the 2-way splits of the same amount. The 3-way split of 180 lb N/A resulted in yields similar to those of the single applications and the 2-way splits. No significant yield advantage was observed with the 3-way split, especially in the water-seeded experiments. A slight yield advantage was observed in the drill-seeded experiment in East Carroll, although the increase was not significant, and was probably due to some loss of basal N prior to permanent flood application. Most yield components responded positively to increasing N. Number of sterile florets increased significantly with increasing N, except in East Carroll, where sterility was high even at low N. The number of filled grains remained relatively constant at all locations across N rates.

Experiment: Nitrogen rate x timing study

Location: Rice Research Station

Soil Type/Analysis: Crowley silt loam; ph: 6.8; O.M.: 0.78%; extractable nutrients (mg/kg): P-8, Na-57, K-83, Ca-1261, Mg-272, Zn-1.03, S-4.90, As-2.71

Variety/Seeding Rate: LMNT, 150 lb/A

Planting Method/Date: Water-seeded, Apr 13

Fertilization: 60 lb/A P_2O_5 and K_2O ppi; nitrogen source, ammonium sulfate

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

Emergence Date: LMNT, Apr 20

Water Management: Flooded, Apr 12; drained, June 7; reflooded, June 9; harvest drainage, July 28

Herbicides: 0.6 oz ai/A Londax (bensulfuron-methyl), May 13; 1.0 lb ai/A Basagran (bentazon), June 8

Insecticides: 0.6 lb ai/A Furadan (carbofuran), May 23

Fungicides: 0.28 lb ai/A Tilt (propiconazol), June 23; 0.5 lb ai/A Benlate (benomyl), July 7

Harvest: Aug 16

Experimental Design: Randomized complete block with four replications of 10 N rate x timing treatment combinations

Comments: Moderate N deficiency was evident 4 weeks after emergence at 30 lb/A and 7 weeks after emergence at 60 lb/A. Days to 50% heading and plant height increased with increasing N (Table 1). Optimum grain yield occurred at a N rate of 120 lb/A.

Table 1. Effect of N rate and timing on performance, grain yield, and yield components of water-seeded Lemont rice. Rice Research Station, Crowley, LA. 1988.

Total N	Time of N*: PP	PI	PD	PD + 10 days	Days to 50% heading	Plant height	Grain yield at 12% moisture	Whole plant	Panicles	Panicle weight	Grain weight	Panicle weight	Grain weight	Sterile florets	Filled grains
----------(lb/A)----------						(cm)	(lb/A)	($g/3\ ft^2$)	($no/3\ ft^2$)	----($g/3\ ft^2$)----		(g/20 panicles)		(no/20 panicles)	
0	--	--	--	--	76	59	4315	275	142	177	166	27	26	56	962
30	30	--	--	--	73	59	5573	356	159	218	206	28	26	64	987
60	60	--	--	--	74	68	7147	449	187	299	260	30	28	83	1058
90	90	--	--	--	75	75	8190	504	193	301	279	33	31	159	1193
90	60	30	--	--	73	72	7778	488	186	289	273	31	29	133	1114
120	120	--	--	--	78	77	8359	553	226	309	284	28	26	155	1063
120	90	30	--	--	75	76	8459	579	231	335	311	29	27	171	1081
150	150	--	--	--	80	81	8315	569	232	314	285	29	26	248	1075
180	180	--	--	--	80	85	8425	557	222	298	274	31	28	278	1189
180	120	--	30	30	77	80	8541	549	217	291	282	30	27	244	1109
C.V., %					1.45	4.54	4.08	8.49	9.14	11.50	8.63	9.52	9.55	30.14	9.11
LSD (0.05):					2	6	601	60	26	47	33	ns	ns	70	143

* Time of N: PP = preplant; PI = panicle initiation; and PD = panicle differentiation.

Experiment: Nitrogen rate x timing study

Location: East Carroll Parish, Buford Perry Farm

Soil Type/Analysis: Sharkey clay; ph: 6.4; O.M.: 1.47%; extractable nutrients (mg/kg): P-21, Na-127, K-537, Ca-5508, Mg-1460, Zn-5.51, S-10.22, As-6.68

Variety/Seeding Rate: LMNT, 100 lb/A

Planting Method/Date: Drill-seeded, Apr 27

Fertilization: Nitrogen source, urea

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

Emergence Date: LMNT, May 17

Water Management: Flushed, May 2, May 9, May 16, May 24, May 31; permanent flood, June 17; harvest drainage, Sep 7

Herbicides: 4.0 lb ai/A Stam (propanil), May 21; 4.0 lb ai/A Stam, June 12; 0.9 oz ai/A Londax (bensulfuron-methyl), July 1

Insecticides: 0.6 lb ai/A Furadan (carbofuran), July 12

Fungicides: 0.22 lb ai/A Tilt (propiconazol), July 18; 0.5 lb ai/A Benlate (benomyl), Aug 6

Harvest: Sep 23

Experimental Design: Randomized complete block with four replications of 10 N rate x timing treatment combinations

Comments: Response to applied N was observed 4 days after applying the basal N and permanent flood. A N deficiency occurred during mid-season, even at high rates of applied N, indicating poor efficiency and uptake. Days to 50% heading and plant height increased with increasing N (Table 2). Optimum grain yield occurred at a N rate of 120 lb/A.

Table 2. Effect of N rate and timing on performance, grain yield, and yield components of drill-seeded Lemont rice. Buford Perry Farm, East Carroll Parish, LA. 1988.

	Time of N*														
Total N	PF	PI	PD	PD + 10 days	Days to 50% heading	Plant height	Grain yield at 12% moisture	Whole plant	Panicles	Panicle weight	Grain weight	Panicle weight	Grain weight	Sterile florets	Filled grains
----------(lb/A)----------						(cm)	(lb/A)	(g/3 ft^2)	(no/3 ft^2)	----(g/3 ft^2)----		(g/20 panicles)		(no/20 panicles)	
0	--	--	--	--	85	64	4551	458	88	263	251	57	53	288	2063
30	30	--	--	--	85	67	5361	523	101	293	280	60	57	248	2151
60	60	--	--	--	86	71	6032	590	118	327	314	66	63	254	2333
90	90	--	--	--	88	75	6592	685	129	381	364	64	61	279	2279
90	60	30	--	--	87	75	6465	505	94	287	276	66	63	268	2345
120	120	--	--	--	90	76	6884	731	139	402	386	65	63	268	2411
120	90	30	--	--	88	73	6480	615	119	338	324	53	50	238	1884
150	150	--	--	--	91	79	6809	690	137	376	360	70	67	267	2571
180	180	--	--	--	91	78	6749	741	142	406	389	59	56	296	2128
180	120	--	30	30	90	80	7011	658	122	365	349	65	62	261	2342
C.V., %					0.93	3.10	4.25	11.10	12.04	11.13	11.02	9.81	10.08	24.77	9.95
LSD (0.05):					2	4	523	100	21	55	52	9	9	ns	325

* Time of N: PF = preflood; PI = panicle initiation; and PD = panicle differentiation.

Experiment: Nitrogen rate x timing study

Location: Rapides Parish, Will Bollich Farm

Soil Type/Analysis: Moreland clay; ph: 6.6; O.M.: 1.54%; extractable nutrients (mg/kg): P-47, Na-22, K-314, Ca-3055, Mg-934, Zn-3.88, S-5.71, As-6.20

Variety/Seeding Rate: LMNT, 100 lb/A

Planting Method/Date: Drill-seeded, May 9

Fertilization: Nitrogen source, ammonium sulfate

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

Emergence Date: LMNT, May 22

Water Management: Flushed, May 12, May 19, May 24, May 30, June 4, June 11; permanent flood, June 18; harvest drainage, Sep 1

Herbicides: 4.0 lb ai/A Bolero (thiobencarb), May 10; 3.0 lb ai/A Stam (propanil) + 0.25 lb ai/A Buctril (bromoxynil), June 2; 0.9 oz ai/A Londax (bensulfuron-methyl), June 22; 3.0 lb ai/A Ordram (molinate), June 29

Insecticides: 0.6 lb ai/A Furadan (carbofuran), July 8

Fungicides: 0.17 lb ai/A Tilt (propiconazol), July 14

Harvest: Sep 14

Experimental Design: Randomized complete block with four replications of 10 N rate x timing treatment combinations

Comments: Response to applied N was observed 4 days after applying the basal N and permanent flood. Days to 50% heading and plant height increased with increasing N (Table 3). Optimum grain yield occurred at a N rate of 120 lb/A.

Table 3. Effect of N rate and timing on performance, grain yield, and yield components of drill-seeded Lemont rice. Will Bollich Farm, Rapides Parish, LA. 1988.

Total N	Time of N*: PF	PI	PD	PD + 10 days	Days to 50% heading	Plant height	Grain yield at 12% moisture	Whole plant	Panicles	Panicle weight	Grain weight	Panicle weight	Grain weight	Sterile florets	Filled grains
----------(lb/A)----------						(cm)	(lb/A)	(g/3 ft^2)	(no/3 ft^2)	----(g/3 ft^2)----		(g/20 panicles)		(no/20 panicles)	
0	--	--	--	--	80	72	5751	410	90	238	229	56	52	212	1943
30	30	--	--	--	81	77	6518	532	106	301	288	56	52	216	1911
60	60	--	--	--	82	78	6684	504	110	284	273	49	47	169	1734
90	90	--	--	--	84	81	6941	590	129	317	305	53	50	201	1874
90	60	30	--	--	83	80	7083	510	114	281	268	55	51	246	1935
120	120	--	--	--	85	82	7074	577	131	311	296	52	48	267	1854
120	90	30	--	--	85	81	7301	605	122	333	317	55	51	303	1917
150	150	--	--	--	86	83	7380	676	136	371	353	63	58	318	2181
180	180	--	--	--	86	85	7159	674	149	360	340	55	50	425	1947
180	120	--	30	30	84	83	7158	511	120	281	264	53	49	319	1872
C.V., %					1.77	2.97	4.62	13.91	11.01	14.46	14.78	13.06	14.49	34.59	14.08
LSD (0.05):					3	5	626	113	19	65	63	ns	ns	134	ns

* Time of N: PF = preflood; PI = panicle initiation; and PD = panicle differentiation.

Experiment: Nitrogen rate x timing study

Location: Rapides Parish, Will Bollich Farm

Soil Type/Analysis: Moreland silty clay; ph: 7.0; O.M.: 1.62%; extractable nutrients (mg/kg): P-51, Na-30, K-470, Ca-3472, Mg-942, Zn-4.37, S-7.31, As-6.20

Variety/Seeding Rate: LMNT, 150 lb/A

Planting Method/Date: Water-seeded, May 12

Fertilization: Nitrogen source, ammonium sulfate

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

Emergence Date: LMNT, May 18

Water Management: Flooded, May 11; drained, May 15; reflooded, May 19; drained, June 8; reflooded, June 10; harvest drainage, Sep 1

Herbicides: 4.0 lb ai/A Bolero (thiobencarb), May 10; 0.9 oz ai/A Londax (bensulfuron-methyl), June 22

Insecticides: 0.6 lb ai/A Furadan (carbofuran), June 18

Fungicides: 0.17 lb ai/A Tilt (propiconazol), July 14

Harvest: Sep 14

Experimental Design: Randomized complete block with four replications of 10 N rate x timing treatment combinations

Comments: Nitrogen deficiency was not observed until later in the season, even at low rates of applied N. Days to 50% heading and plant height increased with increasing N (Table 4). Optimum grain yield occurred at a N rate of 120 lb/A.

Table 4. Effect of N rate and timing on performance, grain yield, and yield components of water-seeded Lemont rice. Will Bollich Farm, Rapides Parish, LA. 1988.

	Time of N*														
Total N	PP	PI	PD	PD + 10 days	Days to 50% heading	Plant height	Grain yield at 12% moisture	Whole plant	Panicles	Panicle weight	Grain weight	Panicle weight	Grain weight	Sterile florets	Filled grains
----------(lb/A)----------						(cm)	(lb/A)	(g/3 ft^2)	(no/3 ft^2)	----(g/3 ft^2)----		(g/20 panicles)		(no/20 panicles)	
0	--	--	--	--	75	63	5975	395	138	239	229	39	37	127	1409
30	30	--	--	--	75	68	6983	522	135	303	291	50	47	214	1835
60	60	--	--	--	76	72	7516	575	161	337	322	48	45	186	1728
90	90	--	--	--	78	78	7439	535	167	295	278	40	36	241	1396
90	60	30	--	--	77	76	7375	484	145	282	267	39	36	188	1427
120	120	--	--	--	78	76	7265	542	160	309	294	41	38	164	1500
120	90	30	--	--	78	78	7692	500	155	279	263	36	32	269	1285
150	150	--	--	--	80	80	6858	501	149	279	262	44	40	244	1616
180	180	--	--	--	80	79	6833	527	161	272	255	41	38	191	1511
180	120	--	30	30	79	79	7316	603	170	337	318	46	42	270	1645
C.V., %					0.95	3.71	4.53	16.95	13.77	19.02	19.19	23.46	23.83	31.11	21.79
LSD (0.05):					1	5	633	ns	ns	ns	ns	ns	ns	ns	ns

* Time of N: PP = preplant; PI = panicle initiation; and PD = panicle differentiation.

Experiment: Nitrogen rate x timing study

Location: Morehouse Parish, Zaunbrecher Farm

Soil Type/Analysis: Hebert silty clay loam; ph: 5.8; O.M.: 1.12%; extractable nutrients (mg/kg): P-15, Na-145, K-299, Ca-2941, Mg-918, Zn-2.58, S-15.67, As-6.36

Variety/Seeding Rate: LMNT, 150 lb/A

Planting Method/Date: Water-seeded, Apr 28

Fertilization: Nitrogen source, ammonium sulfate

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

Emergence Date: LMNT, May 7

Water Management: Flooded, Apr 27; drained, May 2; reflooded, May 5; drained, May 28; reflooded, May 30; harvest drainage, Aug 23

Herbicides: 3.0 lb ai/A Stam (propanil) + 0.75 lb ai/A Basagran (bentazon), May 30; 1.2 oz ai/A Londax (bensulfuron-methyl), June 13

Insecticides: 0.6 lb ai/A Furadan (carbofuran), June 8

Fungicides: 0.17 lb ai/A Tilt (propiconazol), July 14; 0.5 lb ai/A Benlate (benomyl), Aug 6

Harvest: Sep 7

Experimental Design: Randomized complete block with four replications of 10 N rate x timing treatment combinations

Comments: Nitrogen deficiency was observed 3 weeks after emergence at low N. Days to 50% heading and plant height increased with increasing N (Table 5). Optimum grain yield occurred at a N rate of 120 lb/A.

Table 5. Effect of N rate and timing on performance, grain yield, and yield components of water-seeded Lemont rice. Zaunbrecher Farm, Morehouse Parish, LA. 1988.

	Time of N*														
Total N	PP	PI	PD	PD + 10 days	Days to 50% heading	Plant height	Grain yield at 12% moisture	Whole plant	Panicles	Panicle weight	Grain weight	Panicle weight	Grain weight	Sterile florets	Filled grains
----------(lb/A)----------						(cm)	(lb/A)	(g/3 ft^2)	(no/3 ft^2)	----(g/3 ft^2)----		(g/20 panicles)		(no/20 panicles)	
0	--	--	--	--	82	56	6337	368	139	208	196	32	31	90	1174
30	30	--	--	--	78	57	7387	486	165	282	267	37	36	107	1338
60	60	--	--	--	79	61	8142	536	181	301	285	33	31	121	1176
90	90	--	--	--	80	67	8474	492	174	277	260	35	33	145	1245
90	60	30	--	--	79	68	8768	515	166	298	281	35	33	135	1255
120	120	--	--	--	81	71	8947	632	214	336	313	33	31	177	1196
120	90	30	--	--	81	68	9078	580	204	312	289	33	31	186	1247
150	150	--	--	--	83	76	8592	659	216	337	315	36	34	182	1329
180	180	--	--	--	85	79	8183	688	235	339	315	32	30	205	1195
180	120	--	30	30	81	76	8811	641	232	355	331	38	35	208	1330
C.V., %					0.97	4.42	3.80	11.85	11.48	12.16	12.20	14.14	14.30	21.81	13.10
LSD (0.05):					1	6	616	96	32	54	50	ns	ns	49	ns

* Time of N: PP = preplant; PI = panicle initiation; and PD = panicle differentiation.

INFLUENCE OF NITROGEN FERTILIZATION ON PERFORMANCE AND RATOON CROP GRAIN YIELDS OF MARS, MERCURY, AND LEMONT RICE

P.K. Bollich, W.J. Leonards, Jr., S.M. Rawls, and D.M. Walker

INTRODUCTION

Rice farmers in southwest Louisiana have the opportunity to produce ratoon, or second crops, for many of the rice varieties currently being grown. Previous research has shown that second crop grain yields can be increased if additional fertilizer nitrogen (N) is applied to the second crop upon completion of main crop harvest.

This study was initiated to determine the response of second crop grain yields of three early-season rice varieties to variable rates of N applied to the second crop.

MATERIALS AND METHODS

A N rate of 120 lb/A as ammonium sulfate was banded approximately 2 inches deep with 60 lb/A P_2O_5 and K_2O 1 day prior to flooding the water-seeded experiment. Presoaked seed of each variety was seeded at the rate of 150 lb/A into a shallow flood. The rice was grown in a continuous flood culture. The main crop was harvested, and grain yields were estimated for each variety. After completion of harvest, fertilizer N was surface-broadcast at rates of 0, 25, 50, 75, 100, and 125 lb/A. A shallow flood was immediately established.

Pest control (weeds, insects, disease), when necessary, was practiced according to current recommendations. Plant height, days to 50% heading, and grain yield were estimated from four plots for each variety in the main crop. In the second crop, individual whole plots were combine-harvested at field maturity. Number of ratoon tillers, days to 50% heading, grain moisture, and grain yield were measured.

SUMMARY AND CONCLUSIONS

A study was conducted to determine the influence of variable rates of N on performance and grain yield of three rice varieties at the Rice Research Station, Crowley, LA.

Tiller production was good for all varieties. Number of tillers generally increased as rate of N increased. Tiller production was most prolific for the variety Lemont. Mars and Mercury were similar in their tillering ability. Days to 50% heading of the second crop (calculated from emergence of the main crop to heading of the second crop) was similar for the medium-grain varieties Mars and Mercury. Lemont required 15 days more to reach heading in the second crop. Heading was similar in the main crop for all varieties. The medium-grain varieties initiated reproductive growth faster than Lemont, as evidenced by the significantly longer period of time required to reach 50% heading. Rate of applied N had little influence on maturity of the second crop. All varieties responded positively to increasing rate of N. The most significant change in grain yield occurred with an application of 25 lb N/A, increasing average yield by 400 lb/A. Grain yield continued to increase up to a N rate of 125 lb/A, however, the response was somewhat lower.

Higher second crop grain yields can be realized if N is applied after harvest of the main crop. Additional research is needed to determine the optimum N requirement for maximizing second crop grain yields in Louisiana.

Experiment: Second crop variety x nitrogen study

Location: Rice Research Station

Soil Type/Analysis: Crowley silt loam; ph: 6.6; O.M.: 0.69%; extractable nutrients (mg/kg): P-10, Na-54, K-218, Ca-1194, Mg-258, Zn-1.16, S-4.50, As-2.55

Variety/Seeding Rate: MARS, MERC, LMNT, 150 lb/A

Planting Method/Date: Water-seeded, Apr 9

Fertilization: First planting, 60 lb/A P_2O_5 and K_2O + 120 lb N/A (ammonium sulfate) ppi; second planting, variable rates (ammonium sulfate)

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

Emergence Date: MERC, Apr 14; MARS, Apr 15; LMNT, Apr 16

Water Management: Flooded, Apr 8; drained, June 7; reflooded, June 9; harvest drainage, July 24; second planting flooded, Aug 5; drained, Oct 31

Herbicides: 0.6 oz ai/A Londax (bensulfuron-methyl), May 13; 1.0 lb ai/A Basagran (bentazon), June 8

Insecticides: 0.6 lb ai/A Furadan (carbofuran), May 23

Fungicides: 0.28 lb ai/A Tilt (propiconazol), June 23; 0.5 lb ai/A Benlate (benomyl), July 7

Harvest: Main crop, Aug 4; second crop, Nov 9

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

Comments: Seedling vigor was very good for MERC and MARS in the first planting. Days to 50% heading was similar for the three varieties. MARS, MERC, and LMNT yielded 7974, 7606, and 7405 lb/A, respectively, in the main crop. Regrowth in the second crop for MARS and MERC was similar, with LMNT producing a higher number of tillers (Table 1). LMNT required 15 days more than MARS or MERC to reach 50% heading in the second crop. All varieties responded to increased rates of N in the second crop, and produced excellent grain yields.

Table 1. Effect of N rate on performance and second crop grain yields of water-seeded rice varieties. Rice Research Station, Crowley, LA. 1988.

Total N	Tillers				Second crop days to 50% heading*				Second crop grain yields at 12% moisture			
	MARS	MERC	LMNT	N Mean	MARS	MERC	LMNT	N Mean	MARS	MERC	LMNT	N Mean
(lb/A)	------(no/3 ft^2)------				---------(cm)---------				--------(lb/A)--------			
0	211	216	272	233	149	151	166	155	1265	1140	1440	1282
25	241	281	324	282	150	150	168	156	1720	1517	1806	1681
50	247	279	286	271	149	150	167	156	1799	1793	1773	1788
75	223	259	324	268	151	151	168	157	2016	1845	1993	1951
100	274	297	328	300	152	151	168	157	2293	1986	2047	2109
125	205	281	382	289	151	152	167	157	2399	2178	2114	2230
Variety mean	234	269	319		151	151	167		1915	1743	1862	
C.V., %	21.36				0.87				11.18			
LSD (0.01):												
Nitrogen	ns				1				280			
Variety	46				1				161			
Varieties within N	ns				ns				ns			
Varieties across N	ns				ns				ns			

* Days to 50% heading is calculated from emergence of the main crop to 50% heading of the second crop.

EFFECT OF STUBBLE MANAGEMENT AND N FERTILIZATION ON RATOON PERFORMANCE, GRAIN YIELD, AND YIELD COMPONENTS OF MERCURY RICE

P.K. Bollich, W.J. Leonards, Jr., S.M. Rawls, and D.M. Walker

INTRODUCTION

Ratoon cropping, or second cropping, has been practiced in Louisiana for many years. Second cropping gives the farmer an excellent opportunity to increase total production on a given area with a limited amount of additional input. At the present time, second crop production is rather inconsistent, and has not been fully exploited. Typically, a second crop gets little attention from the farmer, resulting in very low grain yields. Research has not adequately addressed second cropping systems. More emphasis is currently being placed on yield maximization of the second crop, by farmers as well as researchers.

Previous research has shown that cultural practices, varieties, and fertilization may influence second crop grain production. Varieties differ in their ratoon potential, and a variety with good ratooning ability may be influenced by management in both the main crop and the ratoon. Earlier research has shown some varieties to respond to higher rates of nitrogen (N). Stubble height also appears to influence second crop response, since clipping of the stubble and straw removal has increased tiller production and grain yield of some varieties. At the present time, a general recommendation for second crop production in southwest Louisiana is to apply 45 to 60 lbs N/A after main crop harvest and immediately flood the field.

This study was initiated to determine whether second crop grain yields could be improved by using better straw management techniques and a more defined N fertilization program. The objectives of this study are to 1) determine the influence of three straw management techniques on tiller formation, grain yield, and yield components of the ratoon, 2) determine the influence of post-heading main crop N fertilization on tiller production and grain yield of the ratoon, and 3) determine optimum N rate for ratoon production.

MATERIALS AND METHODS

The medium grain, semidwarf variety Mercury was used in the study. A N rate of 120 lb/A as ammonium sulfate was banded approximately 2 inches deep with 60 lb/A P_2O_5 and K_2O 1 day prior to flooding the water-seeded experiment. Presoaked Mercury was seeded at the rate of 150 lb/A into a shallow flood. Continuous flood water management was practiced in this study. Pest control (weeds, insects, disease), when necessary, was practiced according to current recommendations. The experiment was combine-harvested at field maturity, and main crop grain yield and plant height were estimated from four individual whole plots.

The straw management systems were imposed onto the experiment after completion of harvest. Conventional straw management consisted of harvesting the main crop plots at a height of 14 to 16 inches (for optimum harvest efficiency) and leaving the straw spread on the remaining stubble. A rolling treatment consisted of knocking down the stubble which had been handled in the conventional manner with a heavy roller. A clipping treatment consisted of recutting the stubble to a height of 6 to 8 inches after harvest and removing all straw.

Ten N treatments were imposed onto each of the three straw management systems. Two treatments consisted of applying either 30 or 60 lb N/A into the main crop floodwater (MCF) 2 days prior to harvest drainage, with no additional N applied in the second crop. Two treatments consisted of applying either 30 or 60 lb N/A into the MCF, followed by 45 lb N/A in the second crop. The remaining treatments included N rates of 0, 30, 45, 60, 75, and 90 lb/A applied only to the second crop. All second crop N treatments were applied to the stubble prior to establishing a shallow, permanent flood.

Number of tillers in the ratoon was determined 4 weeks after flooding. Individual whole plots were combine-harvested at field maturity. Days to 50% heading, grain moisture, and grain yield were measured. Yield components and total biomass were measured.

SUMMARY AND CONCLUSIONS

A study was conducted to determine the influence of stubble management and N fertilization on performance, second crop grain yield, and yield components of Mercury rice. Main crop grain yield was estimated to be 7606 lb/A.

Clipping the rice stubble and removing the straw had no influence on tiller production, days to 50% heading, or grain yield (Table 1). Rolling the stubble, however, significantly decreased tillering and grain yield. Grain yields and tiller production increased as rate of N increased. Main crop heading applications generally showed no advantage over comparable rates of N applied to the second crop after harvest, unless additional N was applied to the second crop.

Stubble management also influenced yield components of the second crop. Rolling the stubble decreased whole plant weight, panicle number, panicle weight, and grain weight (Table 2). Weight of individual panicles, number of sterile florets, and filled grain number were increased by rolling (Table 3). No differences were observed between conventional straw management and clipping with respect to influence on yield components. Increasing N tended to increase all yield components. Nitrogen applied to the MCF significantly increased panicle number and weight, whole plant weight, sterile florets, and filled grains when an additional application was made to the second crop. There was little difference in influence on yield components of a single application of N in the MCF when compared to a similar rate applied only to the second crop.

established 4 weeks after emergence. The two water management treatments included a continuous flood after establishment of the permanent flood and draining at mid-tillering to aerate the seedbed. The drained treatment was left unflooded for 10 days. A topdress application of 45 lb N/A was applied to both water management treatments, and the drained plots were reflooded.

Pest control (weeds, insects, disease), when necessary, was practiced according to current recommendations. The plots were evaluated for straighthead at maturity and were rated based on estimated yield loss. Individual whole plots were harvested with a small-plot combine at field maturity. Days to 50% heading, plant height, grain moisture, and grain yield were determined.

SUMMARY AND CONCLUSIONS

A field study was conducted at the Rice Research Station, Crowley, LA, to determine the effect of Zn and water management on straighthead of Lemont rice.

Days to 50% heading was not influenced by As, Zn, or water management (Table 1). Plants were taller in the drained treatment, and was probably due to more efficient uptake of the topdress N since it was applied to a dry soil and water-incorporated. In the flooded treatment, topdress N was applied into the water, and plant uptake was probably decreased somewhat. There was little evidence of straighthead in the drained treatment at any level of As. In the continuous flood treatment, severity of straighthead increased as rate of As increased. Average grain yields were significantly higher in the drained treatment. Differences in efficiency of the N topdress between water management appeared to influence grain yield, since yields were higher in the drained treatment at a 0 level of As. Yields were constant across Zn and As treatments with draining and aeration. In continuous flood water management, grain yields significantly decreased as rate of As increased, whether Zn had been applied or not.

Draining fields having a history of straighthead can significantly reduce the probability and severity of yield losses due to straighthead. The cultural practice does have a limitation beyond the control of the farmer. Since complete aeration of the soil is necessary for control, any rainfall occurring during the draining procedure will have an influence on the degree of straighthead control. More research is needed to determine other factors involved in the manifestation of straighthead so that additional cultural practices can be identified to help control this disorder.

Experiment: Arsenic x Zinc x water management study

Location: Rice Research Station

Soil Type/Analysis: Crowley silt loam; ph: 6.7; O.M.: 0.67%; extractable nutrients (mg/kg): P-6, Na-83, K-159, Ca-1417, Mg-350, Zn-1.68, S-7.09, As-2.92

Variety/Seeding Rate: LMNT, 100 lb/A

Planting Method/Date: Drill-seeded, May 6

Fertilization: 60 lb/A P_2O_5 and K_2O + 30 lb/A N ppi; 120 lb N/A preflood; 45 lb N/A topdress at PI

Plot Size: 4 x 15 ft (60 ft^2)

Emergence Date: May 15

Water Management: Flushed, May 10, May 16, May 27; flooded, June 9; drained (drain treatment), June 21; reflooded, July 1; harvest drainage, Aug 30

Herbicides: 4.0 lb ai/A Stam (propanil), May 25; 3.0 lb ai/A Stam + 0.75 lb ai/A Basagran (bentazon), May 31; 3.5 lb ai/A Ordram (molinate), June 14

Insecticides: 0.6 lb ai/A Furadan (carbofuran), May 22

Fungicides: 0.17 lb ai/A Tilt (propiconazol), June 21

Harvest: Sep 9

Experimental Design: Split plot in a randomized complete block with four replications, water management assigned to main plots and As x Zn treatment combinations to subplots

Comments: Plots in the draining treatment were completely aerated, with the rice plants showing very slight water stress. Days to 50% heading was not influenced by any treatment effect, while plant height was increased by draining (Table 1). Draining significantly increased grain yields of the As-treated plots, while grain yields decreased in the non-drained plots as rate of As increased.

Table 1. Influence of arsenic, zinc, and water management on performance, grain yield, and straighthead reaction of drill-seeded Lemont rice. Rice Research Station, Crowley, LA. 1988.

Rate		Days to 50% heading		Plant height		Straighthead rating*		Grain yield at 12% moisture	
Arsenic	Zinc	Drained	Flooded	Drained	Flooded	Drained	Flooded	Drained	Flooded
----(lb/A)----				------(cm)------				-----(lb/A)-----	
0	0	81	82	79	76	0	0	7660	7051
2	0	82	82	78	74	0	2	7731	5225
4	0	82	82	79	76	0	5	7232	4502
6	0	81	82	81	75	0	4	8038	3941
0	1	81	83	81	77	0	0	7943	6748
2	1	81	82	78	76	0	2	7952	5593
4	1	81	83	80	74	0	4	7218	4196
6	1	81	82	79	72	0	4	7650	3936
Water management mean		81	82	79	75			7678	5149
C.V., %		0.99		3.19		50.43		9.77	
LSD (0.01):									
Water management		1		3				1054	
Zn		ns		ns				ns	
As		ns		ns				598	

* Rating based on a scale of 0 to 9, where 0 = resistant (no yield loss) and 9 = highly susceptible (complete sterility).

INFLUENCE OF FEEDER ROOT NECROSIS ON MANAGEMENT PRACTICES OF WATER-SEEDED LEMONT RICE

P.K. Bollich, R.W. Schneider, M.C. Rush, W.J. Leonards, Jr., S.M. Rawls, and D.M. Walker

INTRODUCTION

Recent studies have shown feeder root necrosis (FRN), a disorder associated with a host of pathogenic fungi, especially *Pythium* spp., to affect seedling rice. Research has indicated that this disorder can be quite severe, especially in water-seeded rice, resulting in seedling loss and poor plant stands. Previous studies have shown the fungicide Ridomil (metalaxyl) to be effective in controlling FRN and increasing plant stands of water-seeded rice.

The objectives of this study are to 1) evaluate the effectiveness of Ridomil on FRN of water-seeded Lemont rice, and 2) compare agronomic performance of Lemont at variable rates of seeding and fertilizer nitrogen (N) application with and without Ridomil.

MATERIALS AND METHODS

The long-grain semidwarf variety Lemont was planted in this study. Nitrogen rates of 60, 90, 120, and 150 lb/A, and 60 lb/A P_2O_5 and K_2O were banded approximately 2 inches deep into a prepared seedbed. Ridomil was sprayed onto the soil surface at a rate of 1 pint/A. The test was immediately flooded to a depth of 2 to 3 inches. Presoaked Lemont was seeded at rates of 60, 90, 120, and 150 lb/A. Continuous flood water management was practiced, and the rice was allowed to emerge through the flood.

Pest management (weeds, insects, disease) was practiced according to current recommendations. Plant stands were determined after emergence. Individual whole plots were combine-harvested at field maturity. Days to 50% heading, plant height, grain moisture, and grain yield were determined.

SUMMARY AND CONCLUSIONS

A field experiment was conducted at the Rice Research Station to determine the influence of Ridomil on FRN of water-seeded Lemont rice grown under continuous flood culture and to compare variable rates of seeding and fertilizer N application with and without Ridomil.

Number of seedlings increased as seeding rate increased, as expected. Application of Ridomil siginificantly increased the number of seedlings at all seeding rates when at least 120 lb N/A was applied. There were generally no differences in seedling numbers due to Ridomil when 150 lb N/A was applied. Ridomil had no effect on days to 50% heading, plant height, or grain yield.

Days to 50% heading and plant height increased as rate of N increased. No yield response was observed above 120 lb/A. Days to 50% heading and plant height decreased slightly as seeding rate increased. Grain yields were relatively constant across seeding rate.

Ridomil did have a significant influence on stand establishment, increasing seedling number at all seeding rates when N was applied up to 120 lb/A. With the exception of a 60 lb/A seeding rate at fertilizer N levels of 60, 90, and 120 lb/A, resulting stand in the other treatments not receiving a Ridomil application was well within current recommendations for an optimum plant stand.

Experiment: Feeder root necrosis study

Location: Rice Research Station

Soil Type/Analysis: Crowley silt loam; ph: 6.0; O.M.: 0.74%; extractable nutrients (mg/kg): P-9, Na-68, K-90, Ca-994, Mg-248, Zn-3.10, S-9.23, As-3.24

Variety/Seeding Rate: LMNT, 150 lb/A

Planting Method/Date: Water-seeded, Apr 22

Fertilization: 60 lb/A P_2O_5 and K_2O ppi; nitrogen source, ammonium sulfate

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

Emergence Date: LMNT, Apr 26

Water Management: Flooded, Apr 21; drained, June 7; reflooded, June 9; harvest drainage, Aug 5

Herbicides: 3.0 lb ai/A Ordram (molinate), May 18; 0.6 oz ai/A Londax (bensulfuron-methyl), May 20; 1.0 lb ai/A Basagran (bentazon), June 8

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

Fungicides: 1.0 pt ai/A Ridomil (metalaxyl), Apr 21; 0.28 lb ai/A Tilt (propiconazol), June 28; 0.5 lb ai/A Rovral (iprodione), July 14

Harvest: Aug 25

Experimental Design: Split plot in a randomized complete block with four replications, ridomil assigned to main plots and N rate x seeding rate combinations to subplots

Comments: LMNT displayed good seedling vigor and emergence through a continuous flood. Moderate N deficiency was observed at 60 lb N/A after 7 weeks. Ridomil had no influence on days to 50% heading, plant height, or grain yield (Table 1). Increasing N increased days to 50% heading, plant height, and grain yield. Days to 50% heading and plant height decreased as seeding rate increased. Seeding rate had no effect on grain yield.

Table 1. Influence of Ridomil, N rate, and seeding rate on performance and grain yield of water-seeded Lemont rice. Rice Research Station, Crowley, LA. 1988.

Rate		Stand count		Days to 50% heading		Plant height		Grain yield at 12% moisture	
Nitrogen	Seed	Ridomil	No Ridomil	Ridomil	No Ridomil	Ridomil	No Ridomil	Ridomil	No Ridomil
----(lb/A)----		----(plants/ft^2)---				-------(cm)--------		-------(lb/A)------	
60	60	18	11	77	76	72	73	6295	5812
60	90	32	21	75	74	71	72	6187	6156
60	120	36	29	73	74	74	72	7019	6939
60	150	42	28	71	72	71	74	7291	6662
90	60	18	12	78	78	78	81	7549	7445
90	90	28	20	76	77	80	77	8029	7298
90	120	33	27	74	76	78	78	7983	8000
90	150	40	31	73	73	77	77	7858	7900
120	60	21	13	79	78	83	85	8287	8137
120	90	25	17	77	77	81	81	8305	8105
120	120	38	31	77	76	79	80	7910	7896
120	150	42	30	75	77	78	81	8169	8085
150	60	21	23	79	79	87	88	8272	8191
150	90	28	28	78	79	85	84	8245	8136
150	120	34	33	78	78	82	84	8264	7617
150	150	45	39	77	77	81	82	8026	7807
Ridomil Mean		31	25	76	76	79	79	7731	7512
C.V., %		21.43		1.40		4.23		6.06	
LSD (0.05):									
Ridomil		5		ns		ns		ns	
Nitrogen mean									
60		27		74		72		6545	
90		27		76		78		7758	
120		27		77		81		8112	
150		32		78		84		8070	
LSD (0.01):		4		1		2		304	
Seed rate mean									
60		17		78		81		7499	
90		25		77		79		7558	
120		33		76		78		7704	
150		37		75		78		7725	
LSD (0.01):		4		1		2		ns	
N rate x seed rate		ns				ns			

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 98,000 cwt. of pedigreed stock of 22 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 the 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 (20-60-60 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 or 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 flow directly into a treater which applies a measured quantity of liquid fungicide for protection of young rice plants from seedling disease. The rice is bagged as it comes from the treater, 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 and/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 each variety of rice is handled. The machineries used in fallow plowing and in seedbed preparation are important sources of contamination 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 rouging 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.

1988 Activities

Of the 2399 cwt. of foundation seed rice sold in March 1988, the varieties and quantities were as follows: Mercury, 952 cwt.; Lemont, 897 cwt.; and Tebonnet, 550 cwt.

The Rice Research Station's foundation seed crop in 1988 consisted of 19.67 acres of Lemont, 17.81 acres of Mercury, 14.89 acres of Tebonnet, 10.68 acres of Mars, and 9.85 acres of Gulfmont.

Breeder seed was grown in 1988 as follows: Lemont, .60 acre; Mercury, .50 acre; Tebonnet, .50 acre; Mars, .50 acre; Gulfmont, .50 acre; and 2201, an experimental long-grain variety, .25 acre.

Headrows of Lemont, Mercury, Mars, and Gulfmont were also grown in 1988.

STAGING-AREA BAITING WITH DRC-2698 (CAT) FOR CONTROLLING ROOSTING BLACKBIRDS ASSOCIATED WITH DAMAGE TO SPROUTING RICE[1]

E.A. Wilson, J.F. Glahn[2], P.W. Lefebvre[2], G.A. Harper[2], and E.A. LeBoeuf[2]

INTRODUCTION

Blackbirds are responsible for locally severe damage to sprouting rice. Much of this damage is associated with proximity to spring blackbird roosts. Lethal reduction of numbers of spring roosting blackbirds may provide an alternative to existing methods of controlling blackbird depredations on sprouting rice. Staging-area baiting is the most environmentally sound roost-reduction technique for use in southwestern Louisiana, since it requires no introduction of toxicants into aquatic roost ecosystems. The compound DRC-2698 (CAT) is an avicide selective for blackbirds and has been used experimentally to control fall roosting blackbird populations associated with sunflower damage (Cummings and Schafer 1985). In the study reported here, we evaluated the feasibility of baiting with DRC-2698 (CAT) at spring roost staging areas for reducing populations of spring roosting blackbirds.

MATERIALS AND METHODS

The study was conducted during March of 1988. Medium-grain brown rice, which had previously been determined to be an acceptable grain bait carrier (Wilson et al. 1986), was treated with DRC-2698 (2% by weight), using lecithin as a sticker.

Three 15-20-acre test fields were selected within a 0.5-mi radius of the Miller's Lake blackbird roost in Evangeline Parish[3]. Each field was a blackbird staging area consisting of pasture or rice stubble and located under flightlines entering and exiting the roost. On each field we established eight bait lanes (20 ft wide X 600-900 ft long) spaced on 100-ft centers. Fifty pairs of 1 ft^2 sample plots were established along the bait lanes of each field at systematic intervals proportional to total bait lane length. Within each pair of plots, one plot was covered with (1 X 2" mesh) screen wire to exclose blackbirds and allow determination of bait consumption by small birds, small rodents, and insects; the other plot was left exposed. Before baiting with the DRC-2698 (CAT)-treated brown rice, each field was prebaited with untreated brown rice for 1-2 days. Bait (and prebait) was applied at a rate of 50 lbs

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[1] This research was supported in part by funds provided by rice producers through the Louisiana Rice Research Board and by the U.S. Department of Agriculture.

[2] Wildlife Biologists, USDA/APHIS/Animal Damage Control, Bowling Green, Kentucky; Gainesville, Florida; Baton Rouge, Louisiana; and Crowley, Louisiana, respectively.

[3] We express appreciation to growers Clifton Fruge and Charles Veillon for their cooperation in this experiment.

per lane acre using a Herd seed broadcaster mounted on a Suzuki 230 4-wheel ATV. Rice particles in each plot were counted immediately after each prebait and bait application and daily thereafter where bird use was observed. Bait (and prebait) consumption (lbs) by blackbirds was calculated by subtracting the mean percent reduction in rice particles in exclosed plots from the mean percent removed from exposed plots and multiplying by the total pounds of bait applied. Each field was baited or rebaited following >75% consumption of the prebait or bait. Blackbird mortality was estimated using flight pen data indicating 96 birds killed per pound of bait consumed (Glahn et al. 1988).

Daily during prebaiting and baiting, we observed each field in the morning and evening as flightlines left and returned to the roost. We recorded estimates of numbers of birds passing over and landing on test fields and length of time birds spent on test fields. Species compositions of flightlines and feeding flocks were also recorded. Numbers of birds in the roost were estimated weekly before, during, and after baiting by estimating the number of birds entering the roost per minute during the evening flight and multiplying by the length of the flight (minutes). Species composition of the roost was determined through observation of flightlines and random shotgun collection of birds near the roost.

RESULTS AND DISCUSSION

Birds were readily attracted to bait sites with 60-90% of target flightlines foraging on each site after 1-2 days of prebaiting (Tables 1-3). Percent bird use by flightlines varied considerably among observations and fields, but birds consistently used sites throughout most of the 6-8-day baiting period. Flightlines over sites and flocks using fields were made up primarily of red-winged blackbirds (Agelaius phoeniceus) and brown-headed cowbirds (Molothrus ater). Grackle flightlines were not attracted to sites as readily as the previous species. Flightline populations over two of the three sites declined following several bait applications, but treatment response could not be determined due to natural roost decline.

Consumption of bait (and prebait) from exposed plots appeared to be largely an all or nothing phenomenon. In general, all bait particles (regardless of number) were consumed from each plot fed upon by birds. Estimates of prebait removal by blackbirds after 24 hr of exposure ranged from 62 to 100%. During baiting, blackbirds removed 93, 85, and 87% of treated particles from fields 1, 2, and 3, respectively. Based on an estimated total bait consumption of 1310 lbs, estimated blackbird mortality was in excess of 125,000 (Table 4). Because of the slow-acting nature of CAT (>12 hrs between consumption and mortality), only a few dead birds were found near bait sites. Necropsies performed on birds retrieved from the roost suggested that all had died from CAT poisoning.

Between 29 February and 4 March (prior to bait application), the Miller's Lake roost was estimated to contain about 1.5 million blackbirds. About 80% of these were red-winged blackbirds. The roost conspicuously declined over the course of the study (Table 5), with species composition approaching 99% redwings. By 22 March the roost contained approximately 85,000 redwings. Because of migration and other natural factors affecting roosting bird numbers, we were unable to ascertain a roost population response due to baiting. Bird numbers in flightlines passing over bait sites appeared to decline at a more rapid rate than those in untreated flightlines (Table 5), but this too could be an event associated with normal roost dynamics.

SUMMARY AND CONCLUSIONS

Redwings and cowbirds were readily attracted to three staging area bait sites at the Miller's Lake roost in Evangeline Parish. Blackbirds accepted CAT-treated bait for a number of days, suggesting that flightline reduction through sustained baiting may be feasible. Projected blackbird mortality from bait consumption on a limited area (<10 acres) was high (>125,000). Therefore, overall roost population control may be feasible provided that bait sites can be located under all major flightlines.

LITERATURE CITED

Cummings, J.L., and E.W. Schafer, Jr. 1985. An evaluation of the effectiveness of CAT (DRC-2698)-treated baits for reducing roosting blackbird populations associated with blackbird damage in commercial sunflower fields. Denver Wildlife Research Center, Bird Damage Research Report No. 357. 10 pp.

Glahn, J.F., M.L. Avery, P.W. Lefebvre, R.E. Matteson, and C.O. Nelms. 1988. Evaluation of DRC-2698 (CAT)-treated rice bait consumption as an index to red-winged blackbird mortality. Denver Wildlife Research Center, Bird Damage Research Report No. 417. 14 pp.

Wilson, E.A., J.F. Glahn, B.U. Constantine, and E.A. LeBoeuf. 1986. Feasibility of baiting blackbirds at spring roosts for reducing damage to sprouting rice. 78th Ann. Prog. Rpt., Rice Res. Stn., La. Agri. Exp. Stn., L.S.U. Agricultural Center 78:86-90.

Table 1. Estimated blackbird flightline population over site and bird use of Field 1 during prebaiting and baiting with 2% DRC-2698 (CAT)-treated brown rice, Evangeline Parish, Louisiana, March 1988.

			Flightlines over field			Flightline use of field				
Date am or pm	Weather °F/sky	Prebaiting or baiting	Total birds	No. RW&CB[1]	% RW&CB	Total birds	% use	No. RW&CB	% use RW&CB	Time on site (min)
3/02 pm	65/rain	Prebait	61,200	58,140	95	13,000	21	12,350	21	42
3/03 am	64/overcast	Prebait	150,000	144,000	96	50,000	33	49,500	34	30
3/03 pm	68/overcast	Prebait	70,000	68,600	98	59,000	85	56,050	82	50
3/04 am	44/pc	Prebait	161,000	159,400	99	33,000	20	32,000	20	30
3/04 pm	53/overcast	Bait	121,000	115,000	95	25,000	21	24,500	21	40
3/05 am	46/pc	Bait	126,000	119,700	95	48,000	40	45,600	38	60
3/05 pm	54/clear	Bait	150,000	135,000	83	4,000	3	4,000	3	22
3/06 am	44/clear	Bait	170,000	161,500	95	40,000	24	38,000	24	65
3/06 pm	65/pc	Bait	185,000	129,500	70	3,000	2	3,000	2	55
3/07 am	52/pc	Bait	150,000	135,000	90	50,000	33	50,000	37	78
3/07 pm	60/overcast	Bait	125,000	75,000	60	11,000	9	9,900	13	50
3/08 am	64/rain	Bait	80,000	68,000	85	30,000	38	24,000	35	45
3/08 pm	64/overcast	Bait	50,000	30,000	60	5,500	11	5,500	18	40
3/09 am	54/rain	Bait	90,000	81,000	90	20,000	22	20,000	25	55
3/10 pm	60/clear	Prebait	100,000	40,000	40	3,000	3	2,550	6	15
3/11 am	58/pc	Prebait	45,000	40,500	90	15,000	33	13,500	33	60
3/11 pm	64/pc	Bait	50,000	35,000	70	12,000	24	12,000	34	59
3/12 am	64/overcast	Bait	75,000	56,250	75	25,000	33	22,500	40	--
3/12 pm	67/pc	Bait	40,000	30,000	75	25,000	63	22,500	75	70
3/13 am	45/clear	Bait	77,000	65,450	85	25,000	32	23,250	36	21
3/13 pm	54/clear	Bait	34,000	13,600	40	3,200	9	2,880	21	45
3/14 am	38/clear	Bait	51,000	28,000	55	10,000	20	9,000	32	30
3/14 pm	46/clear	Bait	26,000	15,000	58	6,500	25	6,500	43	45
3/15 am	33/clear	Bait	57,000	34,200	60	10,000	18	10,000	29	60

[1] Red-winged blackbirds and brown-headed cowbirds.

Table 2. Estimated blackbird flightline population over site and bird use of Field 2 during prebaiting and baiting with 2% DRC-2698 (CAT)-treated brown rice, Evangeline Parish, Louisiana, March 1988.

			Flightlines over field			Flightline use of field				
Date am or pm	Weather °F/sky	Prebaiting or baiting	Total birds	No. RW&CB[1]	% RW&CB	Total birds	% use	No. RW&CB	% use RW&CB	Time on site (min)
3/08 pm	64/overcast	Prebait	100,000	95,000	95	90,000	90	90,000	95	28
3/09 am	54/rain	Prebait	100,000	90,000	90	8,000	8	7,200	8	28
3/10 pm	60/clear	Prebait	133,000	---	--	20	<1	---	--	5
3/11 am	58/pc	Prebait	53,000	52,000	98	47,000	90	47,000	90	111
3/11 pm	64/pc	Bait	39,000	37,000	95	33,000	85	31,000	83	54
3/12 am	64/overcast	Bait	68,500	65,000	95	62,000	90	59,000	91	73
3/12 pm	67/pc	Bait	33,000	31,000	94	31,000	95	29,000	95	74
3/13 am	45/clear	Bait	30,000	28,500	95	28,500	95	28,500	100	72
3/13 pm	54/clear	Bait	45,000	43,000	96	22,500	50	21,000	49	41
3/14 am	38/clear	Bait	10,000	9,500	95	10,000	100	9,500	100	75
3/14 pm	46/clear	Bait	24,000	23,000	96	2,000	8	2,000	8	47
3/15 am	33/clear	Bait	10,000	9,500	95	9,500	95	9,500	100	80
3/15 pm	--/--	Bait	12,000	11,000	92	600	5	600	5	39
3/16 am	40/pc	Bait	14,000	13,000	93	4,200	30	42,000	32	44
3/16 pm	54/clear	Bait	14,000	13,000	93	0	0	0	0	0
3/17 am	48/pc	Bait	12,000	11,000	92	3,000	25	3,000	27	15

[1] Red-winged blackbirds and brown-headed cowbirds.

Table 3. Estimated blackbird flightline population over site and bird use of Field 3 during prebaiting and baiting with 2% DRC-2698 (CAT)-treated brown rice, Evangeline Parish, Louisiana, March 1988.

			Flightlines over field			Flightline use of field				
Date am or pm	Weather °F/sky	Prebaiting or baiting	Total birds	No. RW&CB[1]	% RW&CB	Total birds	% use	No. RW&CB	% use RW&CB	Time on site (min)
3/14 pm	46/clear	Prebait	18,000	15,000	83	1,300	7	1,100	7	35
3/15 am	33/clear	Prebait	16,800	14,300	85	10,000	60	8,500	60	34
3/15 pm	--/--	Bait	18,000	16,200	90	1,800	10	1,600	10	20
3/16 am	40/pc	Bait	17,300	15,600	90	6,920	40	6,200	40	25
3/16 pm	54/clear	Bait	22,000	16,600	75	5,000	23	4,500	27	45
3/17 am	48/pc	Bait	41,000	36,900	90	12,000	29	11,400	31	45
3/17 pm	45/overcast	Bait	38,000	34,200	90	34,200	90	32,500	95	70
3/18 am	50/rain	Bait	31,000	27,900	90	15,500	50	13,950	50	20

[1] Red-winged blackbirds and brown-headed cowbirds.

Table 4. Bait applications and estimated bird consumption and mortality during DRC-2698 (CAT) baiting trials at three test sites near the Miller's Lake roost, Evangeline Parish, Louisiana, March 1988.

Field	Bait exposure period	Bait application (lbs)	Bait exposed (lbs)	Bait consumed (lbs)	Estimated blackbird mortality
1	3/04 - 3/05	160	160.0	114.4	10,982
	3/05 - 3/06	160	205.0	146.2	14,035
	3/06 - 3/08	160	218.8	175.9	16,886
	3/11 - 3/13	160	160.0	160.0	15,360
	3/13 - 3/15	160	160.0	149.3	14,332
	Totals	800		745.8	71,595
2	3/11 - 3/12	165	165.0	159.0	15,264
	3/12 - 3/13	165	171.0	130.6	12,538
	3/13 - 3/16	165	205.0	130.4	12,518
	Totals	495		420.0	40,320
3	3/15 - 3/16	110	110.0	77.7	7,459
	3/16 - 3/17	55	87.3	56.6	5,434
	3/17 - 3/18	0	30.7	10.0	960
	Totals	165		144.3	13,853
Grand totals		1460		1310	125,768

Table 5. Blackbird roosting population estimates at Miller's Lake during baiting trials with DRC-2698 (CAT)-treated brown rice, Evangeline Parish, Louisiana, March 1988.

Date	Period	Treated flightlines[1]	Untreated flightlines[2]	Total population
2/29/88	Pre-treatment	815,000	711,000	1,526,000
3/04/88	Pre-treatment	---	---	1,624,000
3/09/88	Treatment	366,000	493,000	859,000
3/15/88	Treatment	161,000	301,000	462,000
3/22/88	Post-treatment	24,000	61,000	85,000

[1] Segment of population passing over bait sites on flightlines.

[2] Segment of population not passing over bait sites on flightlines.

POTENTIAL NONTARGET HAZARDS ASSOCIATED WITH THE USE OF TOXIC BAITS FOR CONTROLLING BLACKBIRDS IN SOUTHWESTERN LOUISIANA[1/]

E.A. Wilson, J.F. Glahn[2/], and E.A. LeBoeuf[3/]

INTRODUCTION

Blackbirds (Icterinae) are responsible for locally severe damage to rice in southwestern Louisiana, and monetary loss to individual growers can be substantial. It has been hypothesized that localized blackbird depredations can be reduced through lethal reduction of roosting populations. The feasibility of controlling large numbers of blackbirds through the application of toxic baits to roost staging areas has recently been demonstrated (Glahn et al. 1989). Staging-area baiting appears to be the most environmentally sound roost-reduction technique, since it requires no introduction of toxicants into aquatic roost ecosystems. Data collected using the avicide DRC-2698 (CAT) and brown rice as a grain bait carrier have suggested that toxic baiting hazards to nontarget species may be minimal (Glahn et al. 1989). However, the slow acting (>12 hrs between ingestion and mortality) and selective characteristics of CAT have limited the determination of nontarget mortality.

The toxicant carbofuran is more suitable for the study of potential nontarget hazards, because it is nonselective and fast acting; the consumption of carbofuran usually results in on-site mortality. In this study we used carbofuran-treated brown rice to provide additional information regarding potential nontarget hazards associated with the use of toxic baits for controlling blackbirds in southwestern Louisiana.

METHODS AND MATERIALS

The study was conducted during March and April of 1988. We selected study sites in the northern, central, and southern portions of the southwestern Louisiana rice belt. Three sites (E1, E2, and E3) were located near Miller's Lake in Evangeline Parish, two (V1 and V2) were adjacent to the coastal marsh of Vermilion Parish, and one (A1) was located near Crowley in Acadia Parish. Bait application sites included a variety of habitat types, including grain stubble, weedy fields, and bare soil.

Brown rice was treated with carbofuran (2% by weight), then diluted 1:99 or 1:50 with untreated brown rice. Sites were prebaited with 50 lb/A of untreated brown rice for 1 to 3 days followed by 3 to 4 days exposure of the toxic bait mixture applied at the same rate. We applied bait in one to eight 20-ft wide lane(s) using a Suzuki ATV-mounted Herd broadcaster. The 1:99 bait mixture was applied at sites in Evangeline Parish. All other sites received the 1:50 bait mixture.

1/ This research was supported in part by rice producers through the Louisiana Rice Research Board and by the U.S. Department of Agriculture.
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We searched bait lanes and adjacent cover at least twice daily for dead or affected birds and evidence of scavenging. Where bird activity was high, sites were monitored almost continuously during daylight hours. Test sites were monitored for bird mortality until bait lanes were plowed up by cooperators or until the bait was deactivated by rainfall. Dead birds were collected and preserved for later examination.

At each site we established a census route that followed the nearest available cover surrounding the baited area. Each route was walked at least twice before and after bait application, and birds seen or heard were recorded by number and species.

RESULTS AND DISCUSSION

Numbers and species of nontarget birds recorded during pre- and postbait censuses of bait sites were extremely variable among observations and provided little meaningful information regarding impact of baiting on bird populations (Tables 1-6). Most birds were observed around the perimeter of bait sites; only a few were observed foraging on baited lanes. Savannah sparrows (*Passerculus sandwichensis*) were observed foraging on sites E1, E2, and V2. Mourning doves (*Zenaida macroura*) were seen feeding on sites E2 and V2. American crows (*Corvus brachyrhynchos*) were seen on site E1. Several species of shorebirds were observed feeding around small puddles of water on site V1.

Nontarget mortality resulting from baiting was low in comparison to blackbird mortality (Table 7). Two savannah sparrows were recovered from site V2, and one was recovered from each of sites E2 and E3. Eight mourning doves died on site V2. A pair of mottled ducks (*Anas fulvigula*) and three buff-breasted sandpipers (*Tryngites subruficollis*) were found dead on site V1. A red-tailed hawk (*Buteo jamaicensis*) died on site V2, apparently as a result of feeding on the carcass of a carbofuran-killed boat-tailed grackle (*Quiscalus major*). Stomach analyses showed that savannah sparrows, mourning doves, mottled ducks, and buff-breasted sandpipers had all consumed treated rice. Buff-breasted sandpipers may have mistaken rice for invertebrates.

Blackbirds were more readily attracted to baited sites than nontarget species. Large numbers of blackbirds fed on sites E1, V1, and V2, and blackbird mortality was high (Table 7). Most mortality occurred on baited lanes. A few birds were recovered from adjacent cover.

Potential nontarget hazards associated with the use of toxic grain baits for controlling blackbirds appear greatest for savannah sparrows and mourning doves. These species were present at four of six baited sites. Flickinger et al. (1986) reported mortality of savannah sparrows and mourning doves from the illegal use of carbofuran-treated rice. Savannah sparrow mortality from toxic grain baits was also reported by Glahn et al. (1987).

The presence of water is an important factor influencing potential hazards to many birds. Mottled ducks and buff-breasted sandpipers that died on site V1 were apparently attracted to small puddles of water, even though most of the site (>80%) was dry. Flickinger (1979) observed mortality of snow geese (*Chen caerulescens*) shortly after rice fields planted with aldrin-treated seed were flooded by heavy rains. A great variety of waterfowl, shorebirds, and wading birds was reported to have died in other flooded rice fields planted with aldrin-treated seed (Flickinger and King 1972).

Secondary poisoning is a potential problem associated with the use of toxic baits for controlling blackbirds. In addition to the secondary poisoning of a red-tailed hawk on site V2, a northern harrier (Circus cyaneus) was observed preying on affected redwings at site V1 and showed signs (reluctance to fly, unstable flight) of carbofuran intoxication. American crows are believed to have scavenged blackbirds at site E1. Evidence of nocturnal scavenging was present at site V1. Dead blackbirds may have been fed upon by owls or mammals. Balcomb (1983) reported secondary poisoning of red-shouldered hawks (Buteo lineatus) from feeding on poisoned birds. Flickinger and King (1972) reported secondary poisoning of several species of birds from consumption of invertebrates that fed on poisoned grain.

CONCLUSIONS AND RECOMMENDATIONS

A number of factors may account for the relatively low nontarget mortality observed in this study: (1) Brown rice appears to be relatively unattractive to most nontarget species. Numbers of nontargets foraging on baited fields were low in comparison to numbers present in the vicinity of bait sites. (2) The baiting effort (acreage and exposure period) was limited. (3) The dilution of the treated bait lowered the potential for consumption of treated particles. (4) Some off-site mortality may have gone undiscovered.

The use of an avicide selective for blackbirds such as DRC-2698 (CAT) or DRC-1339 (Starlicide) would probably have eliminated most of the nontarget mortality observed in this study. These materials are relatively nontoxic to many birds and present low secondary hazards because they are metabolized within the body of dead birds. However, toxicities of CAT and Starlicide to many species are unknown, and additional bioassays should be conducted. Mourning doves and owls are relatively sensitive to these materials, and the potential impact of baiting with CAT (or Starlicide) on dove and owl populations needs further evaluation. To accomplish this, more sophisticated population monitoring techniques should be developed.

Nontarget hazards may vary greatly by location of bait sites (habitat) and timing of bait application relative to bird migrations. These variables need further consideration. The determination of optimal dilution rates for baiting blackbirds would permit maximum blackbird mortality and minimal exposure of toxicants to nontarget species. Nontarget hazards are greatly increased by the presence of water, and well-drained bait sites should be selected to avoid attracting waterfowl, shorebirds, and wading birds.

LITERATURE CITED

Balcomb, R. 1983. Secondary poisoning of red-shouldered hawks with carbofuran. J. Wildl. Manage. 47:1129-1132.

Flickinger, E.L. 1979. Effects of aldrin exposure on snow geese in Texas rice fields. J. Wildl. Manage. 43:94-101.

Flickinger, E.L., and K.A. King. 1972. Some effects of aldrin-treated rice on gulf coast wildlife. J. Wildl. Manage. 36:706-727.

Flickinger, E.L., C.A. Mitchell, D.H. White, and E.J. Kolbe. 1986. Bird poisoning from misuse of the carbamate Furadan in a Texas rice field. Wildl. Soc. Bull. 14:59-62.

Glahn, J.F., E.W. Schafer, Jr., and D.F. Mott. 1987. Further evaluation of DRC-4917 as a toxic marker: Implications for blackbird control with toxic baits. Denver Wildlife Research Center, Bird Damage Report No. 413. 10 pp.

Glahn, J.F., E.A. Wilson, and P.W. Lefebvre. 1989. A preliminary evaluation of baiting preroosting assemblages of blackbirds with DRC-2698 (CAT)-treated brown rice for reducing sprouting rice damage. Denver Wildlife Research Center, Bird Damage Research Report No. 437. 9 pp.

Table 1. Nontarget birds seen or heard during censuses of site E1 before (pre) and after (post) application of a 1:99 dilution of 2% carbofuran-treated brown rice, Evangeline Parish, Louisiana, 1988.

Date	Period	Mourning Dove	Northern Cardinal	Savannah Sparrow	Unidentified Sparrow	Northern Mockingbird	American Crow	Blue Jay
3/03	pre	0	2	50	2	1	0	1
3/04	pre	13	2	50	1	2	0	1
3/10	post	0	2	50	1	0	1	0
3/11	post	0	3	100	0	0	1	0
3/12	post	0	4	150	0	0	1	0

Table 2. Nontarget birds seen or heard during censuses of site E2 before (pre) and after (post) application of a 1:99 dilution of 2% carbofuran-treated brown rice, Evangeline Parish, Louisiana, 1988.

Date	Period	Mourning Dove	Savannah Sparrow
3/14	pre	5	5
3/15	pre	0	6
3/16	post	0	0
3/17	post	0	3
3/18	post	3	4

Table 3. Nontarget birds seen or heard during censuses of site E3 before (pre) and after (post) application of a 1:99 dilution of 2% carbofuran-treated brown rice, Evangeline Parish, Louisiana, 1988.

Date	Period	Northern Cardinal	Savannah Sparrow	American Crow	Logger-head Shrike	Red-tailed Hawk	Kill-deer	Great Blue Heron	Unidentified Shore-Bird
3/14	pre	2	25	0	1	1	0	0	0
3/15	pre	8	3	0	0	0	3	0	0
3/16	post	1	6	2	0	0	0	1	20
3/17	post	3	1	0	0	0	0	0	0
3/18	post	5	6	0	0	0	0	0	0

Table 4. Nontarget birds seen or heard during censuses of site V1 before (pre) and after (post) application of a 1:50 dilution of 2% carbofuran-treated brown rice, Vermilion Parish, Louisiana, 1988.

		Nontarget birds 1/																						
Date	Period	UNSP	NOCA	KILL	BWTE	EAKI	EAME	LWFG	LEYE	LBDO	BBPL	MODO	MODU	UNSH	BRTH	LBHE	NOHA	WTSP	OROR	LEBI	COYE	RSTO	BLJA	AMCO
3/25	pre	0	1	0	5	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3/28	pre	2	0	2	0	1	3	5	1	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0
3/29	post	5	1	1	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
3/31	post	0	1	0	0	2	0	0	0	0	0	3	2	50	0	0	0	0	0	0	0	0	0	0
4/04	pre 2/	0	2	2	0	2	0	0	0	0	0	2	0	0	1	1	0	0	0	0	0	0	0	0
4/05	post	0	1	0	0	3	0	0	0	0	0	1	2	0	1	0	1	1	1	1	1	2	1	1

1/ UNSP - Unidentified Sparrow; NOCA - Northern Cardinal; KILL - Killdeer; BWTE - Blue-winged Teal; EAKI - Eastern Kingbird; EAME - Eastern Meadowlark; LWFG - Lesser White-fronted Goose; LEYE - Lesser Yellowlegs; LBDO - Short-billed Dowitcher; BBPL - Black-bellied Plouver; MODO - Mourning Dove; MODU - Mottled Duck; UNSH - Unidentified Shorebird; BRTH - Brown Thrasher; LBHE - Little Blue Heron; NOHA - Northern Harrier; WTSP - White-Throated Sparrow; OROR - Orchard Oriole; LEBI - Least Bittern; COYE - Common Yellowthroat; RSTO - Rufous-sided Towhee; BLJA - Blue Jay; AMCO - American Coot.

2/ Prebait reapplied after consumption of all treated baits.

Table 5. Nontarget birds seen or heard during censuses of site V2 before (pre) and after (post) application of a 1:50 dilution of 2% carbofuran-treated brown rice, Vermilion Parish, Louisiana, 1988.

Date	Period	Unidentified Sparrow	Northern Cardinal	Northern Mockingbird	Mourning Dove	Killdeer	Eastern Kingbird	Tricolored Heron	Northern Shrike
4/06	pre	3	1	0	0	0	0	0	0
4/07	pre	2	0	2	12	0	0	0	0
4/09	post	2	0	0	0	1	1	1	0
4/11	post	2	0	0	2	0	2	0	1

Table 6. Nontarget birds seen or heard during censuses of site A1 before (pre) and after (post) application of a 1:50 dilution of 2% carbofuran-treated brown rice, Acadia Parish, Louisiana, 1988.

Date	Period	Loggerhead Shrike	Lesser Yellowlegs	Brown Thrasher	Fulvous Whistling-Duck	House Sparrow	Unidentified Sandpiper	Unidentified Sparrow	Common Snipe	Mottled Duck	Killdeer
4/12	pre	1	5	1	100	6	0	0	0	0	0
4/13	pre	0	0	0	0	0	20	5	0	0	0
4/14	post	1	0	1	0	0	60	11	0	0	0
4/15	post	0	3	0	0	4	0	0	1	1	2

Table 7. Exposure period, baiting acreage, and bird mortality associated with the application of carbofuran-treated brown rice bait mixtures at sites in Evangeline (E1, E2, and E3), Vermilion (V1 and V2), and Acadia (A1) parishes, Louisiana, 1988.

Site/Type	Exposure period (days)	Bait lane acres	Mortality							
			Red-winged Blackbird	Brown-headed Cowbird	Boat-tailed Grackle	Savannah Sparrow	Mourning Dove	Buff-breasted Sandpiper	Mottled Duck	Red-tailed Hawk
E1/Soybean stubble	4	.41	672	25	0	0	0	0	0	0
E2/Fallow field	3	.14	1	0	0	1	0	0	0	0
E3/Dirt roadbed	3	.14	0	0	0	1	0	0	0	0
V1/Cultivated field	4	1.10	1433	9	32	0	0	3	2	0
V2/Soybean stubble	3	.41	499	13	34	2	8	0	0	1
A1/Grass airstrip	4	.41	0	0	0	0	0	0	0	0

PLANT PHYSIOLOGY

INTRODUCTION

Plant growth regulators (PGRs) can have a tremendous effect on crop production because of their ability to alter plant growth and development. Therefore, studies of PGR modifications to plant growth and development which would improve rice production were conducted.

At present, PGRs have been identified which can modify internode elongation and research has shown modification of internode elongation can be beneficial. To date, research has shown PGRs can reduce plant stature by limiting internode elongation. In varieties susceptible to lodging because of tall stature, reductions in plant height by PGRs have been accomplished and have resulted in a greater tolerance of tall varieties to lodging. In addition, studies to modify internode elongation in rice have shown that PGRs can limit exsertion of the panicle. Studies of this particular response to properly timed applications of PGRs have shown that seed production in red rice can be prevented. In that respect PGRs offer the first control measures for established red rice in commercial rice production. Studies on preventing red rice seed production were continued.

In preliminary greenhouse and small plot trials, emergence has been improved with PGR seed treatments which cause mesocotyl and coleoptile elongation. These structures are short in some semidwarf cultivars and seeding more than 1 inch below the soil surface can result in poor stands. Small plot studies were continued in 1988. In addition seedling height of semidwarf rice increases slowly resulting in poor seedling vigor. Seedling height was increased markedly in 1987, and studies to increase seedling height with PGRs were continued in 1988.

Some PGRs are reported to increase grain yield directly. Several of those materials were evaluated.

To address the objectives of stature reduction, red rice seed elimination, emergence and seedling vigor improvement of semidwarf cultivars and yield enhancement, PGRs were tested for their effects on rice growth and development.

PLANT GROWTH REGULATOR EFFECTS ON RICE

R.T. Dunand, R.R. Dilly, and G.A. Meche

<u>Experiment:</u> Stature reduction and grain production in drill-seeded, early maturing, medium-grain rice <u>(Oryza sativa</u> 'MARS') with KIM-112

<u>Location:</u> Rice Research Station, Crowley, LA

<u>Soil Type/Test Results:</u> N/A

<u>Variety/Seeding Rate:</u> Mars/85 lb/A

<u>Planting Date:</u> 28 Apr 88

<u>Row Spacing:</u> 7 inch

<u>Fertilizer:</u> 7-21-21 with 1.2% Zn at 300 lb/A on 28 Apr; urea (46% N) at 200 lb/A on 26 May; urea at 75 lb/A on 15 June

<u>Plot Size:</u> 3.5 x 10 ft

<u>Treated Area:</u> 3.5 x 10 ft

<u>Treatment(s):</u>

Timing
1. Early boot on 13 July
2. Mid boot on 20 July
3. Late boot on 26 July

Rate
1. Untreated check
2. 0.02 lb ai/A
3. 0.04 lb ai/A

<u>Pertinent Rainfall:</u> 0.65 in. on 20 July; otherwise no significant rainfall within 24 hours following application

<u>Herbicide(s):</u> Propanil (3 lb ai/A) by airplane, 13 May
Propanil (3 lb ai/A) by hand sprayer, 25 May
Ordram (3.5 lb ai/A) by airplane, 7 June
Londax (0.6 lb ai/A) by airplane, 10 June
Bolero (4 lb ai/A) by airplane, 14 June

<u>Insecticide(s):</u> Furadan (0.5 lb ai/A) by airplane, 14 June

<u>Fungicide(s):</u> Tilt (0.3 lb ai/A) by airplane, 28 June and 21 July

<u>Emergence:</u> Began on 9 May

<u>Permanent Flood:</u> 27 May (established); 29 Aug (drained)

Harvest Date: 2 Sept

Harvested Plot Area: 1.17 (center 2 rows) x 5 ft by hand; threshed with Vogel thresher

Experiment Design: Factorial experiment with a randomized complete block (four replications) design

Comments: KIM-112 reduced plant height, delayed maturity, and lowered grain yield. Due to small plot size, no lodging occurred. As the time between KIM-112 application and heading decreased, height reduction decreased. KIM-112 rate and height reduction were directly related. KIM-112 increased grain moisture 0.5 to 1.0%, indicating slightly delayed maturity. Grain yields, although not significantly affected by KIM-112, were lowered 300 to 1200 lb/A by KIM-112.

An ideal plant height for rice is 30 to 36 inches. Applications of KIM-112 at mid boot (11 days before heading) reduced plant height into this range with only a slight negative impact on grain yield. Further investigation into this area using large plots may yield beneficial results.

Table 1. Stature reduction and yield factors in rice (*Oryza sativa* 'MARS') with KIM-112. Rice Research Station, Crowley, LA. 1988.

Treatment	Mature plant height (in)	Panicle density (panicles /sq ft)	Grain moisture (%)	Grain yield at 12% moisture (lb/A)
5 days before heading 0 lb ai/A KIM-112	40a	28a	14.61ab	7433a
5 days before heading .02 lb ai/A KIM-112	36ab	31a	15.41ab	7162a
5 days before heading .04 lb ai/A KIM-112	34bcd	26a	15.21ab	6245a
11 days before heading 0 lb ai/A KIM-112	39a	29a	14.98ab	7429a
11 days before heading .02 lb ai/A KIM-112	32cd	32a	15.68ab	7102a
11 days before heading .04 lb ai/A KIM-112	30de	30a	15.85a	7121a
18 days before heading 0 lb ai/A KIM-112	39a	31a	14.47b	7547a
18 days before heading .02 lb ai/A KIM-112	35abc	26a	14.53ab	6511a
18 days before heading .04 lb ai/A KIM-112	27e	29a	15.59ab	6424a
LSD (.05)	4	8	1.20	1680

PLANT GROWTH REGULATOR EFFECTS ON RICE

R.T. Dunand, R.R. Dilly, and G.A. Meche

Experiment: Stature reduction and grain production in drill-seeded very early maturing long-grain rice (*Oryza sativa* 'TEBONNET') with KIM-112

Location: Rice Research Station, Crowley, LA

Soil Type/Test Results: N/A

Variety/Seeding Rate: Tebonnet/85 lb/A

Planting Date: 27 Apr 88

Row Spacing: 7 inch

Fertilizer: 7-21-21 with 1.2% Zn at 300 lb/A on 27 Apr; urea (46% N) at 200 lb/A on 26 May; urea at 75 lb/A on 15 June

Plot Size: 3.5 x 10 ft

Treated Area: 3.5 x 10 ft

Treatments(s):

Timing
1. Mid boot on 11 July
2. Late boot on 19 July

Rate
1. Untreated check
2. 0.02 lb ai/A
3. 0.04 lb ai/A

Pertinent Rainfall: 0.05 in. on 19 July; otherwise no significant rainfall within 24 hours following application

Herbicide(s): Propanil (3 lb ai/A) by airplane, 13 May
Propanil (3 lb ai/A) by hand sprayer, 25 May
Ordram (3.5 lb ai/A) by airplane, 7 June
Londax (0.6 lb ai/A) by airplane, 10 June
Bolero (4 lb ai/A) by airplane, 14 June

Insecticide(s): Furadan (0.5 lb ai/A) by airplane, 14 June

Fungicide(s): Tilt (0.3 lb ai/A) by airplane, 28 June and 21 July

Emergence: Began on 9 May

Permanent Flood: 27 May (established); 16 Aug (drained)

Harvest Date: 1 Sept

Harvested Plot Area: 1.17 (center 2 rows) x 5 ft by hand; threshed with Vogel thresher

Experimental Design: Factorial experiment with a randomized complete block (four replications) design

Comments: KIM-112 reduced plant height and had little effect on grain production. Due to small plot size, no lodging occurred. As the time between KIM-112 application and heading decreased, height reduction decreased. KIM-112 rate and height reduction were closely related. Grain yields, although not significantly affected by KIM-112, were increased 200 to 400 lb/A by KIM-112 applied at mid-boot.

An ideal plant height for rice is 30 to 36 inches. Applications of KIM-112 at mid boot (13 days before heading) reduced plant height into this range with a slight positive impact on grain yield. Further investigation into this area using large plots may yield beneficial results.

Table 1. Stature reduction and yield factors in rice (*Oryza sativa* 'TEBONNET') with KIM-112. Rice Research Station, Crowley, LA. 1988.

Treatment	Mature plant height (in)	Panicle density (panicles /sq ft)	Grain moisture (%)	Grain yield at 12% moisture (lb/A)
8 days before heading 0 lb ai/A KIM-112	41a	32a	13.73a	6940a
8 days before heading .02 lb ai/A KIM-112	35b	32a	13.91a	6869a
8 days before heading .04 lb ai/A KIM-112	36b	33a	13.71a	6306a
13 days before heading 0 lb ai/A KIM-112	42a	30a	13.64a	6462a
13 days before heading .02 lb ai/A KIM-112	32c	33a	13.85a	6866a
13 days before heading .04 lb ai/A KIM-112	31c	33a	13.79a	6657a
LSD (.05)	3	4	0.69	888

PLANT GROWTH REGULATOR EFFECTS ON RICE

R.T. Dunand, R.R. Dilly, and G.A. Meche

Experiment: Gibberellic acid emergence enhancement in rice (*Oryza sativa* 'TEBONNET')

Location: Rice Research Station, Crowley, LA

Soil Type/Test Results: N/A

Variety/Seeding Rate: Tebonnet/85 lb/A

Planting Date: 27 Apr 88

Row Spacing: 7 inch (3 inch seeding depth)

Fertilizer: 7-21-21 with 1.2% Zn at 300 lb/A on 27 Apr; urea (46% N) at 200 lb/A on 26 May; urea at 100 lb/A on 22 June

Plot Size: 3.5 x 20 ft

Treated Area: 3.5 x 20 ft

Treatment(s): 0, 10, 30, 50, 70, 100, 200 ppm (applied as dust to seed and concentration based on weight)

Rainfall During Germination and Emergence: 30 Apr, 2.0 in; 1 May, .2 in; 6 May, flush; 12 May, .19 in, flush; 13 May, .05 in; 16 May, flush; 20 May, flush; 21 May, 1.0 in; 22 May, .5 in

Herbicide(s): Propanil (3 lb ai/A) by airplane, 13 May
Propanil (3 lb ai/A) by hand sprayer, 25 May
Ordram (3.5 lb ai/A) by airplane, 7 June
Londax (0.6 lb ai/A) by airplane, 10 June
Bolero (4 lb ai/A) by airplane, 14 June

Insecticide(s): Furadan (0.5 lb ai/A) by airplane, 14 June

Fungicide(s): Tilt (0.3 lb ai/A) by airplane, 28 June and 21 July

Emergence: Began on 9 May

Permanent Flood: 27 May (established); 16 Aug (drained)

Harvest Date: 2 Sept

Harvested Plot Area: 2.33 ft (center 4 rows) using Suzue small plot combine; length 14 ft (rep 1), 16.5 ft (rep 2 and 3), 17.5 ft (rep 4)

Experimental Design: Randomized complete block (four replications)

Comments: Gibberellic acid seed treatment had no effect on stand, grain yield, and panicle density of Tebonnet rice. Tebonnet was responsive in 1987. Tebonnet has the poorest seedling vigor of the three primary varieties (Lemont, Mars, and Tebonnet) grown in Louisiana. The wet environment during emergence may have been too stressful for gibberellic acid to be effective on Tebonnet.

Table 1. Gibberellic acid emergence enhancement in rice (*Oryza sativa* 'TEBONNET'). Rice Research Station, Crowley, LA. 1988.

Gibberellic acid conc. (ppm)	Time to 50% emergence (days)	Preflood stand density (plants/ sq ft)	Mature plant height (in)	Panicle density (panicles/ sq ft)	Grain yield at 12% moisture (lb/A)	Grain moisture (%)
0	16a	15a	44ab	30a	8160a	19.0a
10	16ab	14a	42b	27a	7782a	18.8a
30	16ab	15a	44ab	27a	7786a	19.0a
50	15b	14a	44ab	29a	7645a	19.3a
70	16ab	15a	44ab	30a	8272a	18.9a
100	16ab	15a	45a	29a	8365a	18.7a
200	16ab	15a	45ab	30a	8055a	19.1a
LSD (.05)	1	4	3	4	1088	0.8

PLANT GROWTH REGULATOR EFFECTS ON RICE

R.T. Dunand, R.R. Dilly, and G.A. Meche

Experiment: Gibberellic acid emergence enhancement in rice (*Oryza sativa* 'MARS')

Location: Rice Research Station, Crowley, LA

Soil Type/Test Results: N/A

Variety/Seeding Rate: Mars/85 lb/A

Planting Date: 28 Apr 88

Row Spacing: 7 inch (3 inch seeding depth)

Fertilizer: 7-21-21 with 1.2% Zn at 300 lb/A on 28 Apr; urea (46% N) at 200 lb/A on 26 May; urea at 75 lb/A on 15 June

Plot Size: 3.5 x 20 ft

Treated Area: 3.5 x 20 ft

Treatment(s): 0, 10, 30, 50, 70, 100, 200 ppm (applied as dust to seed and concentration based on weight)

Rainfall During Germination and Emergence: 30 Apr, 2.0 in; 1 May, .2 in; 6 May, flush; 12 May, .19 in, flush; 13 May, .05 in; 16 May, flush; 20 May, flush; 21 May, 1.0 in; 22 May, .5 in

Herbicide(s): Propanil (3 lb ai/A) by airplane, 13 May
Propanil (3 lb ai/A) by hand sprayer, 25 May
Ordram (3.5 lb ai/A) by airplane, 7 June
Londax (0.6 lb ai/A) by airplane, 10 June
Bolero (4 lb ai/A) by airplane, 14 June

Insecticide(s): Furadan (0.5 lb ai/A) by airplane, 14 June

Fungicide(s): Tilt (0.3 lb ai/A) by airplane, 28 June and 21 July

Emergence: Began on 9 May

Permanent Flood: 27 May (established); 29 Aug (drained)

Harvest Date: 7 Sept

Harvested Plot Area: 2.33 (center 4 rows) x 16 ft using Kubota small plot combine

Experimental Design: Randomized complete block (four replications)

Comment: Gibberellic acid (GA) seed treatment had a negative effect on seedling stand of Mars. Emergence, mature plant height, panicle density, grain yield, and grain moisture were unaffected by GA. Although stand and panicle density were not increased by the GA treatments, numerically, grain yields were higher except with the 30 ppm treatment. Mars typically has good seedling vigor. The influence of GA on Mars and medium-grain rice in general may be insignificant.

Table 1. Gibberellic acid emergence enhancement in rice (*Oryza sativa* 'MARS'). Rice Research Station, Crowley, LA. 1988.

Gibberellic acid conc. (ppm)	Time to 50% emergence (days)	Preflood stand density (plants/ sq ft)	Mature plant height (in)	Panicle density (plants/ sq ft)	Grain yield at 12% moisture (lb/A)	Grain moisture (%)
0	15a	13a	42a	25a	8006a	14.8ab
10	14ab	9b	42a	22a	8712a	14.4b
30	15ab	9b	43a	24a	8007a	15.1ab
50	15ab	8b	42a	22a	8151a	15.4ab
70	14b	10b	42a	24a	8514a	14.7ab
100	15ab	10b	42a	20a	8452a	15.2ab
200	14b	9b	42a	25a	8541a	15.5a
LSD (.05)	1	3	1	5	790	0.9

PLANT GROWTH REGULATOR EFFECTS ON RICE

R.T. Dunand, R.R. Dilly, and G.A. Meche

Experiment: Gibberellic acid emergence enhancement in rice (*Oryza sativa* 'LEMONT')

Location: Rice Research Station, Crowley, LA

Soil Type/Test Results: N/A

Variety/Seeding Rate: Lemont/85 lb/A

Planting Date: 28 Apr 88

Row Spacing: 7 inch (3 inch seeding depth)

Fertilizer: 7-21-21 with 1.2% Zn at 300 lb/A on 28 Apr; urea (46% N) at 200 lb/A on 26 May; urea at 75 lb/A on 15 June; 100 lb/A on 22 June

Plot Size: 3.5 x 26 ft

Treated Area: 3.5 x 26 ft

Treatment(s): 0, 10, 30, 50, 70, 100, 200 ppm (applied as dust to seed and concentration based on weight)

Rainfall During Germination and Emergence: 30 Apr, 2.0 in; 1 May, .2 in; 6 May, flush; 12 May, .19 in, flush; 13 May, .05 in; 16 May, flush; 20 May, flush; 21 May, 1.0 in; 22 May, .5 in

Herbicide(s): Propanil (3 lb ai/A) by airplane, 13 May
Propanil (3 lb ai/A) by hand sprayer, 25 May
Ordram (3.5 lb ai/A) by airplane, 7 June
Londax (0.6 lb ai/A) by airplane, 10 June
Bolero (4 lb ai/A) by airplane, 14 June

Insecticide(s): Furadan (0.5 lb ai/A) by airplane, 14 June

Fungicide(s): Tilt (0.3 lb ai/A) by airplane, 28 June and 21 July

Emergence: Began on 9 May

Permanent Flood: 27 May (established); 29 Aug (drained)

Harvest Date: 9 Sept

Harvested Plot Area: 2.33 (center 4 rows) x 22 ft using Kubota small plot combine

Experimental Design: Randomized complete block (four replications)

Comments: Emergence rate, seedling stand, mesocotyl length, panicle density, and grain yield were increased by gibberellic acid (GA) seed treatment. Gibberellic acid treatment hastened emergence by 2 days (16 DAP for the check compared to 14 DAP for GA). Preflood seedling stand was increased 20-40% with the greatest increase associated with 10 and 20 ppm GA. Gibberellic acid produced increases in mesocotyl length of 1.5 to 2 cm which accounts for the increases in emergence and stand. These results are more or less consistent with results in 1987. Panicle density was increased up to 25% by GA, and resultant positive yield increases ranged between 400 and 700 lb/A. The negative impact on grain yield of 70 ppm GA is inconsistent and unexplained.

Rainfall was significant during emergence in 1988. Alternate wetting and drying of the soil caused crusting of the soil surface before emergence. Flushing was necessary at times. These were harsh conditions during germination and emergence. The success of GA seed treatment in 1987 and 1988 indicates seed treatment can be beneficial under a wide range of conditions.

Table 1. Gibberellic acid emergence enhancement in rice (*Oryza sativa* 'LEMONT'). Rice Research Station, Crowley, LA. 1988.

Gibberellic acid conc. (ppm)	Time to 50% emergence (days)	Preflood stand density (plants/ sq ft)	Mesocotyl length 41 DAP (mm)	Mature plant height (in)	Panicle density (panicles /sq ft)	Grain yield at 12% moisture (lb/A)	Grain moisture (%)
0	16a	13b	11c	30a	25b	5508ab	13.5a
10	14b	18a	17bc	30ab	29ab	6238a	13.4a
30	14b	18a	19bc	30a	32a	6138a	13.1a
50	14b	16ab	27ab	29ab	29ab	6363a	13.3a
70	14b	16ab	24ab	28b	27ab	4950b	13.2a
100	14b	16ab	29ab	29ab	28ab	6211a	13.3a
200	14b	16ab	34a	29ab	29ab	5899a	13.1a
LSD (.05)	0	3	12	1	4	889	0.4

PLANT GROWTH REGULATOR EFFECTS ON RICE

R.T. Dunand, R.R. Dilly, and G.A. Meche

Experiment: Gibberellic acid postemergence and early flood establishment in rice (*Oryza sativa* 'LEMONT' and 'MARS')

Location: Rice Research Station, Crowley, LA

Soil Type/Test Results: N/A

Variety/Seeding Rate: Lemont/85 lb/A; Mars/85 lb/A

Planting Date: 27 Apr 88

Row Spacing: 7 inch (0.5 inch seeding depth)

Fertilizer: 7-21-21 with 1.2% Zn at 300 lb/A on 27 Apr; urea (46% N) at 270 lb/A for Lemont and 210 lb/A for Mars on 2 June for early flood treatments and on 9 June for standard flood treatments

Plot Size: 3.5 x 22 ft

Treated Area: 3.5 x 22 ft

Treatment(s): Gibberellic acid rates: 0 and .014 lb ai/A applied at 2-3 leaf stage (19 May); Flood dates: early flood (2 June) based on height (12 inches) of GA treatment and standard flood (9 June) based on height (12 inches) of check treatment

Rainfall: No significant rainfall within 24 hours after GA application

Herbicide(s): Propanil (3 lb ai/A) by airplane, 13 May
Propanil (3 lb ai/A) by hand sprayer, 25 May (early flood)
Propanil (3 lb ai/A) by hand sprayer, 8 June (standard flood)
Ordram (3.5 lb ai/A) by airplane, 7 June
Londax (0.6 lb ai/A) by airplane, 10 June
Bolero (4 lb ai/A) by airplane, 14 June

Insecticide(s): Furadan (0.5 lb ai/A) by airplane, 14 June

Fungicide(s): Tilt (0.3 lb ai/A) by airplane, 28 June and 21 July

Emergence: 10 May

Permanent Flood: Established - see treatments; Drained, 23 Aug (early), 29 Aug (standard)

Harvest Date: 14 Sept

Harvested Plot Area: 2.33 (center 4 rows) x 17 ft using Kubota small plot combine

Experimental Design: Split plot (main plots - flood date, subplots - gibberellic acid rate); randomized complete block (four replications)

Comments: Grain yield tended to be higher in the early flood treatments (6537 vs 6155 lb/A). In particular, Mars treated with gibberellic acid (GA) and flooded early (36 DAP) produced the highest yield (7146 lb/A). In general, Lemont (5683 vs 6010 lb/A) responded to GA better than Mars (6907 vs 6785 lb/A). The potential for yield increases in rice from early flood establishment is known. Increasing seedling height in rice with GA to allow early flooding may have a significant impact on future rice production.

Table 1. Gibberellic acid and early flooding in rice (*Oryza sativa* 'LEMONT' and 'MARS'). Rice Research Station, Crowley, LA. 1988.

Flood time (DAP)	Variety	Gibberellic acid rate (lb ai/A)	Grain moisture (%)	Grain yield at 12% moisture (lb/A)
36	Lemont	0	13.2de	5985bcd
	Lemont	.014	13.0e	6232a-d
	Mars	0	13.5cde	6785ab
	Mars	.014	13.5cde	7146a
43	Lemont	0	13.7bcd	5381d
	Lemont	.014	14.2abc	5789cd
	Mars	0	14.7a	7029a
	Mars	.014	14.3ab	4623abc
LSD (.05)			0.6	866

PLANT GROWTH REGULATOR EFFECTS ON RICE

R.T. Dunand, R.R. Dilly, and G.A. Meche

Experiment: Gibberellic acid/propanil postemergence and seedling vigor in rice (*Oryza sativa* 'MARS')

Location: Rice Research Station, Crowley, LA

Soil Type/Test Results: N/A

Variety/Seeding Rate: Mars/85 lb/A

Planting Date: 25 Apr 88

Row Spacing: 7 inch (3 inch seeding depth)

Fertilizer: 7-21-21 with 1.2% Zn at 300 lb/A on 28 Apr; urea (46% N) at 200 lb/A on 26 May

Plot Size: 3.5 x 26 ft

Treated Area: 3.5 x 26 ft

Treatment(s): Propanil (0, 3, 4, 5, 6 ai lb/A); Gibberellic acid (.004, .007, .014 lb ai/A); Propanil + Gibberellic acid (4 + .014 lb ai/A, 5 + .014 lb ai/A, 6 + .014 lb ai/A) applied at 3-4 leaf stage (24 May)

Rainfall During Germination and Emergence: 30 Apr, 2.0 in; 1 May, .2 in; 6 May, flush; 12 May, .19 in, flush; 13 May, .05 in; 16 May, flush; 20 May, flush; 21 May, 1 in; 22 May, .5 in

Herbicide(s): Propanil (3 lb ai/A) by airplane, 13 May
Ordram (3.5 lb ai/A) by airplane, 7 June
Londax (0.6 lb ai/A) by airplane, 10 June
Bolero (4 lb ai/A) by airplane, 14 June

Insecticide(s): Furadan (0.5 lb ai/A) by airplane, 14 June

Fungicide(s): Tilt (0.3 lb ai/A) by airplane, 28 June and 21 July

Emergence: 6 May

Permanent Flood: 27 May (established); 23 Aug (drained)

Harvest Date: 9 Sept

Harvested Plot Area: 2.33 (center 4 rows) x 22 ft using Kubota small plot combine

Experimental Design: Randomized complete block (four replications)

Comments: Seedling height of Mars (2 weeks after treatment) was increased slightly (10%) by gibberellic acid (GA) and noticeably by GA and propanil (30%) mixed. Mature plant height, grain yield, and grain moisture were unaffected. Effects on Mars, although less dramatic, were similar to Lemont, indicating GA and propanil are compatible on rice and can increase seedling vigor. Mars is a tall stature rice, and the results indicate tall stature rice is less responsive than semidwarf rice as represented by Lemont (See preceding report).

Table 1. Gibberellic acid (GA) enhanced seedling elongation in rice (*Oryza sativa* 'MARS'). Rice Research Station, Crowley, LA. 1988.

Treatment	Rate (lb ai/A)	Seedling height (in)	Mature plant height (in)	Grain yield at 12% moisture (lb/A)	Grain moisture (%)
Propanil	3	22de	43a	7197ab	13.4a
Propanil	4	22e	43a	7391a	13.7a
Propanil	5	22de	43a	7373a	13.6a
Propanil	6	22e	43a	7283a	13.5a
GA	.004	23cd	43a	7409a	13.3a
GA	.007	24bc	43a	7405a	13.6a
GA	.014	24b	43a	7436a	13.6a
Propanil + GA	4 + .014	29a	42a	6989b	13.7a
Propanil + GA	5 + .014	29a	43a	7393a	13.7a
Propanil + GA	6 + .014	28a	42a	7394a	13.8a
LSD (.05)		1	1	221	0.4

PLANT GROWTH REGULATOR EFFECTS ON RICE

R.T. Dunand, R.R. Dilly, and G.A. Meche

Experiment: Gibberellic acid/propanil postemergence and seedling vigor in rice (*Oryza sativa* 'LEMONT')

Location: Rice Research Station, Crowley, LA

Soil Type/Test Results: N/A

Variety/Seeding Rate: Lemont/85 lb/A

Planting Date: 27 Apr 88

Row Spacing: 7 inch (3 inch seeding depth)

Fertilizer: 7-21-21 with 1.2% Zn at 300 lb/A on 28 Apr; urea (46% N) at 200 lb/A on 26 May

Plot Size: 3.5 x 26 ft

Treated Area: 3.5 x 26 ft

Treatment(s): Propanil (0, 3, 4, 5, 6 ai lb/A); Gibberellic acid (.004, .007, .014 lb ai/A); Propanil + Gibberellic acid (4 + .014 lb ai/A, 5 + .014 lb ai/A, 6 + .014 lb ai/A) applied at 3-4 leaf stage (24 May)

Rainfall During Germination and Emergence: 30 Apr, 2.0 in; 1 May, .2 in; 6 May, flush; 12 May, .19 in, flush; 13 May, .05 in; 16 May, flush; 20 May, flush; 21 May, 1.0 in; 22 May, .5 in

Herbicide(s): Propanil (3 lb ai/A) by airplane, 13 May
Ordram (3.5 lb ai/A) by airplane, 7 June
Londax (0.6 lb ai/A) by airplane, 10 June
Bolero (4 lb ai/A) by airplane, 14 June

Insecticide(s): Furadan (0.5 lb ai/A) by airplane, 14 June

Fungicide(s): Tilt (0.3 lb ai/A) by airplane, 28 June and 21 July

Emergence: 6 May

Permanent Flood: 27 May (established); 23 Aug (drained)

Harvest Date: 5 Sept

Harvested Plot Area: 2.33 ft (center 4 rows) using Kubota small plot combine; length 24 ft (rep 1), 26 ft (rep 2, 3, 4)

Experimental Design: Randomized complete block (four replications)

Comments: Seedling height (2 weeks after treatment) was increased by gibberellic acid (GA) alone and to a much greater degree by GA plus propanil. Gibberellic acid and propanil were compatible and grain yield was unaffected. Mature plant height and grain moisture were also unaffected by GA and GA + propanil. Gibberellic acid can improve seedling vigor in Lemont by increasing seedling height. The primary benefit associated with tall seedlings is related to early flooding which can facilitate weed control, increase grain yield, and hasten maturity.

Table 1. Gibberellic acid (GA) enhanced seedling height in rice (*Oryza sativa* 'LEMONT'). Rice Research Station, Crowley, LA. 1988.

Treatment	Rate (lb ai/A)	Seedling height (in)	Mature plant height (in)	Grain yield at 12% moisture (lb/A)	Grain moisture (%)
Propanil	3	17d	33a	7806ab	14.0ab
Propanil	4	17d	33a	7886ab	13.8ab
Propanil	5	17d	32a	7677ab	14.0ab
Propanil	6	16d	32a	7784ab	14.0ab
GA	.004	18cd	32a	7329b	13.7b
GA	.007	19bc	33a	7766ab	13.7b
GA	.014	20b	32a	7338b	14.0ab
Propanil + GA	4 + .014	24a	32a	7845ab	14.1ab
Propanil + GA	5 + .014	24a	32a	8164a	14.3a
Propanil + GA	6 + .014	24a	32a	7689ab	14.1ab
LSD (.05)		1	1	569	0.5

PLANT GROWTH REGULATOR EFFECTS ON RICE

R.T. Dunand, R.R. Dilly, and G.A. Meche

Experiment: Plant growth regulator seed treatment and fenoxaprop postemergence for red rice control in water-seeded rice (*Oryza sativa* 'TEBONNET')

Location: South Unit, Rice Research Station, Crowley, LA

Soil Type/Test Results: N/A

Variety/Seeding Rate: Tebonnet/200 lb/A

Planting Date: 21 Apr 88

Row Spacing: Water-seeded

Fertilizer: 300 lb/A 7-21-21 with Zn (1.2%) and 200 lb/A urea (46% N) preplant incorporated on 19 Apr

Plot Size: 5 x 30 ft

Treated Area: 5 x 30 ft

Treatment(s):

1. Untreated check
2. Gibberellic acid (GA), 10 ppm + Whip, 0.15 lb ai/A
3. GA, 10 ppm + Whip, 0.30 lb ai/A
4. GA, 10 ppm + Whip, 0.45 lb ai/A
5. GA, 100 ppm + Whip, 0.15 lb ai/A
6. GA, 100 ppm + Whip, 0.30 lb ai/A
7. GA, 100 ppm + Whip, 0.45 lb ai/A
8. AC94377 (AC), 100 ppm + Whip, 0.15 lb ai/A
9. AC, 100 ppm + Whip, 0.30 lb ai/A
10. AC, 100 ppm + Whip, 0.45 lb ai/A
11. AC, 1000 ppm + Whip, 0.15 lb ai/A
12. AC, 1000 ppm + Whip, 0.30 lb ai/A
13. AC, 1000 ppm + Whip, 0.45 lb ai/A

Seed treatments - Seed were soaked in plant growth regulator solutions for 24 hours beginning on 19 Apr; seed were kept moist for 24 hours following draining

Fenoxaprop treatments - Applied at 4-5 leaf/beginning tillering stage on 19 May

Sprayer: CO_2-driven, hand-held, 32 psi, 15 GPA, 80015 nozzles

Rainfall: No significant rainfall within 24 hours after fenoxaprop application

Herbicide(s): Propanil (4 lb ai/A) by airplane on 25 May

Insecticide(s): Furadan (0.5 lb ai/A) by airplane on 7 June

Fungicide(s): None

Emergence: 21 Apr (seeded germinated seed)

Water Management: Flooded (1 to 2 inches) on 20 Apr for seeding; drained on 22 Apr and permanent flood (3 to 4 inches) established on 26 Apr; flood lowered to 1-2 inches on 18 Apr prior to Whip application and raised to 3-4 inches on 27 Apr

Harvest Date: 19 Aug (treatments); 24 Aug (checks)

Harvested Plot Area: 2.33 x 30 ft using Suzue small plot combine

Experimental Design: Randomized complete block (four replications)

Comments: Plant growth regulator seed treatments followed by seedling application of fenoxaprop provided a high degree of red rice control. The impact on grain yield, milling yield, grain quality, and lodging was significant. Tebonnet stand and panicle density were improved slightly. Red rice stands were reduced at least 95% by most treatment combinations, and red rice panicle density was decreased significantly. Subsequent reductions in red rice seed in the grain improved total and whole millings and grade. Both grade and milling yield determine unit price. Unit price was increased seven fold. Taking unit price and grain yield into consideration, gross income was increased 20 fold. Reduction in red rice competition at least doubled grain yield. Lodging was also reduced dramatically. In rice fields heavily infested with red rice, plant growth regulator/fenoxaprop combinations in sequence can have dramatically beneficial effects on rice production.

Table 1. Plant growth regulator seed treatment and fenoxaprop postemergence for red rice control in water-seeded rice (*Oryza sativa* 'TEBONNET'). Rice Research Station, Crowley, LA. 1988.

Seed treatment	Fenoxaprop rate (lb ai/A)	Tebonnet stand density (plants /sq ft)	Tebonnet panicle density (panicles /sq ft)	Red rice stand density (plants /sq m)	Red rice panicle density (panicles /sq m)	Grain moisture (%)	Grain yield at 12% moisture (lb/A)	Lodging (%)
-	0	14a	24bcd	60a	237a	21.6a	1835b	100a
10 PPM GA	.15	20a	39ab	5c	12c	19.7a	4575a	0c
10 PPM GA	.30	16a	28a-d	3c	7c	20.6a	3953a	0c
10 PPM GA	.45	13a	20d	2c	7c	20.9a	3626a	0c
100 PPM GA	.15	16a	31a-d	3c	7c	20.3a	4457a	0c
100 PPM GA	.30	18a	33a-d	2c	4c	21.8a	3778a	0c
100 PPM GA	.45	14a	24bcd	1c	3c	22.1a	3701a	0c
100 PPM AC94377	.15	20a	39a	38b	138b	22.6a	4204a	75ab
100 PPM AC94377	.30	19a	37abc	17c	28c	21.8a	4041a	50b
100 PPM AC94377	.45	17a	30a-d	2c	7c	21.2a	3735a	0c
1000 PPM AC94377	.15	16a	24cd	7c	23c	20.9a	4389a	50b
1000 PPM AC94377	.30	17a	27a-d	3c	7c	21.7a	3854a	0c
1000 PPM AC94377	.45	16a	24cd	3c	7c	21.8a	3563a	0c
LSD (.05)		7	13	16	61	2.5	1098	37

Table 2. Plant growth regulator seed treatment and whip postemergence for red rice control in water-seeded rice (*Oryza sativa* 'TEBONNET'). Rice Research Station. Crowley, LA. 1988.

Seed treatment	Fenoxaprop rate (lb ai/A)	Total milling yield (%)	Whole milling yield (%)	Other types (%)	Grade	Unit price ($/cwt)	Gross income ($/A)
-	0	66c	47c	18.1a	SGa	1.13b	21b
10 PPM GA	.15	71a	65a	3.1b	3b	6.93a	320a
10 PPM GA	.30	71ab	65ab	1.5b	2b	7.20a	286a
10 PPM GA	.45	70ab	63ab	3.6b	3b	6.86a	250a
100 PPM GA	.15	70ab	63ab	3.6b	4b	6.69a	303a
100 PPM GA	.30	70ab	63ab	1.9b	2b	6.98a	263a
100 PPM GA	.45	70ab	63ab	1.5b	2b	7.17a	266a
100 PPM AC94377	.15	70ab	61ab	4.0b	4b	5.82a	270a
100 PPM AC94377	.30	69b	59b	3.3b	3b	5.65a	245a
100 PPM AC94377	.45	71a	65a	1.5b	2b	7.24a	271a
1000 PPM AC94377	.15	71a	66a	3.2b	4b	6.96a	306a
1000 PPM AC94377	.30	71ab	65a	2.6b	3b	7.13a	275a
1000 PPM AC94377	.45	71ab	64ab	1.9b	2b	7.19a	256a
LSD (.05)		2	5	3.4	2	1.36	101

PLANT GROWTH REGULATOR EFFECTS ON RICE

R.T. Dunand, R.R. Dilly, and G.A. Meche

Experiment: AC94377 emergence enhancement in rice (*Oryza sativa* 'TEBONNET')

Location: Rice Research Station, Crowley, LA

Soil Type/Test Results: N/A

Variety/Seeding Rate: Tebonnet/85 lb/A

Planting Date: 27 Apr 88

Row Spacing: 7 inch (3 inch seeding depth)

Fertilizer: 7-21-21 with 1.2% Zn at 300 lb/A on 27 Apr; urea (46% N) at 200 lb/A on 26 May; urea at 75 lb/A on 15 June

Plot Size: 3.5 x 20 ft

Treated Area: 3.5 x 20 ft

Treatment(s): 0, 500, 1000, 2000 ppm (applied as dust to seed and concentration based on weight)

Rainfall During Germination and Emergence: 30 Apr, 2.0 in; 1 May, .2 in; 6 May, flush; 12 May, .19 in, flush; 13 May, .05 in; 16 May, flush; 20 May, flush; 21 May, 1.0 in; 22 May, .5 in

Herbicide(s): Propanil (3 lb ai/A) by airplane, 13 May
Propanil (3 lb ai/A) by hand sprayer, 25 May
Ordram (3.5 lb ai/A) by airplane, 7 June
Londax (0.6 lb ai/A) by airplane, 10 June
Bolero (4 lb ai/A) by airplane, 14 June

Insecticide(s): Furadan (0.5 lb ai/A) by airplane, 14 June

Fungicide(s): Tilt (0.3 lb ai/A) by airplane, 28 June and 21 July

Emergence: Began on 9 May

Permanent Flood: 27 May (established); 29 Aug (drained)

Harvest Date: 2 Sept

Harvested Plot Area: 2.33 ft (center 4 rows) using Suzue small plot combine; length 14 ft (rep 1), 16.5 ft (rep 2 and 3), 17.5 ft (rep 4)

Experimental Design: Randomized complete block (four replications)

Comments: Seed treatments of AC94377 had no effect on time to 50% emergence, grain moisture, panicle density, or mature plant height. Tebonnet is a tall stature rice. Its ability to emerge from deep planting depths is not limited by a short mesocotyl and coleoptile as in semidwarf rice. Visual effects of AC94377 enhancing seedling height were observed. The inability of AC94377 to affect permanent plant height indicates its ability to stimulate elongation in rice is temporary.

Preflood seedling stand and grain yield were significantly reduced by seed treatment with 2000 ppm AC94377. At this high rate, seedlings were tall and spindly and their weakened shoots fell over. Some of these seedlings did not recover and died. The reduced stand affected grain yield. Tebonnet is a tall stature rice with adequate seedling growth. The stimulating effect of AC94377 on seedling elongation of tall stature rice is unnecessary and can have negative effects.

Table 1. AC94377 emergence enhancement in rice (*Oryza sativa* 'TEBONNET'). Rice Research Station, Crowley, LA. 1988.

AC94377 conc. (ppm)	Time to 50% emergence (days)	Preflood seedling stand (plants/ sq ft)	Grain moisture (%)	Grain yield at 12% moisture (lb/A)	Panicle density (panicles/ sq ft)	Mature plant height (in)
0	15a	17a	19.1a	8198a	30a	44a
500	15a	14ab	19.3a	7686a	28a	44a
1000	15a	13ab	19.6a	7538a	26a	45a
2000	15a	11b	20.3a	6619b	25a	45a
LSD (.05)	0	5	1.6	871	8	2

PLANT GROWTH REGULATOR EFFECTS ON RICE

R.T. Dunand, R.R. Dilly, and G.A. Meche

Experiment: AC94377 emergence enhancement in rice (*Oryza sativa* 'MARS')

Location: Rice Research Station, Crowley, LA

Soil Type/Test Results: N/A

Variety/Seeding Rate: Mars/85 lb/A

Planting Date: 28 Apr 88

Row Spacing: 7 inch (3 inch seeding depth)

Fertilizer: 7-21-21 with 1.2% Zn at 300 lb/A on 28 Apr; urea (46% N) at 200 lb/A on 26 May; urea at 75 lb/A on 15 June

Plot Size: 3.5 x 20 ft

Treated Area: 3.5 x 20 ft

Treatment(s): 0, 500, 1000, 2000 ppm (applied as dust to seed and concentration based on weight)

Rainfall During Germination and Emergence: 30 Apr, 2.0 in; 1 May, .2 in; 6 May, flush; 12 May, .19 in, flush; 13 May, .05 in; 16 May, flush; 20 May, flush; 21 May, 1.0 in; 22 May, .5 in

Herbicide(s): Propanil (3 lb ai/A) by airplane, 13 May
Propanil (3 lb ai/A) by hand sprayer, 25 May
Ordram (3.5 lb ai/A) by airplane, 7 June
Londax (0.6 lb ai/A) by airplane, 10 June
Bolero (4 lb ai/A) by airplane, 14 June

Insecticide(s): Furadan (0.5 lb ai/A) by airplane, 14 June

Fungicide(s): Tilt (0.3 lb ai/A) by airplane, 28 June and 21 July

Emergence: Began on 9 May

Permanent Flood: 27 May (established); 29 Aug (drained)

Harvest Date: 9 Sept

Harvested Plot Area: 2.33 (center 4 rows) x 16 ft using Kubota small plot combine

Experimental Design: Randomized complete block (four replications)

Comments: AC94377 seed treatment had a significant effect on time to 50% emergence, preflood seedling stand, grain moisture, and grain yield of Mars rice. AC94377 seed treatment had no effect on panicle density and mature plant height. Time to 50% emergence was 14 days after planting with 500, 1000, and 2000 ppm AC94377 compared to 15 days after planting with the untreated check. Preflood seedling stand was decreased 30% by the 2000 ppm AC94377 seed treatment (10 plants/sq ft compared to 13 plants/sq ft in the untreated check). The same treatment increased grain moisture by 1% and decreased grain yield by greater than 1000 lb/A compared to the check. Mars, a tall stature rice, exhibited a similar response to the high AC94377 rate as did Tebonnet (See preceding report), another tall rice. Seedlings grew taller than normal and were spindly. Shoots were weakened and broke over and did not recover. The decrease in grain yield was a reflection of stand reduction. The slight delay in maturity is not understood.

Table 1. AC94377 emergence enhancement in rice (*Oryza sativa* 'MARS'). Rice Research Station, Crowley, LA. 1988.

AC94377 conc. (ppm)	Time to 50% emergence (days)	Preflood seedling stand (plants/ sq ft)	Grain moisture (%)	Grain yield at 12% moisture (lb/A)	Panicle density (panicles/ sq ft)	Mature plant height (in)
0	15a	13a	15.3b	8250a	29a	43a
500	14b	12ab	16.0ab	8089a	27a	43a
1000	14b	11ab	16.1ab	8108a	25a	43a
2000	14b	10b	16.6a	7056b	24a	42a
LSD (.05)	1	3	1.1	916	8	1

PLANT GROWTH REGULATOR EFFECTS ON RICE

R.T. Dunand, R.R. Dilly, and G.A. Meche

Experiment: AC94377 emergence enhancement in rice (*Oryza sativa* 'LEMONT')

Location: Rice Research Station, Crowley, LA

Soil Type/Test Results: N/A

Variety/Seeding Rate: Lemont/85 lb/A

Planting Date: 28 Apr 88

Row Spacing: 7 inch (3 inch seeding depth)

Fertilizer: 7-21-21 with 1.2% Zn at 300 lb/A on 28 Apr; urea (46% N) at 200 lb/A on 26 May; urea at 75 lb/A on 15 June

Plot Size: 3.5 x 26 ft

Treated Area: 3.5 x 26 ft

Treatment(s): 0, 500, 1000, 2000 ppm (applied as dust to seed and concentration based on weight)

Rainfall During Germination and Emergence: 30 Apr, 2.0 in; 1 May, .2 in; 6 May, flush; 12 May, .19 in, flush; 13 May, .05 in; 16 May, flush; 20 May, flush; 21 May, 1.0 in; 22 May, .5 in

Herbicide(s): Propanil (3 lb ai/A) by airplane, 13 May
Propanil (3 lb ai/A) by hand sprayer, 25 May
Ordram (3.5 lb ai/A) by airplane, 7 June
Londax (0.6 lb ai/A) by airplane, 10 June
Bolero (4 lb ai/A) by airplane, 14 June

Insecticide(s): Furadan (0.5 lb ai/A) by airplane, 14 June

Fungicide(s): Tilt (0.3 lb ai/A) by airplane, 28 June and 21 July

Emergence: Began on 9 May

Permanent Flood: 27 May (established); 29 Aug (drained)

Harvest Date: 9 Sept

Harvested Plot Area: 2.33 (center 4 rows) x 22 ft using Kubota small plot combine

Experimental Design: Randomized complete block (four replications)

Comments: AC94377 seed treatment had a significant effect on time to 50% emergence, preflood seedling stand, panicle density, and mature plant height of Lemont rice. There was no effect on grain yield or moisture. AC94377 shortened time to 50% emergence by 2 days (14 days after planting compared to 16 days after planting in the check). Preflood seedling stand was increased greater than 30% with 2000 ppm AC94377 (16 plants/sq ft compared to 12 plants/sq ft in the check). Panicle density was increased 10% and mature plant height decreased 2 inches by 1000 ppm AC94377.

AC94377 seed treatment had a generally positive influence on semidwarf rice production. Increases in stand and panicle density offer a buffer against other negative influences on grain production such as disease and environmental stress. Although stand and panicle density increases were significant and diseases were controlled and little environmental stress encountered, the benefits of AC94377 were not reflected in enhanced grain production.

Table 1. AC94377 emergence enhancement in rice (*Oryza sativa* 'LEMONT'). Rice Research Station, Crowley, LA. 1988.

AC94377 conc. (ppm)	Time to 50% emergence (days)	Preflood seedling stand (plants/ sq ft)	Grain yield at 12% moisture (lb/A)	Grain moisture (%)	Panicle density (panicles/ sq ft)	Mature plant height (in)
0	16a	12b	5533ab	13.4a	28b	30a
500	14b	14ab	5831a	13.5a	30ab	29ab
1000	14b	14ab	5228b	13.2a	31a	28b
2000	14b	16a	5539ab	13.4a	30ab	30ab
LSD (.05)	1	3	516	0.3	3	2

PLANT GROWTH REGULATOR EFFECTS ON RICE

R.T. Dunand, R.R. Dilly, and G.A. Meche

Experiment: AC94377 and early flood establishment in rice (*Oryza sativa* 'LEMONT')

Location: Rice Research Station, Crowley, LA

Soil Type/Test Results: N/A

Variety/Seeding Rate: Lemont/85 lb/A

Planting Date: 27 Apr 88

Row Spacing: 7 inch (0.5 inch seeding depth)

Fertilizer: 7-21-21 with 1.2% Zn at 300 lb/A on 27 Apr; urea (46% N) at 270 lb/A on 26 May for early flooded treatments and on 9 June for late flooded treatments

Plot Size: 3.5 x 22 ft

Treated Area: 3.5 x 22 ft

Treatment(s): Seed treatments: 0, 1000, 2000 ppm (applied as dust to seed and concentration based on weight); Flood dates: 27 May based on height of 2000 ppm treatment, 9 June based on height of check treatment (basis for flooding was 12-inch plant height).

Rainfall During Germination and Emergence: 30 Apr, 2.0 in; 1 May, .2 in; 6 May, flush; 12 May, .19 in, flush; 13 May, .05 in; 16 May, flush; 20 May, flush; 21 May, 1.0 in; 22 May, .5 in

Herbicide(s): Propanil (3 lb ai/A) by airplane, 13 May
Propanil (3 lb ai/A) by hand sprayer, 25 May (early flood)
Propanil (3 lb ai/A) by hand sprayer, 8 June (standard flood)
Ordram (3.5 lb ai/A) by airplane, 7 June
Londax (0.6 lb ai/A) by airplane, 10 June
Bolero (4 lb ai/A) by airplane, 14 June

Insecticide(s): Furadan (0.5 lb ai/A) by airplane, 14 June

Fungicide(s): Tilt (0.3 lb ai/A) by airplane, 28 June and 21 July

Emergence: Began on 9 May

Permanent Flood: Established - see treatments; Drained - 23 Aug (early), 29 Aug (standard)

Harvest Date: 9 Sept

Harvested Plot Area: 2.33 (center 4 rows) x 17 ft using Kubota small plot combine

Experimental Design: Split plot (main plots-flood date, subplots-AC94377 concentration); randomized complete block (four replications)

Comments: AC94377 stimulated seedling elongation in Lemont. Seedlings from treated seed attained 12 inches in height 2 weeks earlier than seedlings from untreated seeds. Selecting a seedling height of 12 inches as the criterion for establishing the permanent flood allowed flooding AC94377 treatments 2 weeks early. Grain yield was significantly increased by early flooding. There was no significant difference between AC94377 treatments and their corresponding untreated checks. Enhancing seedling height to allow early flooding in rice can have a significant impact on grain yield.

Table 1. AC94377 and early flood establishment in rice (*Oryza sativa* 'LEMONT'). Rice Research Station, Crowley, LA. 1988.

Flood establishment (DAP)	AC94377 conc. (ppm)	Grain yield at 12% moisture (lb/A)
31	0	5666a
	1000	5446a
	2000	5269ab
45	0	3951c
	1000	4212c
	2000	4389bc
LSD (.05)		903

PLANT GROWTH REGULATOR EFFECTS ON RICE

R.T. Dunand, R.R. Dilly, and G.A. Meche

Experiment: AC94377 and water depth in water-seeded rice (*Oryza sativa* 'LEMONT')

Location: Rice Research Station, Crowley, LA

Soil Type/Test Results: N/A

Variety/Seeding Rate: Lemont/120 lb/A

Planting Date: 4 May 88

Row Spacing: Water-seeded - Seed were soaked in water for 24 hours beginning on 2 May; seed were kept moist for 24 hours following draining and before sowing

Fertilizer: 7-21-21 with 1.2% Zn at 300 lb/A and urea (46% N) at 200 lb/A on 28 May

Plot Size: 3.5 x 21 ft

Treated Area: 3.5 x 21 ft

Treatment(s): Seed treatments: 0, 100, 1000 ppm (applied as dust to seed and concentration based on weight); water depth: 3 and 6 inches

Rainfall: Not applicable

Herbicide(s): Ordram (3.5 lb ai/A) by airplane, 7 June
Londax (0.6 lb ai/A) by airplane, 10 June
Bolero (4 lb ai/A) by airplane, 14 June

Insecticide(s): Furadan (0.5 lb ai/A) by airplane, 14 June

Fungicide(s): Tilt (0.3 lb ai/A) by airplane, 28 June and 21 July

Emergence: 4 May

Permanent Flood: Established, 4 May; Drained, 29 Aug

Harvest Date: 14 Sept

Harvest Plot Area: 2.5 x 19.5 ft using Kubota small plot combine

Experimental Design: Split plot (main plots-flood depth, subplots-AC94377 concentration); randomized complete block (four replications)

Comments: The ability of AC94377 to elongate rice seedlings was tested in water-seeded rice with continuous flood water management. In AC94377 treatments, seedlings emerged through the flood several days earlier than in the untreated check. Seedling drift due to slow rooting and poor anchorage reduced stands explaining the overall low grain yields. No treatment effects were found.

Table 1. AC94377 and water depth in water-seeded rice (*Oryza sativa* 'LEMONT'). Rice Research Station, Crowley, LA. 1988.

AC94377 conc. (ppm)	Flood depth (in)	Grain yield at 12% moisture (lb/A)
0	3	3219a
100		3561a
1000		3332a
0	6	2914a
100		2926a
1000		2809a
LSD (.05)		1019

PLANT GROWTH REGULATOR EFFECTS ON RICE

R.T. Dunand, R.R. Dilly, and G.A. Meche

Experiment: Gibberellic acid and water depth in water-seeded rice (*Oryza sativa* 'LEMONT')

Location: Rice Research Station, Crowley, LA

Soil Type/Test Results: N/A

Variety/Seeding Rate: Lemont/120 lb/A

Planting Date: 4 May 88

Row Spacing: Water-seeded - Seed were soaked in water for 24 hours beginning on 2 May; seed were kept moist for 24 hours following draining and before sowing

Fertilizer: 7-21-21 with 1.2% Zn at 300 lb/A and urea (46% N) at 200 lb/A on 28 May

Plot Size: 3 x 21 ft

Treated Area: 3 x 21 ft

Treatment(s): Seed treatments - 0, 10, 100 ppm (applied as dust to seed and concentration based on weight); water depth - 3 and 6 inches

Rainfall: Not applicable

Herbicide(s): Ordram (3.5 lb ai/A) by airplane, 7 June
Londax (0.6 lb ai/A) by airplane, 10 June
Bolero (4 lb ai/A) by airplane, 14 June

Insecticide(s): Furadan (0.5 lb ai/A) by airplane, 14 June

Fungicide(s): Tilt (0.3 lb ai/A) by airplane, 28 June and 21 July

Emergence: 4 May

Permanent Flood: Established, 4 May; Drained, 29 Aug

Harvest Date: 14 Sept

Harvested Plot Area: 2.5 x 19.5 ft using Kubota small plot combine

Experimental Design: Split plot (main plots-flood depth, subplots-gibberellic acid concentration); randomized complete block (four replications)

Comments: Gibberellic acid (GA) seed treatment of water-seeded Lemont reduced grain yield. The effect was similar for the 3- and 6-inch flood depths. Grain yield decreased as GA concentration increased. At harvest, it appeared stands were lower in the GA treatments.

Table 1. Gibberellic acid and water depth in water-seeded rice (*Oryza sativa* 'LEMONT'). Rice Research Station, Crowley, LA. 1988.

Flood depth (in)	Gibberellic acid conc. (ppm)	Grain moisture (%)	Grain yield at 12% moisture (lb/A)
3	0	12.9a	1650a
	10	13.6a	1223bc
	100	14.3a	1056c
6	0	12.9a	1493ab
	10	13.6a	1289abc
	100	14.4a	1073c
LSD (.05)		1.6	381

PLANT GROWTH REGULATOR EFFECTS ON RICE

R.T. Dunand, R.R. Dilly, and G.A. Meche

Experiment: Red rice seedhead suppression with UBI-1444 in water-seeded rice (*Oryza sativa* 'TEBONNET')

Location: South Unit, Rice Research Station, Crowley, LA

Soil Type/Test Results: N/A

Variety/Seeding Rate: Tebonnet/200 lb/A

Planting Date: 21 Apr 88

Row Spacing: Water-seeded: Seed were soaked in water for 24 hours beginning on 19 Apr; seed were kept moist for 24 hours following draining and before sowing

Fertilizer: 300 lb/A 7-21-21 with Zn (1.2%) and 200 lb/A urea (46% N) preplant incorporated on 19 Apr

Plot Size: 5 x 15 ft

Treated Area: 5 x 15 ft

Treatment(s):

Timing
1. Milk stage - 7 days after 50% heading on 14 July
2. Dough stage - 14 days after 50% heading on 22 July

Rate
1. Untreated check
2. 1.5 lb UBI-1444/A

Sprayer: CO_2-driven, hand-held, 32 psi, 15 GPA, 80015 nozzles

Rainfall: No significant rainfall within 24 hours after application

Herbicide(s): Propanil (4 lb ai/A) by airplane on 25 May

Insecticide(s): Furadan (0.5 lb ai/A) by airplane on 7 June

Fungicide(s): None

Emergence: 21 Apr (seeded germinated seed)

Water Management: Flooded (1 to 2 inches) on 20 Apr for seeding; drained on 22 Apr, and permanent flood (3 to 4 inches) established on 24 Apr; drained for harvest 29 July

Harvest Date: 9 Aug

Harvested Plot Area: 2.33 x 30 ft using Suzue small plot combine

Experimental Design: Randomized complete block (four replications)

Comments: This experiment was originally designed to include drill- and water-seeded plots. Red rice infestations were so great that the rice in the drill-seeded plots was completely out competed by red rice. Although drill-seeded plots were treated, the few rice plants present at harvest were insufficient to properly evaluate the treatments.

In water-seeded rice, UBI-1444 reduced lodging applied at the milk stage and increased grain moisture applied at the dough stage. Otherwise, grain yield and total and whole milling yields were unaffected by UBI-1444.

Red rice panicle suppression was significantly reduced by the milk stage application by greater than 95%. This resulted in less red rice in the harvested grain and better rice grade. These differences were insignificant statistically. Variability was high because carryover in the combine from plot to plot was great. A very high red rice infestation in the untreated checks left large quantities of red rice in the combine after harvest.

Applying monetary values to grade, milling yield, and grain yield, the application of UBI-1444 at milk stage provided a gross profit of $113/A. This is the third year in a row that UBI-1444 has proven beneficial against red rice.

Table 1. UBI-1444 and red rice seedhead suppression in rice (Oryza sativa 'TEBONNET'). Rice Research Station, Crowley, LA. 1988.

Name	Lodging rating (%)	Grain moisture (%)	Grain yield at 12% moisture (lb/A)	Total milling yield (%)	Whole milling yield (%)
Check - milk stage	9a	21.0b	2407a	67.8a	54.8a
1.5 lb ai/A MH at milk stage	3b	21.5b	3365a	67.6a	56.5a
Check - dough stage	9a	20.5b	3068a	69.3a	58.0a
1.5 lb ai/A MH at dough stage	9a	23.8a	2660a	66.2a	52.8a
LSD	2	2.1	1013	3.5	7.8

Table 2. UBI-1444 and red rice seedhead suppression in rice (Oryza sativa 'TEBONNET'). Rice Research Station, Crowley, LA. 1988.

Treatment	Red rice panicle density (panicles /sq meter)	Red rice (%)	Grade	Unit price ($/cwt)	Gross profit ($/A)
Check - milk stage	173a	11.3a	6a	3.28a	77b
1.5 lb ai/A MH at milk stage	6c	3.8a	4a	5.82a	190a
Check - dough stage	97ab	11.5a	6a	4.19a	136ab
1.5 lb ai/A MH at dough stage	47bc	4.3a	4a	5.54a	150ab
LSD	80	8.7	2	2.41	89

PLANT GROWTH REGULATOR EFFECTS ON RICE

R.T. Dunand, J.B. Baker, R.R. Dilly, and G.A. Meche

Experiment: Red rice control and seedhead suppression with herbicides and plant growth regulators in water-seeded rice (*Oryza sativa* 'TEBONNET')

Location: South Unit, Rice Research Station, Crowley, LA

Soil Type/Test Results: N/A

Variety/Seeding Rate: Tebonnet/200 lb/A

Planting Date: 21 Apr 88

Row Spacing: Water-seeded: seed were soaked in water for 24 hr beginning on 19 Apr; seed were kept moist for 24 hr following draining and before sowing

Fertilizer: 300 lb/A 7-21-21 with Zn (1.2%) and 200 lb/A urea (46% N) preplant incorporated on 19 Apr

Plot Size: 5 x 30 ft

Treated Area: 5 x 30 ft

Treatment(s):

Herbicides:

1. Thiobencarb - 4 lb ai/A, preplant surface on 19 Apr
2. Molinate - 4 lb ai/A, preplant incorporated on 19 Apr

Plant Growth Regulators

1. Mefluidide - 0.25 lb ai/A at late boot on 30 June
2. UBI-1444 - 1.5 lb ai/A at dough stage on 20 July

Sprayer: CO_2-driven, hand-held, 32 psi, 15 GPA, 80015 nozzles

Pertinent Rainfall: 0.65 inches on 20 July

Herbicide(s): Propanil (4 lb ai/A) by airplane on 25 May

Insecticide(s): Furadan (0.5 lb ai/A) by airplane on 7 June

Fungicide(s): None

Emergence: 21 Apr (seeded germinated seed)

Water Management: Flooded (1 to 2 inches) on 20 Apr for seeding; drained on 22 Apr and permanent flood (3 to 4 inches) established on 24 Apr; drained for harvest 29 July

Harvest Date: 25 Aug

Harvested Plot Area: 2.33 x 30 ft using Suzue small plot combine

Experimental Design: Randomized complete block (four replications)

Comments: Grain moisture was unaffected by preplant herbicides and seedhead suppressants alone. In combination preplant herbicides and seedhead suppressants reduced grain moisture.

Grain yield was increased by preplant herbicides and seedhead suppressants. Although not statistically significant, grain yields were higher with preplant herbicides compared to seedhead suppressants. In combination preplant herbicides and seedhead suppressants increased grain yield above either alone. Molinate plus mefluidide significantly increased grain yield compared to all other treatments.

Total and whole milling yield was significantly increased by preplant herbicides and seedhead suppressants, alone and in combination. Difference in milling yield between preplant herbicides and seedhead suppressants alone and in combination were minor. Molinate plus mefluidide gave the highest milling yields.

Red rice panicle density was significantly decreased by preplant herbicides and seedhead suppressants, alone and in combination with the exception of mefluidide. Panicle density with mefluidide was intermediate between the untreated check and other treatments. In general, preplant herbicides in combination with seedhead suppressants resulted in lower panicle density than either alone.

Red rice had incomplete color development in the pericarp and after milling a significant amount of the red rice appeared as a medium grain contaminate. In this case, it was classified as 'other types'. In the untreated check, the amount of other types due to red rice was great enough (>10%) to cause the sample to be classed as mixed rough rice. Other types responded to preplant herbicide and seedhead suppressant in a manner similar to panicle density response. The same was true of red rice + damaged on which grade is based.

Unit price based on milling yield and grade reflected the improvements in these factors from preplant herbicides, seedhead suppressants and their combinations. Both preplant herbicides and seedhead suppressants markedly increased unit price, and the combination of preplant herbicides and seedhead suppressants increased unit price slightly more than either alone. Preplant herbicides and seedhead suppressants influenced gross profit as they influence unit price. Molinate and mefluidide provided the highest unit price as well as gross profit.

Table 1. Preplant herbicides in combination with postemergence plant growth regulators for red rice control in rice (*Oryza sativa* 'TEBONNET'). Rice Research Station, Crowley, LA. 1988.

Treatment	Rate (lb ai/A)	Growth stage	Red rice panicle density (panicles /sq m)	Other types (%)	Milled red rice + damage (%)	Grade	Price ($/cwt)
-	0		148a	11.9a	11.4a	10a	2.88c
Thiobencarb	4	PPS	17c	1.7b	4.4bcd	4b	6.03a
Molinate	4	PPI	13c	1.5b	0.9cd	2b	6.82a
Mefluidide	0.25	Late Boot	106b	9.5a	5.4bc	9a	3.91bc
UBI-1444	1.5	Milk Stage	13c	0.7b	6.0b	4b	5.30ab
Thiobencarb + mefluidide			10c	1.9b	1.0cd	3b	6.98a
Thiobencarb + UBI-1444			2c	0.4b	0.5cd	1b	6.95a
Molinate + mefluidide			10c	1.2b	0.7cd	2b	7.07a
Molinate + UBI-1444			1c	0.4b	0.3d	1b	6.94a
LSD			28	2.9	4.5	3	1.77

Table 2. Preplant herbicides in combination with postemergence plant growth regulators for red rice control in rice (*Oryza sativa* 'TEBONNET'). Rice Research Station, Crowley, LA. 1988.

Treatment	Rate (lb ai/A)	Growth stage	Grain moisture (%)	Grain yield at 12% moisture (lb/A)	Total milling yield (%)	Whole milling yield (%)
-	0		22.55a	2624e	67cd	53d
Thiobencarb	4	PPS	21.65ab	4074cd	69ab	60ab
Molinate	4	PPI	22.77a	4562bcd	69ab	58b
Mefluidide	0.25	Late boot	19.72bc	3729d	69ab	57bc
UBI-1444	1.5	Milk stage	21.63ab	3707d	66d	54cd
Thiobencarb + mefluidide			15.50d	5300b	70ab	61a
Thiobencarb + UBI-1444			18.75c	4738bc	68bc	59ab
Molinate + mefluidide			15.28d	6420a	70a	61a
Molinate + UBI-1444			15.85d	5174b	69ab	59ab
LSD (.05)			2.25	912	1	3

PLANT GROWTH REGULATOR EFFECTS ON RICE

R.T. Dunand, J.B. Baker, R.R. Dilly, and G.A. Meche

Experiment: Sethoxydim and Fenoxaprop postemergence for red rice control in drill-seeded rice

Location: South Unit, Rice Research Station, Crowley, LA

Soil Type/Test Results: N/A

Variety/Seeding Rate: Lemont/85 lb/A

Planting Date: 16 Apr 88

Row Spacing: 7 inch

Fertilizer: 300 lb/A 7-21-21 with Zn (1.2%) at seeding and 260 lb/A urea (46% N) topdressed preflood on 27 May by manually operated Gandy spreader

Plot Size: 5.83 (10 rows) x 30 ft

Treated Area: 5.83 x 30 ft

Treatment(s):

Herbicide

1. Sethoxydim at 0.10 lb/A
2. Sethoxydim at 0.15 lb/A
3. Fenoxaprop at 0.15 lb/A

Timing - based on red rice growth stage

1. Emergence on 30 Apr
2. 1-2 leaf stage on 9 May
3. 3-4 leaf stage on 16 May
4. 5-6 leaf stage on 7 June
5. 8-10 leaf stage on 27 June
6. Booting on 19 July

Sprayer: CO_2-driven, hand-held, 32 psi, 15 GPA, 80015 nozzles

Pertinent Rainfall: 0.2 in. on 30 Apr and 0.05 in. on 19 July

Herbicide(s): Propanil (4 lb ai/A) by airplane, 25 May

Insecticide(s): Furadan (0.5 lb ai/A) by airplane, 7 June

Fungicide(s): None

Emergence: 30 Apr

Water Management: Flushed on 22 Apr, 28 Apr, 5 May, 12 May, and 19 May; permanently flooded on 27 May

Harvest Date: 13 Sept

Harvested Plot Area: 2.33 (4 rows) x 30 ft using a Kubota small plot combine

Experimental Design: Randomized complete block (three replications)

Comments: Lemont tolerance - Lemont tolerance was good to excellent for applications of sethoxydim and fenoxaprop between emergence and the 5-6 leaf stage. There was no difference in Lemont tolerance to sethoxydim and fenoxaprop.

Grass control - Barnyardgrass infested the experiment and control ratings were made. Sethoxydim and fenoxaprop were equally effective on barnyardgrass applied between the 1-4 leaf stages of rice growth providing excellent (90-100%) control at 0.15 lb/A.

Red rice control - Fenoxaprop was more effective on red rice than sethoxydim. Good (30-70%) red rice control was obtained with 0.15 lb fenoxaprop/A applied at the 3-6 leaf stages of rice growth. Poor (10-30%) to no control was obtained with the other treatments.

Red rice panicle suppression - Booting applications of sethoxydim and fenoxaprop provided 50 to 70% panicle suppression. No differences in sethoxydim and fenoxaprop were noted.

Grain moisture - Grain moisture at harvest was 1 to 3.5% higher for the 8-10 leaf stage and booting application times. Although grain moisture was slightly higher with fenoxaprop, there was little consistent difference in the effect of fenoxaprop and sethoxydim on grain moisture.

Grain yield - Grain yields were increased significantly by applying sethoxydim and fenoxaprop from emergence through the 5-6 leaf stage of rice. Yields were numberically higher with fenoxaprop compared to sethoxydim except for the 3-4 leaf stage application, and yields were significantly higher with fenoxaprop for the emergence application. Later applications at the 8-10 leaf stage and booting had no effect and in some treatments reduced grain yields relative to the untreated check.

Table 1. Sethoxydim, fenoxaprop and red rice control in Lemont rice. Rice Research Station, Crowley, LA. 1988.

Treatment	Lemont tolerance rating	Grass control rating	Red rice control rating	Red rice suppression rating at maturity	Grain moisture (%)	Grain yield at 12% moisture (lb/A)
Check		1e	2bc	4bcd	14.64c	2202f
.10 lb ai/A sethoxydim at emergence		3bc	1c	1ef	14.60c	3441e
.15 lb ai/A sethoxydim at emergence	5ab	2cd	2bc	1f	14.96c	3616de
.15 lb ai/A fenoxaprop at emergence	5a	3bc	2bc	1f	15.30bc	4893abc
.10 lb ai/A sethoxydim at 1-2 lf	4ab	4a	1bc	0f	14.53c	4545a-e
.15 lb ai/A sethoxydim at 1-2 lf	4b	5a	1bc	0f	15.62bc	3943cde
.15 lb ai/A fenoxaprop at 1-2 lf	5ab	5a	3a	0f	14.68c	5437a
.10 lb ai/A sethoxydim at 3-4 lf	5a	4a	1bc	0f	13.94c	4334a-e
.15 lb ai/A sethoxydim at 3-4 lf	5a	5a	1bc	1ef	14.86c	5171ab
.15 lb ai/A fenoxaprop at 3-4 lf	5a	5a	2bc	0f	14.84c	4568a-e
.10 lb ai/A sethoxydim at 5-6 lf	5ab	3b	2bc	4bcd	15.03c	4514a-e

Continued.

Table 1. Continued.

Treatment	Lemont tolerance rating	Grass control rating	Red rice control rating	Red rice suppression rating at maturity	Grain moisture (%)	Grain yield at 12% moisture (lb/A)
.15 lb ai/A sethoxydim at 5-6 lf	4b	4a	2bc	1ef	14.67c	4064b-e
.15 lb ai/A fenoxaprop at 5-6 lf	4ab	3b	3ab	0f	14.52c	4663a-d
.10 lb ai/A sethoxydim at 8-10 lf		1e	2bc	3cde	15.36bc	1899fg
.15 lb ai/A sethoxydim at 8-10 lf		1e	2abc	2def	17.31ab	1205fgh
.15 lb ai/A fenoxaprop at 8-10 lf		2de	2bc	0f	18.13a	1679fgh
.10 lb ai/A sethoxydim at boot		1e	1c	5abc	16.00abc	964gh
.15 lb ai/A sethoxydim at boot		1e	1c	7a	15.55bc	577h
.15 lb ai/A fenoxaprop at boot		1e	1c	6ab	16.28abc	1454fgh
LSD	1	1	1	2	1.98	1033

PLANT GROWTH REGULATOR EFFECTS ON RICE

R.T. Dunand, R.R. Dilly, and G.A. Meche

Experiment: Cytokin and rice grain production

Location: Rice Research Station, Crowley, LA

Soil Type/Test Results: N/A

Variety/Seeding Rate: Lemont/85 lb/A

Planting Date: 25 Apr 88

Row Spacing: 7 inch

Fertilizer: 7-21-21 with 1.2% Zn at 300 lb/A on 28 Apr; urea (46% N) at 200 lb/A on 26 May

Plot Size: 3.5 x 26 ft

Treated Area: 3.5 x 26 ft

Treatment(s):

1. Untreated (control)
2. 8 oz Cytokin/A at 3-6 leaf stage
3. 16 oz Cytokin/A at 3-6 leaf stage
4. 8 oz Cytokin/A at panicle differentiation
5. 16 oz Cytokin/A at panicle differentiation
6. Treatment 3 + 8 oz Nu Film 17/A
7. Treatment 5 + 8 oz Nu Film 17/A

Growth stages: 3-6 leaf stage treatments applied on 8 June with exception of treatment 6 applied 17 June; panicle differentiation treatments applied on 8 July

Sprayer: Co_2-driven, hand-held, 32 psi, 15 GPA, 80015 nozzles

Rainfall: No rainfall within 24 hours after treatment except panicle differentiation treatments received rain 5 hours after application

Herbicide(s): Propanil (3 lb ai/A) by airplane, 13 May
Ordram (3.5 lb ai/A) by airplane, 7 June
Londax (0.6 lb ai/A) by airplane, 10 June
Bolero (4 lb ai/A) by airplane, 14 June

Insecticides(s): Furadan (0.5 lb ai/A) by airplane, 14 June

Fungicide(s): Tilt (0.3 lb ai/A) by airplane, 28 June and 21 July

Emergence: 6 May

Permanent Flood: 27 May (established); 23 Aug (drained)

Harvest Date: 9 Sept

Harvested Plot Area: 2.33 ft (center 4 rows) using Kubota small plot combine; length 22 ft (rep 1, 2, and 3), 24 ft (rep 4)

Experimental Design: Randomized complete block (four replications)

Comments: Experimental conditions were good. Stand was ideal and pests were controlled. Rice growth and development were normal. Treatments were made under ideal conditions. Although no visual differences were noted between treatments, grain yield was higher in most treatments than in the control. Treatment 2 was significantly different in grain yield from the control.

Table 1. Cytokin and rice grain production. Rice Research Station, Crowley, LA. 1988.

Treatment	Grain moisture (%)	Grain yield (lb/A)
Check	13.34a	5661b
0.5 pt/A @ 3-6 LF	13.28a	6502a
1.0 pt/A @ 3-6 LF	13.25a	5934b
0.5 pt/A @ PD	13.24a	5993b
1.0 pt/A @ PD	13.18a	5986b
1 pt/A @ 3-6 LF + NUFILM	13.40a	5934b
1.0 pt/A @ PD + NUFILM	13.34a	5644b
LSD	0.38	498

PLANT GROWTH REGULATOR EFFECTS ON RICE

R.T. Dunand, R.R. Dilly, and G.A. Meche

Experiment: Foliar TRIGGRR and rice grain production

Location: Rice Research Station, Crowley, LA

Soil Type/Test Results: N/A

Variety/Seeding Rate: Lemont/85 lb/A

Planting Date: 25 Apr 88

Row Spacing: 7 inch

Fertilizer: 7-21-21 with 1.2% Zn at 300 lb/A on 28 Apr; urea (46% N) at 200 lb/A on 26 May

Plot Size: 3.5 x 26 ft

Treated Area: 3.5 x 26 ft

Treatment(s):

1. Untreated (control)
2. 8 oz Foliar TRIGGRR/A at 3-5 leaf stage
3. 8 oz Foliar TRIGGRR/A at panicle initiation
4. Treatments 2 + 3

Growth stages: 3-5 leaf stage treatments applied on 8 June; panicle initiation treatments applied on 27 June

Sprayer: Co_2-driven, hand-held, 32 psi, 15 GPA, 80015 nozzles

Rainfall: No rainfall within 24 hours after either treatment

Herbicide(s): Propanil (3 lb ai/A) by airplane, 13 May
Ordram (3.5 lb ai/A) by airplane, 7 June
Londax (0.6 lb ai/A) by airplane, 10 June
Bolero (4 lb ai/A) by airplane, 14 June

Insecticides(s): Furadan (0.5 lb ai/A) by airplane, 14 June

Fungicide(s): Tilt (0.3 lb ai/A) by airplane, 28 June and 21 July

Emergence: 6 May

Permanent Flood: 27 May (established); 23 Aug (drained)

Harvest Date: 9 Sept

Harvested Plot Area: 2.33 ft (center 4 rows) using Kubota small plot combine; length 22 ft (rep 1, 2, and 3), 24 ft (rep 4)

Experimental Design: Randomized complete block (four replications)

Comments: Experimental conditions were good. Stand was ideal and pests were controlled. Rice growth and development were normal. Treatments were made under ideal conditions. Although grain yield was highest in treatment 2, there was no significant difference in grain yield between treatments (Table 1).

Table 1. Foliar TRIGGRR and rice grain production. Rice Research Station, Crowley, LA. 1988.

Treatment	Grain moisture %	Grain yield lb/A	Grain yield lb/plot
Check	13.55a	6217a	7.625a
8 oz/A @ 3-5 LF	13.43a	6699a	8.203a
8 oz/A @ PI	13.40a	5967a	7.305a
8 oz/A @ 3-5 LF + 8 oz/A @ PI	13.59a	6195a	7.601a
LSD (.05)	0.33	722	0.879

RICE WEED CONTROL STUDIES[1/]

J.B. Baker, R.T. Dunand and F.J. Zeringue

INTRODUCTION

The goal of these investigations is the improvement of weed control procedures that may be used by Louisiana rice farmers. The studies seek to determine the efficacy of promising new herbicides and the tolerance of rice to these products, to determine how they may best be used in the cultural systems used by Louisiana farmers, to determine if they can be mixed with other herbicides to provide a broader spectrum of weed control, and to compare their performance with the currently recommended practices.

MATERIALS AND METHODS

These experiments were conducted at the main unit of the Rice Research Station in a field which had been managed to maintain heavy infestations of many of the weeds found in rice fields of South Louisiana. The soil type is a Crowley silt loam.

The test field was plowed in late summer to incorporate the weed seeds into the soil and laser levelled to permit more uniform flooding depth over the test plot areas. Seedbed preparation consisted of discing in late winter, and spring-tooth harrowing and cultimulching as needed for the final seedbed preparation. Drill-seeded tests were planted with a 11-runner grain drill and flush irrigated as needed to establish a stand. In one test, the grain was dropped on the soil surface and incorporated lightly in order to simulate broadcast seeding as done by some farmers. In another test presprouted seed were sown into a flooded seedbed. Treatments in this water-seeded test included various water management practices. In the dry-seeded tests, 500 lb/A of 20-10-10 analysis fertilizer was broadcast over the test area prior to establishing the permanent flood. In the case of the water-seeded test, the same rate of fertilizer was applied to the flooded plots at an equivalent stage of development.

Specific details of water management and other information on each test are presented as footnotes to the tables in the results and discussion section of this report.

Yield data were collected in the advanced herbicide comparison test and in the quinclorac combinations test by combine harvesting the entire 7' x 25' plot, weighing the grain, measuring the moisture content, and converting the data to 100-lb/A units at 12% moisture. In the other quinclorac studies a 9 sq. ft. area was hand harvested from each plot and threshed. The grain was weighed, and yield in 100 lb/A units was calculated.

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

All tests were randomized complete block design tests with four replicates. Yield data were subjected to an analysis of variance, and where appropriate, mean comparisons were made using the Duncan's multiple range technique.

Rice tolerance and weed control ratings were taken prior to flooding, in most cases, and at maturity, in some cases, using the following rating scales:

Rice tolerance:
- 1 - very severe injury with greater than 90% stand reduction
- 2 - severe injury with 70 - 90% stand reduction
- 3 - moderate injury, primarily leaf burning and stunting
- 4 - slight injury, primarily leaf burning
- 5 - no detectable injury

Weed control:
- 1 - poor, less than 10% control
- 2 - slight, 10 - 30% control
- 3 - moderate, 30 - 70% control
- 4 - good, 70 - 90% control
- 5 - excellent, greater than 90% control

Information on chemicals tested is presented in Table 9. In the listing of herbicide treatments the following conventions are used: the plus sign (+) indicates a tank mixture of the materials, the slash (/) indicates sequential applications of the herbicides, and the colon (:) indicates that the herbicides are premixed in one formulation.

RESULTS AND DISCUSSION

Advanced Herbicide Comparison Test

The treatments and results are presented in Table 1. The infestations of junglerice and yellow nutsedge were extremely heavy and may have limited the development of the other weeds as well as the rice. The rice tolerance ratings would suggest that there may be a problem in the case of triclopyr, although in a tank mixture with fenoxaprop-ethyl and bentazon there was less injury. Only molinate PPI and the treatments containing triclopyr did not provide adequate control of junglerice. Amazon sprangletop was not adequately controlled by quinclorac or the fenoxaprop-ethyl + bentazon + triclopyr mixture. Only the preplant treatments of thiobencarb or molinate failed to control hemp sesbania. Propanil was obviously the most effective material in controlling texasweed. With the exception of the PPI tank mixture of molinate + quinclorac, none of the other treatments which did not contain propanil controlled texasweed satisfactorily. Although most treatments failed to control yellow nutsedge adequately, treatments which included propanil postemergence provided satisfactory control, with the exception of the mixtures containing bromoxynil or triclopyr. This suggest some antagonistic interaction. The premix of molinate and propanil controlled yellow nutsedge well when applied as an early or late postemergence treatment. Early postemergence propanil treatments, alone or in mixtures, failed to adequately control yellow nutsedge with the exception of the tank mixture with thiobencarb and the sequential combination

Table 1. Advanced Herbicide Comparison Test.[1]

Treatment	Rate	Time of[2] treatment	Rice[3] tolerance	Weed Control[4] ECHCO	LEFPA	SEBEX	CNPPA	CYPES	Yield[5]
	(lb ai/A)								(100 lb/A)
untreated	-	-	5.0a	1.0d	1.0d	1.0c	1.0e	1.0d	8.91
molinate	4.0	PPI	4.3ab	3.0c	5.0a	3.5b	1.8de	3.0a-d	44.5e-i
molinate + quinclorac	4.0 + .375	PPI	4.3ab	4.3abc	5.0a	5.0a	4.0abc	2.3bcd	51.9c-f
thiobencarb	4.0	delpre	4.8ab	5.0a	5.0a	3.5b	1.0e	1.3d	51.8c-f
thiobencarb + quinclorac	4.0 + .375	delpre	4.3ab	5.0a	5.0a	5.0a	2.5b-e	1.3d	47.2e-h
quinclorac	.375	delpre	4.0abc	5.0a	5.0a	5.0a	1.0e	1.0d	43.4f-j
thiobencarb / propanil	4.0 / 3.0	delpre Po	5.0a	5.0a	5.0a	4.5ab	4.8a	5.0a	60.6abc
thiobencarb + propanil	4.0 + 3.0	EPo	5.0a	5.0a	5.0a	4.5ab	4.3ab	4.3ab	58.1a-d
quinclorac + propanil	.375 + 3.0	EPo	5.0a	5.0a	5.0a	5.0a	5.0a	2.8bcd	49.6d-g
quinclorac	.375	EPo	4.5ab	3.5bc	2.5c	5.0a	2.3cde	1.0d	37.0ij
propanil	3.0	EPo	4.8ab	4.8ab	5.0a	5.0a	4.8a	2.5bcd	53.8b-e
propanil / propanil	3.0 / 3.0	EPo Po	5.0a	4.8ab	5.0a	4.5ab	5.0a	5.0a	61.6ab
propanil / fenoxaprop-ethyl	3.0 / .15	EPo LPo	5.0a	5.0a	5.0a	5.0a	4.3ab	1.8cd	52.9b-f
propanil + thiobencarb	3.0 + 3.0	Po	5.0a	5.0a	5.0a	4.8ab	5.0a	5.0a	59.0a-d

(continued)

Table 1. Continued.

Treatment	Rate	Time of treatment[2/]	Rice tolerance[3/]	Weed Control[4/] ECHCO	LEFPA	SEBEX	CNPPA	CYPES	Yield[5/]
	(lb ai/A)								(100 lb/A)
propanil + bromoxynil	3.0 + .375	Po	5.0a	3.8abc	5.0a	5.0a	5.0a	3.5abc	50.7def
propanil + triclopyr	3.0 + .375	Po	3.7bc	3.1c	5.0a	5.0a	4.9a	2.8bcd	39.8hij
fenoxaprop-ethyl + triclopyr	.15 + .375	Po	3.0c	3.5bc	5.0a	4.7ab	1.3e	1.0d	24.9k
fenoxaprop-ethyl + bentazon + triclopyr	.15 + .5 + .375	Po	4.8ab	3.0c	3.5b	5.0a	2.3cde	1.0d	34.4j
propanil:molinate	3.0:3.0	Po	5.0a	5.0a	5.0a	5.0a	5.0a	5.0a	63.8a
propanil:molinate	3.0:3.0	LPo	4.6ab	4.2abc	5.0a	5.0a	3.3a-d	4.9a	41.2g-i

1/ Lemont drill seeded 5/10/88. Flushed 5/12 and 5/19. Emerged 5/20. Fertilized with 500 lb/A of 20-10-10 on 6/3. Flooded 6/15. Rated 8/26.

2/ PPI (preplant incorporated) applied 5/10. Delpre (delayed preemergence) applied 5/16. EPo (early postemergence) applied 5/25. Po (postemergence) applied 5/30. LPo (late postemergence) applied 6/14.

3/ See materials and methods for description of ratings. Ratings followed by the same letter are not significantly different at alpha = .01.

4/ See materials and methods for description of ratings. See Table 10 for identification of weeds. Ratings within a column followed by the same letter are not significantly different at alpha = .01.

5/ Yield values followed by the same letter are not significantly different at alpha = .01.

with postemergence propanil. The yield data reflect the rice tolerance and weed control ratings. Highest yields were obtained where the best weed control and rice tolerance occurred.

In summary, although timing of application may still be a critical factor, there were combination treatments which controlled all of the important weeds in this test. Propanil was an ingredient in all of these combinations, and a sequential treatment with propanil was as good as any of the others. The premix of propanil and molinate looked especially good at the recommended 3 - 4 leaf stage (Po) and performed remarkably well two weeks later (LPo) although the yield was depressed by the additional two weeks of competition with the weeds.

Quinclorac Studies

Quinclorac combination test. Treatments and results are presented in Table 2. Quinclorac and its combinations caused no Lemont injury in this drill-seeded test. Quinclorac alone gave excellent control of junglerice and hemp sesbania when applied delayed preemergence or postemergence, but it was more effective on amazon sprangletop when applied delayed preemergence. It provided unsatisfactory control of texasweed and yellow nutsedge at both times of treatment. There was no detectable difference in the performance of the mixtures containing BAS-090 or BAS-684.

The tank mixture of quinclorac with thiobencarb applied delayed preemergence was more effective on hemp sesbania than thiobencarb alone but no more effective than quinclorac alone. This mixture was ineffective on texasweed and yellow nutsedge. Postemergence application of the tank mixtures of triclopyr or bentazon with quinclorac improved the control of texasweed and yellow nutsedge but failed to control amazon sprangletop. On the other hand, the reverse was true in the case of the postemergence tank mixture of sethoxydim and quinclorac. The tank mixture of bentazon, sethoxydim and quinclorac was effective on all weeds except amazon sprangletop, suggesting a possible antagonism among the ingredients. Never the less, this combination had the highest yield in the test, although not significantly higher than the propanil standard and some of the other mixtures in the test.

Cultural practices test. Treatments and results in the test of the effect of method of dry seeding on quinclorac are presented in Table 3. The rice tolerance data would suggest that there may be a greater chance for rice injury in the preemergence application to broadcast seeded rice than drill-seeded, however this was not a yield reducing level of injury. The method of seeding did not seem to alter the efficacy of quinclorac nor influence the yield. The extremely heavy weed pressure caused an almost complete lack of grain production in the checks.

The effects of various water management practices on the performance of quinclorac in water-seeded rice can be seen in the results presented in Table 4. The untreated check represents the most common method of water management practiced in South Louisiana for the suppression of red rice. The use of preplant thiobencarb with this type of water management improves the red rice control, but it results in a reduced stand of the cultivar. This is not a yield reducing stand reduction and is tolerated in order to obtain improved red

Table 2. Quinclorac Combination Test.[1/]

Treatment	Rate	Time of[2/] treatment	Lemont[3/] tolerance	Weed Control[4/] ECHCO	LEFPA	SEBEX	CNPPA	CYPES	Yield[5/]
	(lb ai/A)								(100 lb/A)
quinclorac	.375	delpre	4.8a	4.8a	4.8a	5.0a	1.5cd	1.0d	36.9bc
quinclorac + thiobencarb	.375 + 4.0	delpre	4.5a	5.0a	5.0a	5.0a	1.3d	1.3d	46.0ab
thiobencarb	4.0	delpre	5.0a	4.8a	5.0a	2.8b	1.0d	1.3d	41.8bc
quinclorac + 1 qt/A BAS-090	.375 -	Po	5.0a	5.0a	1.0c	5.0a	3.8ab	1.5cd	40.5bc
quinclorac + triclopyr + 1 qt/A BAS-090	.375 + .375 -	Po	4.0a	5.0a	1.8c	5.0a	5.0a	3.3abc	45.6abc
quinclorac + 1.5 qt/A BAS-684	.375 -	Po	5.0a	5.0a	1.3c	5.0a	2.3bcd	1.3d	35.5c
quinclorac + bentazon + 1 qt/A BAS-090	.375 + .75 -	Po	4.8a	5.0a	1.8c	5.0a	5.0a	4.8a	53.2a
triclopyr	.375	Po	5.0a	1.0b					6.5d
bentazon	.75	Po	5.0a	1.0b					9.5d
quinclorac + bentazon + sethoxydim + 1 qt/A BAS-090	.375 + .75 + .1 -	Po	4.5a	5.0a	3.3b	5.0a	4.8a	4.3ab	53.7a

(continued)

Table 2. Continued.

Treatment	Rate	Time of treatment[2/]	Lemont tolerance[3/]	Weed Control[4/] ECHCO	LEFPA	SEBEX	CNPPA	CYPES	Yield[5/]
	(lb ai/A)								(100 lb/A)
quinclorac	.375								
+ sethoxydim	+ .1								
+ 1 qt/A BAS-090	-	Po	4.8a	5.0a	5.0a	5.0a	3.5abc	1.0d	41.2bc
propanil	3.0	Po	4.8a	4.8a	5.0a	4.8a	4.3ab	2.5bcd	46.7ab
untreated	-	-	5.0a	1.0b	1.0c	1.0c	1.0d	1.0d	6.9d

1/ Lemont drill seeded 5/10/88. Flushed 5/12 and 5/19. Emerged 5/20. Fertilized with 500 lb/A of 20-10-10 on 6/3. Flooded 6/15. Rated 8/26.

2/ Delpre (delayed preemergence) applied 5/16. Po (postemergence) applied 5/31.

3/ See materials and methods for description of tolerance ratings. Values followed by the same letter are not significantly different at alpha = .01.

4/ See materials and methods for description of control ratings. Values followed by the same letter are not significantly different at alpha = .01. See Table 10 for identification of weeds.

5/ Yield values followed by the same letter are not significantly different at alpha = .05.

Table 3. Effect of cultural practices on quinclorac performance. Dry seeded.[1]

Herbicide	Rate (lb ai/A)	Planting method	Time of treatment[2]	Rice tolerance[3]	Weed Control[3] Grasses	Broadleaves	CYPES	Yield[5] (100 lb/A)
quinclorac	.375	drilled	pre	5.0 a	5.0 a	3.0 a	1.0 a	43.9 a
quinclorac	.375	drilled	delpre	4.5 ab	5.0 a	3.5 a	1.0 a	45.2 a
untreated	-	drilled	-	5.0 a	1.0 b	1.0 b	1.0 a	8.5 b
quinclorac	.375	broadcast	pre	4.0 b	5.0 a	3.5 a	1.0 a	39.5 a
quinclorac	.375	broadcast	delpre	4.8 a	5.0 a	2.8 a	1.0 a	41.7 a
untreated	-	broadcast	-	5.0 a	1.0 b	1.0 b	1.0 a	4.1 b

1/ Seeded with Lemont by the indicated method on 5/17/1988. Flushed on 5/18, 5/25 and 5/30. Rice emerged on 5/27. Fertilized with 500 lb ai/A 20-10-10 on 6/8. Flooded on 6/10.

2/ Pre (preemergence) treatment applied 5/17. Delpre (delayed preemergence) treatment applied to moist soil on 5/24.

3/ See materials and methods for description of tolerance ratings. Ratings followed by the same letter are not significantly different at alpha = .01.

4/ See materials and methods for description of control ratings. The principal grass was junglerice, the principal broadleaf was hemp sesbania, and CYPES is yellow nutsedge.

5/ Yield values followed by the same letter are not significantly different at alpha = .01.

Table 4. Effect of cultural practices on quinclorac performance. Water seeded.[1]

Treatment	Rate	Type of[2] treatment	Rice[3] tolerance	Yield[4]
	(lb ai/A)			(100 lb/A)
quinclorac	.375	A	5.0 a	34.8 a
quinclorac	.375	B	3.75 c	24.3 bc
quinclorac	.375	C	4.0 bc	29.9 ab
quinclorac	.375	D	2.0 e	17.7 c
quinclorac	.375	E	5.0 a	32.8 ab
quinclorac + thiobencarb	.375 + 4.0	C	3.0 d	30.4 ab
thiobencarb	4.0	C	2.75 d	32.6 ab
untreated check	-	F	4.5 ab	36.2 a

[1] Lemont water seeded 5/19/88. Fertilized with 500 lb/A of 20-10-10 on 6/8.

[2] A - Herbicide applied PPS (preplant surface) and plot flooded for seeding on 5/18. No drainage after seeding.
B - Seedbed flushed, herbicide applied PPS to wet seedbed, and plot flooded for seeding on 5/18. Drained after seeding and reflooded on 5/25.
C - Herbicide applied PPS (preplant surface) and plot flooded for seeding on 5/18. Drained after seeding and reflooded on 5/25.
D - Flooded for seeding on 5/18. Drained after seeding and treated with herbicide on 5/19. Reflooded on 5/25.
E - Flooded for seeding on 5/18. Drained after seeding and treated with herbicide on 5/25. Reflooded on 5/25.
F - Flooded for seeding on 5/18. Drained after seeding on 5/19. Reflooded on 5/25.

[3] See materials and methods for rating scale. Ratings followed by the same letters are not significantly different at alpha = .01.

[4] Yield values followed by the same letters are not significantly different at alpha = .01.

rice control. The performance of quinclorac was influence by water management. Preplant application caused serious Lemont injury when the herbicide was applied to a wet soil as contrasted to the application to a dry soil. Application of quinclorac immediately after seeding and draining also resulted in serious Lemont injury. Application one week later, just before reflooding, did not cause rice injury. There was no significant difference between the plots which were treated with quinclorac preplant to dry soil and kept continuously flooded and those which were drained for one week. There were insufficient weeds to make weed ratings in this water-seeded test.

Herbicide Efficacy Studies

General Weed Control. Treatments and results for this test are presented in Table 5. Tank mixtures of reduced rates of oxadiazon with a reduced rate of propanil were evaluated. Although the mixtures gave improved control of broadleaf weeds and sedges, there was no improvement of grass control and there was a significant increase in rice injury.

The tank mixture of M-7200 with propanil provided some improvement in control of grasses and sedges at the higher rates, but there was also an increase in rice injury.

Both rates of the premix of molinate and propanil provided improved control of all weeds without noticeable rice injury.

Broadleaf efficacy test. Treatments and ratings are presented in Table 6. Triclopyr was evaluated with various additives as well as in mixture with propanil. The addition of X-77 improved the control of hemp sesbania significantly, and the control of texasweed was improved slightly. The addition of Staput did not alter rice tolerance or weed control. The combination of X-77 and Staput mixed with triclopyr performed in the same manner as the mixture with X-77. The tank mixture of triclopyr and propanil provided excellent control of hemp sesbania and texasweed.

Grass efficacy test. This test included haloxyfop-methyl, sethoxydim, RE-45601, HOE-46360 and fenoxaprop-ethyl at rates of .015 - .06 lb ai/A, .05 - .10 lb ai/A, .015 - .03 lb ai/A, .0375 - .15 lb ai/A and .075 - .15 lb ai/A, respectively. The treatments were all applied late postemergence when the grass was tillering. The grass pressure was very heavy, and none of the treatments gave a satisfactory level of grass control. HOE-46360 at rates of .06 - .15 lb ai/A gave the same level of control as .15 lb ai/A fenoxaprop-ethyl. None of the other treatments provided a noticeable level of grass control. The poor results in this test can not be explained, but may be due to the excessive grass pressure causing poor coverage, the advanced age of the grass, some unknown weather factor, or a possible interaction with triclopyr which was applied three days after the application of the grass herbicides.

Rice Tolerance Studies

Grass herbicides. Three new potential grass herbicides were evaluated at the use rate and twice the use rate on the three major cultivars at two times of application. The test was oversprayed with the premix of molinate and propanil to eliminate the effects of weeds so that the effects of the grass herbicides

Table 5. Herbicide screening test.[1/]

Herbicide	Rate	Rice[2/] tolerance	Weed Control[3/] Grasses	Broadleaves	Sedges
	(lb ai/A)				
oxadiazon + propanil	.5 + 2	4.0 c	2.75b	5.0 a	3.0 bcd
oxadiazon + propanil	.75 + 2	4.0 c	3.0 b	5.0 a	3.0 bcd
propanil	2	4.75ab	2.5b	3.75b	1.5 ef
propanil	3	5.0 a	3.25b	4.75a	2.25de
M-7200 + propanil	.25 + 3	5.0a	3.25b	4.5ab	2.5 cd
M-7200 + propanil	.5 + 3	4.5abc	3.25b	4.0 ab	3.5 ab
M-7200 + propanil	1 + 3	4.33bc	4.33a	4.33ab	3.33abc
molinate:propanil	2.25:2.25	5.0 a	4.5 a	5.0a	3.75ab
molinate:propanil	3.0:3.0	5.0 a	5.0 a	5.0a	4.0 a
untreated check	-	5.0 a	1.0 c	1.0	1.0 f

1/ Planted 5-10-1988; Emerged 5-20-1988; Treated 5-30-1988; Flooded 6-6-1988.

2/ See materials and methods for description of tolerance ratings. Ratings within a column followed by the same letter are not significantly different at alpha = .01.

3/ See materials and methods for description of control ratings. Ratings within a column followed by the same letter are not significantly different at alpha = .01. Grasses mostly junglerice. Sedges mostly yellow nutsedge. Broadleaves a mixture of mainly hemp sesbania and texasweed with some indian and northern jointvetch.

Table 6. Broadleaf efficacy test[1/].

Herbicide	Rate (lb ai/A)	Time of[2/] treatment	Rice[3/] tolerance	Weed Control[4/] SEBEX	CNPPA
triclopyr	.188	Po	5.0 a	3.25cd	3.75ab
triclopyr	.375	Po	5.0 a	3.5 cd	4.25ab
triclopyr + X-77	.188 + .25%	Po	5.0 a	5.0 a	4.0 ab
triclopyr + X-77	.375 + .25%	Po	5.0 a	5.0 a	4.75a
triclopyr + Staput	.188 + .3%	Po	5.0 a	2.75 d	3.0 b
triclopyr + Staput	.375 + .3%	Po	5.0 a	4.0 bc	4.0 ab
triclopyr + X-77 + Staput	.188 + .25% + .3%	Po	5.0 a	4.75ab	3.25 b
triclopyr + X-77 + Staput	.375 + .25% + .3%	Po	4.75a	5.0 a	4.75a
triclopyr + propanil	.188 + 3	Po	5.0 a	5.0 a	5.0 a
triclopyr + propanil	.375 + 3	Po	5.0 a	5.0 a	5.0 a

1/ Drill seeded May 10,1988. Emerged May 20, 1988. Flooded June 6, 1988. Ordram 10G applied May 7, 1988 at rate of 40 lb/A.

2/ Po treatments applied May 31, 1988.

3/ See materials and methods for description of rice tolerance ratings. Ratings followed by the same letter are not significantly different at alpha = .01.

4/ See materials and methods for description of weed control ratings. Ratings followed by the same letter are not significantly different at alpha = .01. See Table 10 for identification of weeds.

on the cultivars could be determined. The treatments and yield data are presented in Table 7. There are differences in the performance of the herbicides within each cultivar as well as between cultivars. In the case of haloxyfop-methyl, all cultivars tended to yield less at the higher rate and at the later time of treatment. In the case of sethoxydim, there was no significant difference between the rates, but in all cultivars the yields were significantly lower at both rates applied at the later time. In the case of fenoxaprop-ethyl, in the case of Lemont and Tebonnet there was no significant yield reduction at either rate at the early time of application, but there was a significant yield reduction at the higher rate at the later application time. There was a significant yield reduction at both rates and both times of application in the case of Mars. This confirms results from previous years and justifies the restriction on the label with regards to the use of this material on Mars.

Broadleaf herbicides. Two herbicides which are being considered for labelling for use in rice were evaluated in a weed free experiment to determine their effect on yield of the three major cultivars when applied at three different stages of development at the proposed use rate and at twice the proposed use rate. The treatments and yield are presented in Table 8. In the case of bromoxynil, there were no significant differences between the yields within a cultivar at either rate or time of treatment, nor was there a difference between the untreated check and any bromoxynil treatment within a cultivar. In the case of triclopyr at the low rate, there were no significant differences between the different times of treatment except in the case of Lemont where the postemergence treatment yield was significantly lower than the midseason treatment yield. At the high rate of triclopyr within all three cultivars, the yields at the earlier times of treatment were significant lower at the earlier times of treatment than the yields at the midseason time of treatment. These results would suggest that great care must be exercised in application at the earlier times of treatment to assure that the rate applied does not exceed the proposed use rate.

Table 7. Rice tolerance to grass herbicides.[1/]

Herbicide	Rate	Lemont		Tebonnet		Mars	
		Po	BGR	Po	BGR	Po	BGR
	(lb ai/A)	Yield (100 lb/A)[2/]					
haloxyfop-methyl	.0625	52.8ab	51.2abc	59.0a	52.9cde	58.2abc	49.6fgh
haloxyfop-methyl	.125	49.2bcd	45.7d	55.4abc	42.0e	56.4bdc	45.6h
sethoxydim	.1	53.8ab	47.4cd	59.2a	50.9de	60.7ab	51.6efg
sethoxydim	.2	54.4a	45.9d	58.6a	49.3e	60.6a	48.0gh
fenoxaprop-ethyl	.15	51.9ab	50.6abc	57.8ab	56.4abc	55.6cde	49.9fgh
fenoxaprop-ethyl	.3	53.5ab	46.9cd	55.8abc	53.8bcd	53.2def	49.7fgh
untreated check		54.1a		56.8abc		62.4a	

1/ Rice planted 5/17/88. Flushed 5/18, 5/25 and 5/30. Emerged 5/27. Treated with Arrosolo at 1 G/A on 6/8. Fertilized with 500 lb/A of 20-10-10 on 6/14. Po (postemergence) treatments applied 6/14. Flooded 6/17. BGR (before green ring) treatments applied 7/6.

2/ Yield values within a variety followed by the same letter are not significantly different at alpha = .05.

Table 8. Tolerance of major rice varieties to broadleaf weed herbicides.[1/]

Herbicide	Rate	Lemont			Mars			Tebonnet		
		EPo	Po	MS	EPo	Po	MS	EPo	Po	MS
	(lb ai/A)	Yield (100 lb/A)[2/]								
triclopyr	.375	65.9ab	61.0bc	71.3a	82.2bcd	81.4bcd	83.8ab	77.8a	77.2a	76.4a
triclopyr	.75	53.0d	56.3cd	70.0a	78.7d	79.6cd	86.9a	69.9b	70.0b	77.2a
bromoxynil	.25	70.8a	69.1a	70.3a	84.7ab	82.9abc	84.1ab	79.0a	78.0a	75.2a
bromoxynil	.50	70.9a	67.6ab	71.3a	82.9abc	83.1abc	83.1abc	77.7a	77.3a	75.7a
untreated	-	- - - - -	72.6a	- - - - -	- - - - -	81.0bcd	- - - - -	- - - - -	75.7a	- - - - -

[1/] Rice drill seeded on 4/28/88. Emerged 5/7. Oversprayed with 3 lb ai/A propanil on 5/12. EPo (early postemergence treatments applied 5/17. Po (postemergence) treatments applied 5/26. MS (midseason) treatments applied 6/24. Fertilized with 500 lb/A of 20-10-10 on 5/26 and flooded on 5/27.

[2/] Yield values within a variety followed by the same letter are not significantly different at alpha = .05.

Table 9. Herbicides tested in studies at the Rice Research Station, Crowley, LA. 1988.

Name or code no. used in report	Formulation	Chemical nature of active ingredient	Manufacturer
BAS-090		experimental surfactant	BASF
BAS-684		experimental surfactant	BASF
bentazon	2L	3-(1-methylethyl)-(1H)-2,1,3-benzothiadiazin-4(3H)-one 2,2-dioxide	BASF
bromoxynil	2EC	3,5-dibromo-4-hydroxybenzonitrile	Rhone-Poulenc
fenoxaprop-ethyl	1EC	(±)-2-[4-[(6-chloro-2-benzoxazolyl)oxy]phenoxy]propanoic acid, ethyl ester	Hoechst-Roussel
haloxyfop-methyl	50DG	2-[4-[[3-chloro-5(trifluoromethyl)-2-pyridinyl]oxy]phenoxy]propanoic acid, methyl ester	Dow
HOE-46360	.625EC	chemistry not released	Hoechst-Roussel
M-7200	3EC	chemistry not released	Monsanto
molinate	8EC	S-ethyl hexahydro-1H-azepine-1-carbothioate	ICI
oxadiazon	2EC	3-[2,4-dichloro-5-(1-methylethoxy)phenyl]-5-(1,1-dimethlyethyl)-1,3,4-oxadiazol-2-(3H)-one	Rhone-Poulenc

(continued)

Table 9. Continued.

Name or code no. used in report	Formulation	Chemical nature of active ingredient	Manufacturer
propanil	4EC	N-(3,4-dichlorophenyl)propionamide	Rohm & Haas
quinclorac	50WP	3,7-dichloro-8-quinolinecarboxylic acid	BASF
RE-45601	2EC	chemistry not released	Valent
sethoxydim	1.5EC	2-[1-(ethoxyimino)butyl]-5-[2-(ethylthio) propyl]-3-hydroxy-2-cyclohexen-1-one	BASF
Staput		drift preventative agent	
thiobencarb	8EC	S-[4-chlorophenyl)methyl]diethylcarbamothioate	Valent
triclopyr	3EC	[(3,5,6-trichloro-2-pyridinyl)oxy] acetic acid	Dow
X-77		nonionic surfactant	

Table 10. Weeds rated in herbicide test conducted at the Rice Research Station, Crowley, LA. 1988.

Abbreviation used in tables	Common name	Scientific name
CYPES	yellow nutsedge	Cyperus esculentus
CNPPA	texasweed	Caperonia palustris
ECHCO	junglerice	Echinochloa colona
LEFPA	Amazon sprangletop	Leptochloa panicoides
SEBEX	hemp sesbania	Sesbania exaltata

CHEMICAL CONTROL OF RED RICE IN RICE [1/]

J.B. Baker, R.T. Dunand, P.K. Bollich, and F.J. Zeringue

INTRODUCTION

Although the preplant use of molinate or thiobencarb in conjunction with the "pinpoint" flooding method gives a high degree of control of red rice in a water-seeded system, there are no recommended herbicides for controlling red rice in a dry-seeded system. The thrust of these studies is to evaluate the performance of new herbicides in a drill-seeded system and the influence of new variations of water seeding on the performance of molinate and thiobencarb.

MATERIALS AND METHODS

These experiments were conducted at the South Unit of the Rice Research Station in a field that was naturally infested with a long-awned type of red rice. The test area was left idle in 1987, the red rice allowed to mature and shatter, and the soil was disc plowed in the fall to bury the newly produced red rice seed. The fields were disc plowed in the spring as soon as weather conditions permitted, and later were chisel plowed and land levelled. They were retilled as needed to prevent excessive weed growth and just before seeding the final seedbed was prepared.

In water-seeded tests levees were built, and the field to be seeded was flooded as quickly as possible. Normally, flooding was accomplished 2-3 days after seedbed preparation. Water-seeded tests were planted with presprouted Lemont rice at a rate equivalent to 125 lb/A of dry seed. Bags of seed to be presprouted were placed in a canal for 24 hours, placed on a rack to drain for an additional 24 hours, and then sown into the flooded test plots. The plots were drained within 24 hours after seeding and reflooded 5 days later. Tests were fertilized by broadcasting 500 lb/A of 20-10-10 over the test area 2-3 weeks after seeding.

In experiments which were drill seeded, an 11-runner drill was used to seed 100 lb/A of Lemont. The tests were flush irrigated as needed to assure a stand. Just prior to applying the permanent flood, 500 lb/A of 20-10-10 was broadcast over the test area.

The preplant incorporated treatments were applied as sprays and incorporated as quickly as possible with a front-tine garden rototiller. Preplant surface treatments were applied as sprays as soon as possible after seedbed preparation. Sprays were applied in a volume of 15 GPA with a four-nozzel boom equipped with 80015 flat fan tips, spraying at a pressure of 32 psi and a ground speed of 2.5 mph. Information on treatments for each experiment is presented in the tables.

Information on herbicides tested is presented in Table 3.

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

Red rice control and Lemont tolerance ratings were made using the following scales:

Lemont tolerance:

1 - very severe injury with >90% stand reduction.
2 - severe injury with 70 - 90% stand reduction.
3 - moderate injury, 30 - 70% stand reduction.
4 - slight injury, primarily leaf burning and stunting.
5 - no injury.

Red rice control:

1 - poor, <10% control.
2 - slight, 10 - 30% control.
3 - moderate, 30 - 70% control.
4 - good, 70 - 90% control.
5 - excellent, >90% control.

RESULTS AND DISCUSSION

Grooved seedbed test

One problem encountered in water seeding is the washing of seed or the drifting of small rice seedlings. The practice of grooving the seedbed prior to flooding for seeding seems to ameliorate this problem, but its effects on the performance of preplant herbicides is not known. To investigate this, a split-plot experiment was conducted with herbicide treatments being the main plot treatments, and the type of seedbed, grooved or normal, was the subplot treatment. In the case of preplant incorporated (PPI) molinate, the grooving was done after herbicide application. In the case of preplant surface (PPS) thiobencarb, the effect of grooving before of after herbicide application was evaluated. The tank mixture of thiobencarb plus quinclorac was included since this combination has a broader spectrum of weed control than thiobencarb alone.

The seedbed was prepared on 4/19 with the treatments being applied as soon as possible after that. The field was flooded on 4/21, and presprouted Lemont was seeded and the field drained on 4/27. One week later a shallow flood was established. Subplot size was 7'x 25' in a randomized complete block split-plot design.

At maturity, red rice panicles were counted in the center of each subplot in an area 3'x 25', and a 3'x 3' sample area was cut and threshed for yield estimation.

Results are presented in Figure 1 and 2. There was a significant reduction in the red rice panicle density in the herbicide treated plots, but the effects of grooving the seedbed were not significant. Molinate appeared to be slightly more effective in suppressing red rice panicle production. There were no significant differences in yield (Figure 2) due to herbicide use or seedbed grooving. No grade determinations were made.

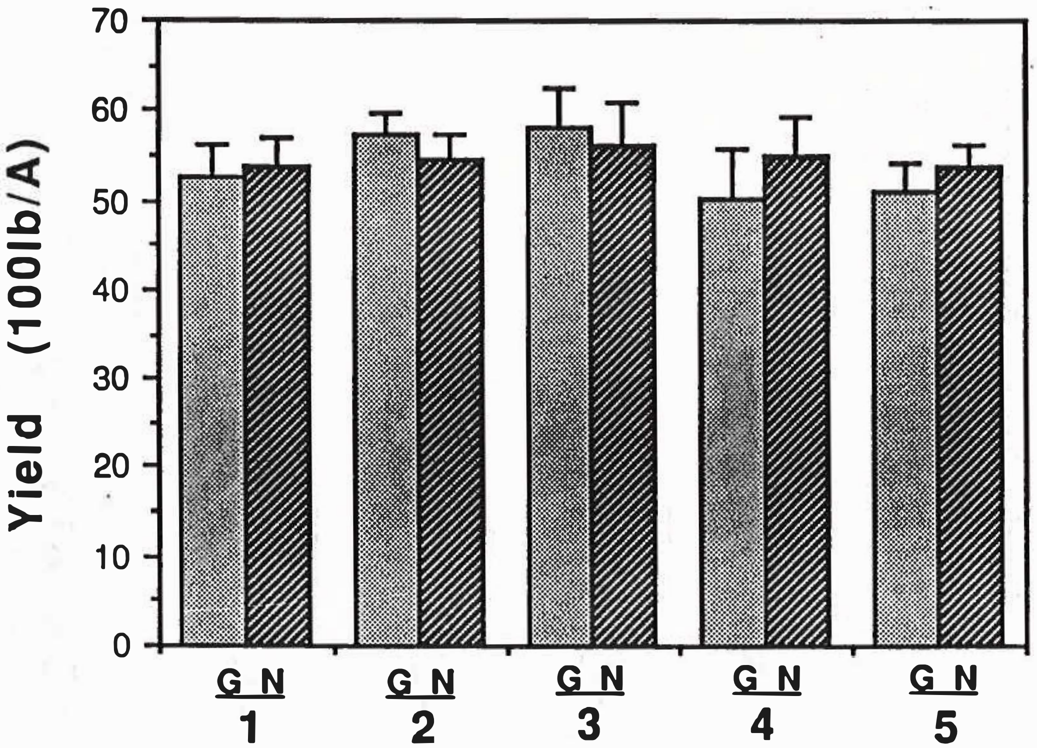

Figure 1. Effect of seedbed grooving on herbicide performance
G = grooved seedbed N = Normal seedbed

1 = molinate, PPI
2 = thiobencarb, PPS before grooving
3 = thiobencarb, PPS after grooving
4 = thiobencarb + quinclorac, PPS after grooving
5 = no herbicide

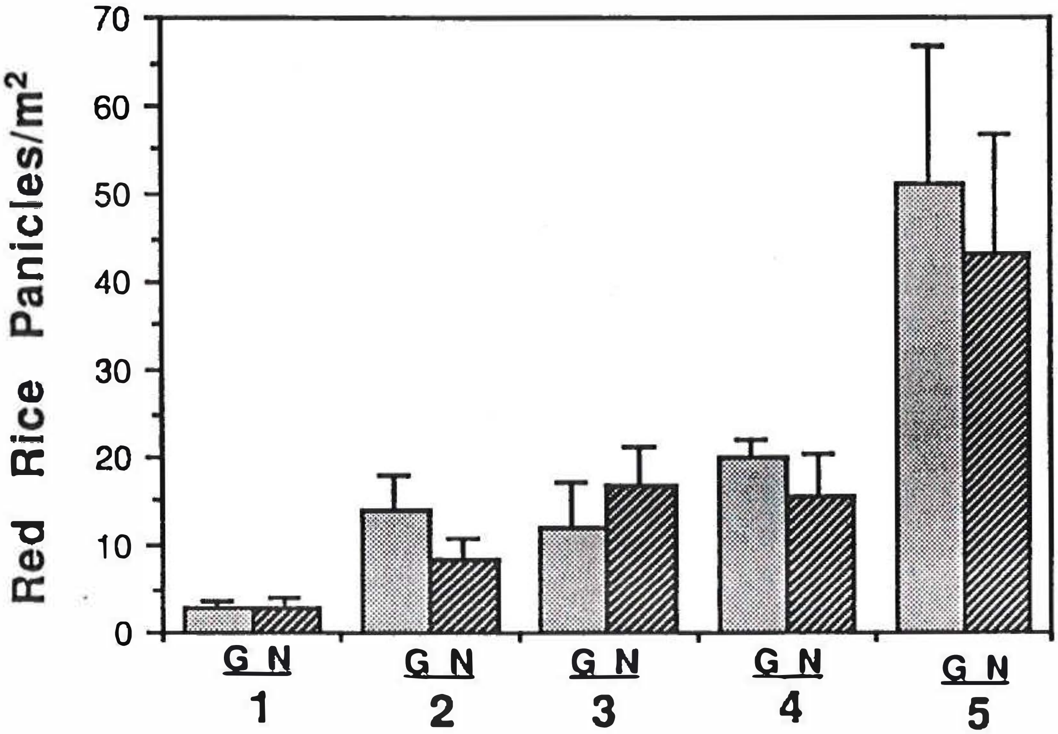

Figure 2. Effect of seedbed grooving on herbicide performance
G = grooved seedbed   N = Normal seedbed

1 = molinate, PPI
2 = thiobencarb, PPS before grooving
3 = thiobencarb, PPS after grooving
4 = thiobencarb + quinclorac, PPS after grooving
5 = no herbicide

Stale seedbed red rice control

Over the years there has been some interest in the possibility of using a broadspectrum, nonpersistent herbicide to kill established seedlings of red rice and other weeds just prior to water seeding. This may help reduce the number of plowings and the loss of soil when fields are drained. This test was designed to evaluate red rice control on a stale seedbed in a water-seeded system.

Details of the experimental procedure are presented along with red rice control ratings in Table 1. The plot size was 7'x 25', and the experimental design was a randomized complete block. The stand of Lemont was lost, probably as a result of late planting and the associated high water temperature which leads to low oxygen tension and poor root development.

The red rice control ratings were taken at maturity and are not truly indicative of the red rice control, since the plants which were not controlled tillered prolifically in the absence of competition from the Lemont. Nonrecorded observations made earlier in the season would indicate that this procedure deserves further study with an earlier planting date to increase the probability of establishing a stand.

Herbicide screening in drill-seeded rice

Only one new product was evaluated in 1988 for potential as a selective control agent for red rice in drill-seeded rice. This experimental herbicide, HOE-46360, was compared with fenoxaprop-ethyl that had been report to show some selectivity in controlling red rice in rice.

Details of the experiment and crop tolerance and red rice control ratings are presented in Table 2. The plot size was 7'x 25', and the experimental design was a randomized complete block. The red rice infestation was extremely heavy, and even the best treatments were totally inadequate. The red rice lodged, and harvest was not possible. It should be noted that HOE-46360 was more active than fenoxaprop ethyl and was slightly more active on red rice than Lemont, but the degree of selectivity is marginal.

It is evident that this practice is not likely to be effective unless it is combined with other practices which will increase the selectivity and lower the density of the red rice infestation. The later could be accomplished by crop rotations that deplete the reserve of red rice seed in the soil and/or the use of PPI molinate to reduce the level of established red rice seedlings at the time the postemergence treatments are applied.

SUMMARY

Grooving the seedbed prior to water seeding does not influence the performance of preplant herbicides in controlling red rice. Stale seedbed control of red rice may provide a means of reducing the amount of tillage involved in seedbed preparation for water seeding and also reduce the amount of soil loss from water seeded fields. Red rice control in drill-seeded rice will likely require a combination of practices in order to attain the desired level of control. The grass herbicides, such as Whip and Poast, may offer some red rice control if the rate and timing can be adjusted to minimize the injury to the planted variety.

Table 1. Stale seedbed red rice control in a water-seeded system. Rice Research Station, Crowley, LA. 1988.[1/]

Herbicide	Rate (lb ai/A)	Red rice Control[2/]
glyphosate[3/]	.5	3.75a
glyphosate	.75	3.75a
glyphosate + thiobencarb	.5 + 4	2.75a
glyphosate + thiobencarb	.75 + 4	3.25a
glufosinate	.375	3.50a
glufosinate	.75	3.25a
glufosinate + thiobencarb	.375 + 4	3.00a
glufosinate + thiobencarb	.75 + 4	3.50a
tilled / thiobencarb	4	2.25ab
tilled check	-	3.50a
stale check	-	1.00 b

1/ Seedbed prepared 4/19. Treatments containing glyphosate or glufosinate applied on 5/26. Tilled checks rototilled on 6/1. Thiobencarb applied to tilled / thiobencarb plots on 6/7. Fertilized with 500 lb/A 20-10-10 on 6/8. Flooded for planting on 6/9. Seeded with presprouted Lemont on 6/10 and drained. Reflooded on 6/17.

2/ Red rice control ratings taken at maturity. See materials and methods for description of rating scale.

3/ Treatments containing glyphosate also contained 1% X-77 and 1.7 lb/A ammonium sulfate.

Table 2. Screening of herbicides for red rice control in drill-seeded rice. Rice Research Station, Crowley, LA. 1988.[1/]

Herbicide	Rate	Lemont tolerance[2/]	Red rice control[3/]
	(lb ai/A)		
HOE-46360	.0375	4.75a	1.75 bc
HOE-46360	.055	4.50a	1.75 bc
HOE-46360	.065	4.25a	2.50ab
HOE-46360	.075	3.25 b	3.25a
HOE-46360	.15	2.50 bc	3.25a
fenoxaprop-ethyl	.15	2.25 c	3.25a

1/ Seedbed prepared and Lemont drill seeded on 4/19. Flushed on 4/25, 5/6, 5/11, and 5/19. Herbicides applied 5/30 - 5/31. Red rice at early tillering stage. Fertilized with 500 lb/A 20-10-10 on 6/1. Flooded 6/3.

2/ See materials and methods for description of tolerance rating scale. Ratings followed by the same letter are not significantly different at alpha = .05.

3/ See materials and methods for description of tolerance rating scale. Ratings followed by the same letter are not significantly different at alpha = .05.

Table 3. Herbicides tested in red rice studies at the Rice Research Station, Crowley, LA. 1988.

Name or code no. used in report	Chemical nature of active ingredient	Manufacturer
fenoxaprop-ethyl	(±)-2-[4-[(6-chloro-2-benzoxazolyl)oxy] phenoxy]propanoic acid, ethyl ester	Hoechst-Roussel
glufosinate	ammonium-DL-homoanalin-4-yl(methyl)phosphinate	Hoechst-Roussel
glyphosate	N-phosphonomethylglysine	Monsanto
HOE - 46360	not released	Hoechst-Roussel
molinate	*S*-ethyl hexahydro-1*H*-azepine-1-carbothioate	ICI
thiobencarb	*S*-[(4-chlorophenyl)methyl]diethylcarbamothioate	Valent
quinclorac	3,7-dichloro-8-quinolinecarboxylic acid	BASF

RICE INSECTS CONTROL STUDIES

RICE WATER WEEVIL RESISTANCE: FOUR-WAY CROSSES

John F. Robinson, E.M. Nowick, S.S. Quisenberry, G.B. Trahan, and R.M. Michot

Location: Rice Research Station, Crowley, LA

Soil: Crowley silt loam

Variety: Selected crosses (resistant x commercial cultivar) x (tolerant x commercial cultivar)

Seeding Rate and Depth: 1.5 g per 30-in; 1.5-in

Planting Method: Drill seeded, Hege small-plot drill, May 27, 1988

Plot Size: Planted: Single row, 30-in (length) x 10-in (row spacing)
Harvested: 10 random panicles per row

Fertilization: 30-60-60 lb/A N-P-K, June 23; 70 lb/A N, June 24

Water Management: Flushed June 3 and June 10; Flooded June 24

Herbicides: Propanil 4 lb ai/A, June 21; Bolero 5 lb ai/A, June 24

Application Equipment: Propanil applied with a hand boom delivering 15 gpa @ 30 psi; Granular insecticides applied with a shaker jar; Bolero applied with a Casaron spreader; fertilizer applied with a motorized Gandy applicator.

Experimental Design: Split-plot with 4 reps; carbofuran treated vs. untreated were whole-plots, crosses were split-plots.

Harvested: Various dates depending on maturity

Comments: The purpose of this test was to identify lines which have both antibiosis and/or antixenosis (low immature counts) and tolerance (low percentage height reduction; (treated - untreated / treated) x 100). Five hundred and forty-two four-way crosses were evaluated. The susceptible check, 'Mars', averaged 33 immatures per core and 9.6% reduction in height. 'Lemont' averaged 35 immatures per core and 8.3% reduction in height. The rice water weevil tolerant lines, CI 11048 and CA 86, averaged 18 and 24 immatures per core and 10.7% and 6.2% reduction in height, respectively. Sixty-four lines had 20 or fewer immatures per core (Figure 1) and 40 lines had 3% or less reduction in height (Figure 2). Seven lines were common to both groups. Panicle rows of these 104 lines will be grown in 1989. Promising selections will be tested in insecticide treated and untreated plots in 1990.

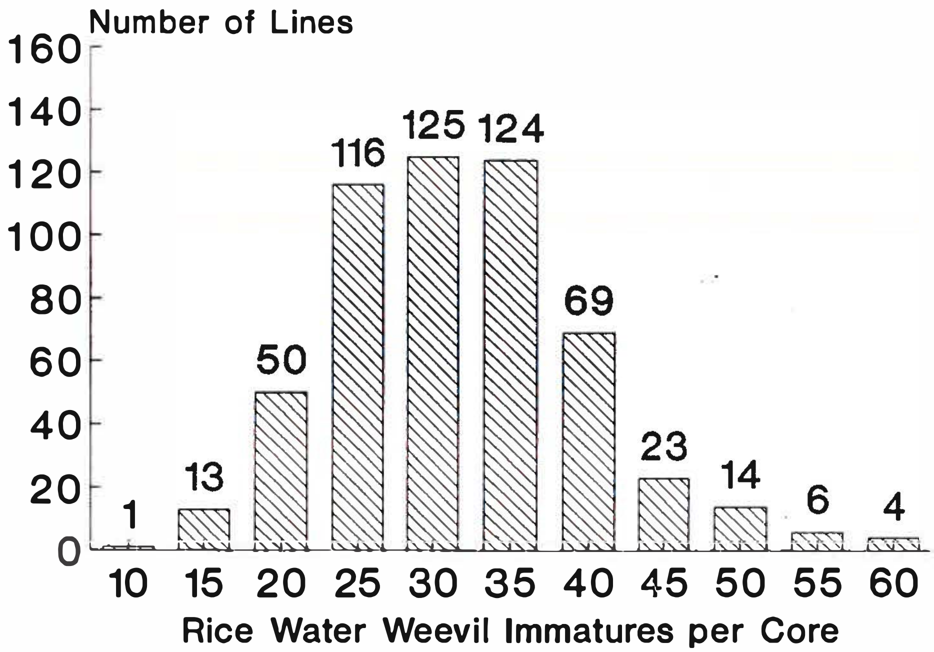

Figure 1. Number of crosses in each category.

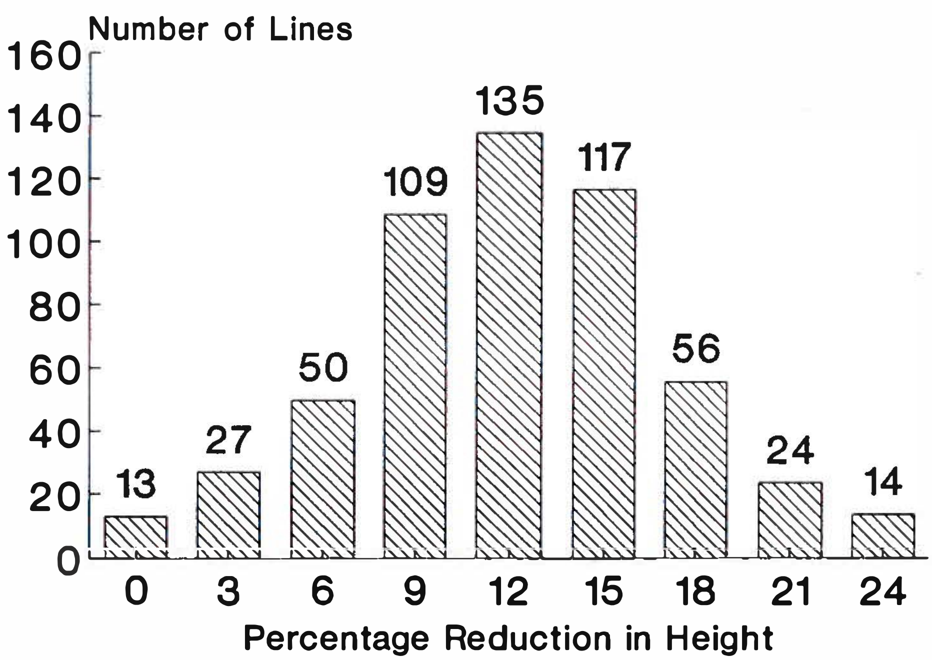

Figure 2. Number of crosses in each category.

RICE WATER WEEVIL RESISTANCE: EVALUATION OF BREEDING LINES

John F. Robinson, S.D. Linscombe, F. Jodari, G.B. Trahan, and S.S. Quisenberry

Location: Rice Research Station, Crowley, LA

Soil: Crowley silt loam

Variety: Selected crosses with rice water weevil tolerant germplasm in their pedigrees

Seeding Rate and Depth: 1.5 g per 30-in; 1.5-in

Planting Method: Drill seeded, Hege small-plot drill, May 20, 1988

Plot Size: Planted: Single row, 30-in (length) x 10-in (row spacing)

Fertilization: 30-60-60 lb/A N-P-K, June 23; 70 lb/A N, June 24

Water Management: Flushed May 26, June 1 and June 10; Flooded June 24

Herbicides: Propanil 4 lb ai/A, June 13 and 21; Bolero 5 lb ai/A, June 24

Experimental Design: Split-plot with 2 reps; carbofuran treated vs. untreated were whole-plots, crosses were split-plots.

Comments: The purpose of this test was to identify lines from the rice breeding project which have tolerance to rice water weevil infestation (low percentage height reduction; (treated - untreated / treated) x 100). The commercial cultivars 'Mars' and 'Lemont' had 10.6% and 12.4% reduction in height, respectively, and the tolerant lines WC 1403, WC 1711, and CI 11048 had 11.3%, 5.6%, and 4.7% reduction in height, respectively. Fifteen crosses had five percent or less reduction in height (Figure 1). These lines will be tested in insecticide treated and untreated plots in 1989 to confirm their tolerance to rice water weevil infestation.

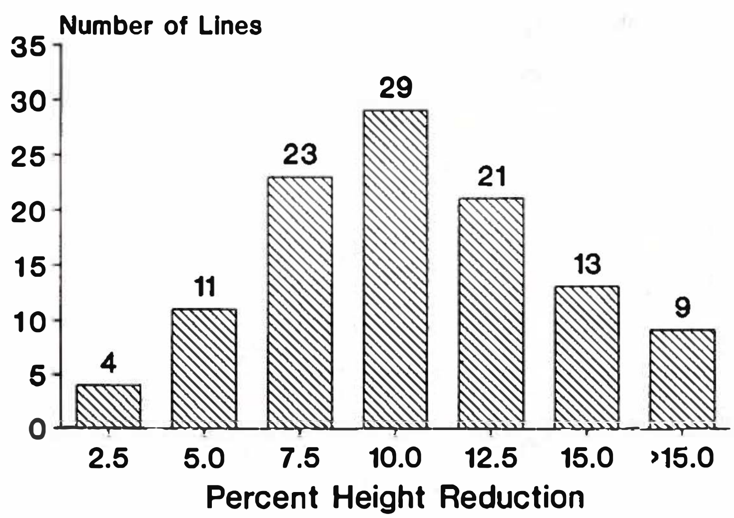

Figure 1. Number of lines in each category.

RICE WATER WEEVIL RESISTANCE: EVALUATION OF ANTHER CULTURE LINES

John F. Robinson, T.P. Croughan, G.B. Trahan, M.M. Meche, and S.S. Quisenberry

Planting Date: June 14, 1988

Emergence Date: June 24, 1988

Herbicide: Propanil 4 lb ai/A July 5, 1988
Bolero 5 lb ai/A July 13, 1988

Fertilizer: 100-60-60 plus 40-0-0 July 13, 1988

Flooded: July 14, 1988

Plot Size: Single row per line 3-ft length; 10-in spacing between rows

Rice Water Weevil Counts: One core sample per plot August 16, 1988

Comments: The purpose of this test was to identify anther culture lines which had low to moderate rice water weevil infestations for inclusion in replicated field tests in 1989. One hundred and eighty-two lines derived from anther culture were evaluated. The susceptible check, 'Mars', averaged 41 immatures per core and the commercial cultivar 'Lemont' averaged 15 per core. Ninety-one lines with immature counts of 20 or below (Figure 1) will be advanced to replicated tests in 1989 to determine their level of resistance to rice water weevil infestation.

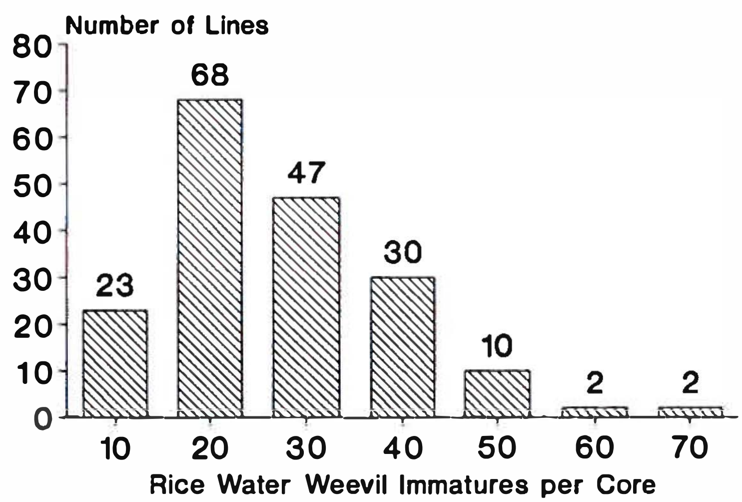

Figure 1. Anther culture lines evaluated for resistance to rice water weevil. Crowley, LA.

RICE WATER WEEVIL RESISTANCE: EVALUATION OF WORLD COLLECTION LINES

John F. Robinson, G.B. Trahan, and S.S. Quisenberry

Planting Date: June 14, 1988

Emergence Date: June 23, 1988

Herbicide: Propanil 4 lb ai/A July 5 and 8, 1988
Bolero 5 lb ai/A July 13, 1988

Fertilizer: 100-60-60 July 13, 1988

Flooded: July 14, 1988

Plot Size: Single row per line 3-ft length; 10-in spacing between rows

Rice Water Weevil Evaluation: One core sample per plot August 19-24, 1988
Root Damage Rating 0=none 9=severe pruning

Comments: The purpose of this test was to identify World Collection lines which had low to moderate rice water weevil infestations and/or root damage ratings for inclusion in replicated field tests in 1989. Nine hundred and seventy World Collection lines were evaluated. The susceptible check, 'Mars', was planted every sixth row and averaged 37 immatures per core (range 15 to 60). In order to speed-up the evaluation process, once the immature count of a sample went above 15 per core counting was stopped and the line was classified as susceptible. Root damage ratings were made on all lines. Lines with immature counts of 15 or below (Figure 1) and root ratings of 7 or less (Figure 2) will be advanced to replicated tests in 1989 to determine their level of resistance to rice water weevil infestation.

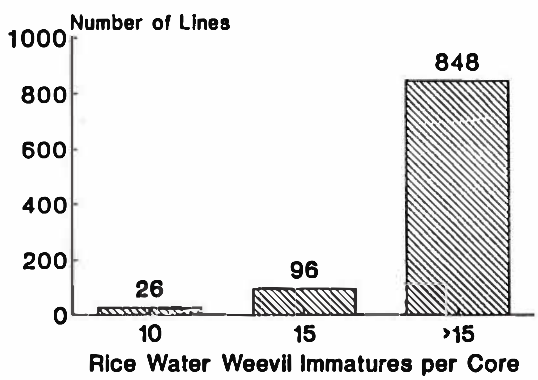

Figure 1. Number of lines in each category. Rice Research Station, Crowley, LA.

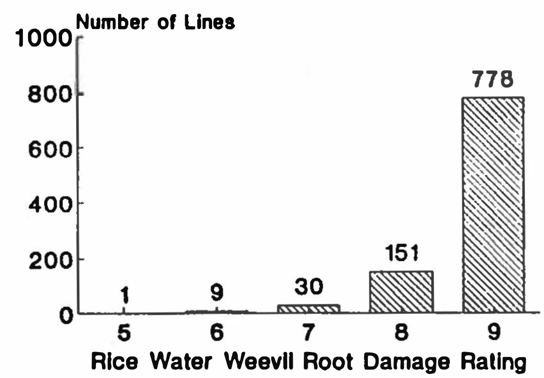

Figure 2. Number of lines in each category. Rice Research Station, Crowley, LA.

RICE WATER WEEVIL RESISTANCE: EVALUATION OF SOMACLONES

John F. Robinson, T.P. Croughan, G.B. Trahan, M.M. Meche, and S.S. Quisenberry

Planting Date: May 30, 1988

Herbicide: Propanil 4 lb ai/A June 9, 1988
Propanil 6 lb ai/A July 11, 1988

Fertilization: 200-0-0 July 11, 1988

Flooded: July 12, 1988

Plot Size: Single row per line 3-ft length; 10-in spacing between rows

Rice Water Weevil Evaluation: Leaf scar ratings, 0=no feeding 9= heavy feeding, August 3, 1988

Comments: The purpose of this test was to identify somaclones which had low to moderate amounts of rice water weevil leaf feeding for inclusion in replicated field tests in 1989. 7,744 somaclones were evaluated. Fifty-one lines had leaf feeding ratings of two to three (Figure 1). These lines will be advanced to replicated tests in 1989 to determine their level of resistance to rice water weevil infestation.

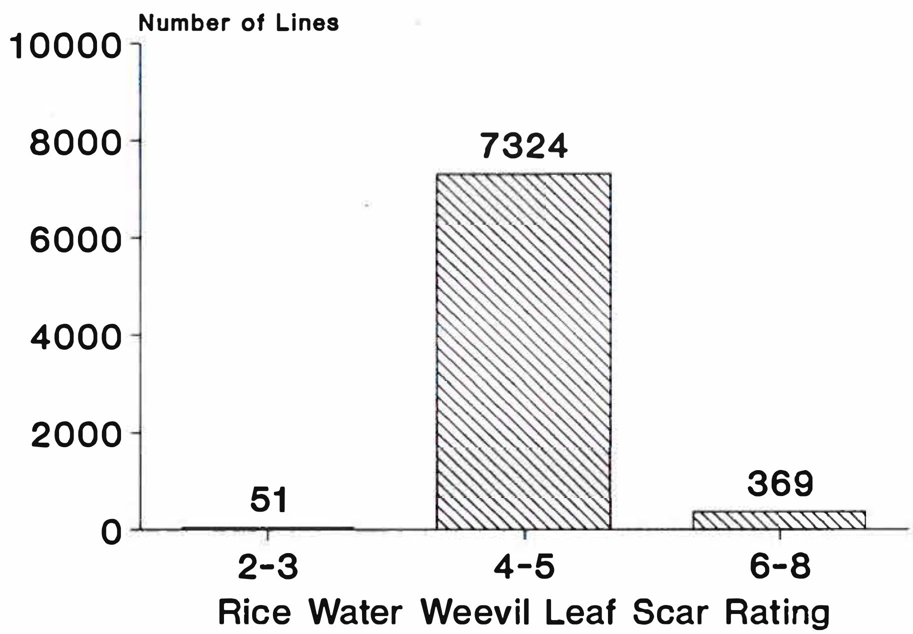

Figure 1. Number of somaclones rated for rice water weevil leaf feeding.

VELVETBEAN CATERPILLAR MIGRATION AND POPULATION DYNAMICS:
A BASIS FOR REGIONAL PEST MANAGEMENT

S.J. Johnson, B.M. Gregory, A.M. Hammond, J.F. Robinson, and G.B. Trahan

The velvetbean caterpillar (VBC), Anticarsia gemmatalis Hubner, migrates annually into the soybean-producing areas of the United States from tropical overwintering areas of south of the 28° northern latitude. The VBC is a chronic and primary pest of soybean, Glycine max (L.) Merrill. It migrates into the southern United States each spring, but only circumstantial evidence exists that long range migration occurs. Consequently, the role of migration in the initiation of VBC populations is poorly understood. Worse yet, relatively little is known about the yearly spatial and temporal dynamics of this insect. The objectives of this study are to: (1) determine the spatial and temporal patterns of VBC larvae and adults in Louisiana, eastern Texas and southern Arkansas; (2) examine the magnitude of these populations; (3) determine the overwintering potential of VBC in Louisiana, Florida, Texas, and Mexico with a temperature model; and (4) examine weather patterns that might affect VBC movement. Monitoring for velvetbean caterpillar adults with pheromone traps began in March 1986 at eleven sites in Louisiana, one in Arkansas, and two in Texas. In 1986, VBC utilized the Mississippi River as a migratory pathway into Louisiana. In 1987, VBC utilized the Mississippi and Sabine rivers as migratory pathways into Louisiana. In 1988, VBC utilized the Mississippi, Sabine, and Atchafalaya rivers as migratory pathways into Louisiana. In 1986-1988, initial captures were made along the rivers. Subsequent captures indicated diffusion throughout the state was accomplished along rivers, bayous, and other waterways. In general, a south to north time lag was observed in peak second generation adult male VBC captures in pheromone traps in soybean in 1986. Similar patterns were observed in 1987 and 1988. Densities of VBC larvae in soybean have remained well below the economic threshold since 1986. The most important wild host in Louisiana, as in Florida, appears to be V. luteola because: (1) VBC larvae are found almost year-round on this plant; (2) V. luteola is ubiquitous in southern Louisiana swamps; (3) V. luteola grows year-round in extreme southeastern Louisiana, unless burned back by freezes; and (4) it serves as a VBC host before and after soybean growth. An overwintering model was developed with a biascorrected sine wave model that calculated cooling degree days (CDD) (°C). The overwintering model predicted an overwintering site for VBC in south Texas and eastern Mexico, and was validated with field collected adult and larvae. Based on larval and adult sampling, and the overwintering model, VBC does not overwinter in Louisiana. Weather analysis is currently in progress.

INTERACTION BETWEEN THE RICE WATER WEEVIL AND *PYTHIUM* IN THE DEVELOPMENT OF FEEDER-ROOT NECROSIS IN RICE

R.A.F. Thompson, S.S. Quisenberry, J.F. Robinson, R.W. Schneider, G.B. Trahan, and R.M. Michot

Location: Rice Research Station, Crowley, LA

Soil: Crowley silt loam

Variety: Lemont

Seeding Rate: Pregerminated seed water-seeded at 156.9 kg/ha

Planting Method: Broadcast - first experiment on May 19, 1988, second experiment, June 23

Plot Size: 7.7 x 1.2 m

Water Management: Flushed at 7 and 10 days, flooded at 14 days

Fertilization: 672.5 kg ai/ha of 20-10-10

Herbicide: 4.5 kg ai/ha of thiobencarb

Treatments: 1) Metalaxyl 1.77 liter/ha applied before flooding and seeding; 2) Carbofuran 0.56 kg/ha applied 14 and 33 days after sowing (DAS) for the first experiment and 13, 19, and 40 DAS for the second experiment; 3) Metalaxyl + Carbofuran; 4) No chemical control.

Application Equipment: Metalaxyl and thiobencarb applied with a CO_2 hand boom delivering 15 gpa @ 30 psi; granular insecticide applied with a shaker jar; fertilizer applied with a motorized gandy.

Experimental Design: Randomized block design consisting of four replicates

Comments: The interaction between the rice water weevil (RWW) and *Pythium* spp. in the development of feeder-root necrosis in rice was evaluated in two field experiments. The RWW population levels in both experiments were extremely high (Tables 1 and 2). In the first experiment, RWW numbers at 50 DAS in plots not treated with carbofuran were lower than treated plots because the reduced root systems of plants in the untreated plots were unable to sustain high RWW populations (Table 1). Since RWW infestation levels remained high throughout both experiments (Tables 1 and 2), rice yields were reduced in all treatments (Tables 3 and 4). Field infection by *Pythium* spp. during the 1988 season was low in these tests. The low *Pythium* infection is thought to have resulted from high ambient temperatures at the time of planting (> 30°C). Since the mean yields of metalaxyl treated plots were not significantly different from the corresponding untreated plots (i.e., metalaxyl vs. check and carbofuran vs. metalaxyl + carbofuran), it can be concluded that *Pythium* was not a factor affecting rice yield (Tables 3 and 4).

Table 1. Mean rice water weevil counts per core sample for the first experiment. Rice Research Station, Crowley, LA. 1988.

Treatment	Means: Days after sowing (DAS) 33	40	50	61
M + CF	5.9 a	2.8 a	10.2 a	19.2 a
CF	7.3 ab	4.5 a	12.9 a	18.4 ab
M	10.5 bc	8.6 b	9.7 a	13.3 b
CK	12.5 a	14.9 c	13.9 a	15.9 ab

Means followed by the same letter are not significantly different (P = 0.05, DMRT).

Table 2. Mean rice water weevil counts per core sample for the second experiment. Rice Research Station, Crowley, LA. 1988.

Treatment	Means: Days after sowing (DAS) 19	25	33	50	56
M + CF	0.1 a	4.8 ab	9.7 a	10.1 a	7.4 a
CF	0.1 a	4.1 a	10.1 a	14.3 ab	10.2 ab
M	0.2 a	8.4 b	17.1 b	13.5 ab	16.5 c
CK	0.2 a	7.8 ab	14.8 ab	18.3 b	14.0 bc

Means followed by the same letter are not significantly different (P = 0.05, DMRT).

Table 3. Plant measurements for the first experiment. Rice Research Station, Crowley, LA. 1988.

Treatment	Means				
	Plant height (cm)	Number of panicles	Weight 20 panicles (g)	Bulk weight/ 25 ft^2 (g)	Grain yield/ hectare (kg)
M + CF	85 a	201 a	33.5 a	608 a	5065 a
CF	85 a	194 a	33.1 a	589 a	5020 a
M	74 b	125 b	28.3 b	339 b	2710 b
CK	75 b	143 b	27.5 b	381 b	3065 b

Grain at 12% moisture. Means followed by the same letter are not significantly different (P = 0.05, DMRT).

Table 4. Plant measurements for the second experiment. Rice Research Station, Crowley, LA. 1988.

Treatment	Means				
	Plant height (cm)	Number of panicles	Weight 20 panicles (g)	Bulk weight/ 25 ft^2 (g)	Grain yield/ hectare (kg)
M + CF	90 a	191 a	36.6 a	693 a	5692.5 a
CF	90 a	209 a	37.1 a	714 a	6092.5 a
M	75 b	127 b	29.0 b	367 b	2865.0 b
CK	77 b	129 b	28.8 b	365 b	2890.0 b

Grain at 12% moisture. Means followed by the same letter are not significantly different (P = 0.05, DMRT).

RICE WATER WEEVIL CONTROL: PROPANIL, WHIP, CARBOFURAN INTERACTION WITH LEMONT

J.F. Robinson, S.S. Quisenberry, G.B. Trahan, and R.M. Michot

Location: Rice Research Station, Crowley, LA

Soil: Crowley silt loam

Variety: Lemont

Seeding Rate: 100 lb/A

Seeding Depth: 1.5 in

Planting Method: Drill seeded, small-plot drill, Apr 19, 1988

Plot Size: Planted: 7 rows, 12.5-ft (length) x 7-in (row spacing)
Harvested: 4 rows, 12.5-ft (length), 29.2 sq ft

Fertilization: 30-60-60 lb/A N-P-K, at planting
120 lb/A N, May 31

Water Management: Flushed Apr 25 and 29, May 5, 11, and 18
Flooded June 1
Drained for harvest Aug 25

Herbicides: Propanil 4 lb ai/A, May 16 and 30
Whip 0.2 lb ai/A and propanil 4.0 lb ai/A applied June 14, 17, 21, and 28 with a CO_2 hand boom delivering 15 gpa @ 42 psi

Insecticide: Carbofuran applied June 14 with a shaker jar

Experimental Design: Split-plot with four reps; carbofuran treated vs untreated were whole-plots, propanil and whip timings were the split-plots. Each whole-plot was individually leveed off. Rice water weevil immature counts were made on July 5. Plant height measured from soil surface to panicle node on Sept 6.

Harvested: Sept 8

Comments: Rice water weevil immature counts averaged 16.9 per core in the untreated plots and 6.1 in the carbofuran treated plots. Comparisons between treated and untreated means showed that with the exception of the propanil 0-day treatment, yields in the carbofuran treated plots were higher (P = 0.05) than those in the untreated plots.

Averaged over timings and carbofuran treatments, application of whip decreased yield 625 lb/A when compared to the application of propanil. Comparisons between treatments and their respective check (P = 0.05) showed that the whip 0-day, 7-day, and 14-day treatments reduced yield in the untreated plots, and the propanil 0-day and the whip 14-day treatments reduced yield in the carbofuran treated plots. The difference in yield between the check and whip treatments averaged over timings in the untreated plots was 1127 lb/A (19.6% reduction), and the difference in yield between the check and the whip treatments averaged over timings in the carbofuran treated plots was 457 lb/A (7.0% reduction). Yield in the whip plots treated with carbofuran averaged 1458 lb/A more than the whip plots not treated with carbofuran.

The data collected in this test show that the variety Lemont is susceptible to damage by whip. The higher percentage yield reduction in the whip plots not treated with carbofuran when compared to the whip carbofuran treated plots suggests that there is no phytotoxic interaction between these materials. These data also indicate that the additional stress of rice water weevil damage may have increased the plant's sensitivity to whip.

Table 1. The effects of propanil, whip, and carbofuran on the yield and height of 'Lemont' rice. Rice Research Station, Crowley, LA. 1988.

Herbicide	Applied days after carbofuran	Yield (lb/A) Carbofuran 0.00	Yield (lb/A) Carbofuran 0.50	Height (cm) Carbofuran 0.00	Height (cm) Carbofuran 0.50	Immatures/Core Carbofuran 0.00	Immatures/Core Carbofuran 0.50
Check	--	5738	6526	58.5	62.8	15.0	6.4
Propanil	00	5546	5699*	56.4	62.3	13.2	6.3
Propanil	03	5323	6381	60.3	62.5	24.0	7.7
Propanil	07	5516	6639	57.8	62.0	15.8	5.1
Propanil	14	5835	6779	57.6	60.8	17.5	6.3
Whip	00	4669*	6206	55.4	58.7	12.9	6.1
Whip	03	5367	6713	58.7	62.0	15.0	5.8
Whip	07	4517*	5914	54.9	58.8	14.8	5.8
Whip	14	3889*	5444*	50.4*	56.1*	24.1	5.0

Whip and propanil applied on June 14 (00), 17 (03), 21 (07), and 28 (14); lsd (0.05) yield = 806 (within column), 764 (across columns), height = 3.3 (within column), 4.5 (across columns); * = significantly different by lsd from respective check within a column; C.V. yield = 9.9.

Table 2. Phytotoxicity ratings from propanil, whip, and carbofuran on 'Lemont' rice. Rice Research Station, Crowley, LA. 1988.

Herbicide	Applied days after carbofuran	June 23 Carbofuran 0.00	June 23 Carbofuran 0.50	July 6 Carbofuran 0.00	July 6 Carbofuran 0.50
Check	--	1.0	1.0	1.5	1.0
Propanil	00	2.3	5.5*	1.5	1.5
Propanil	03	2.0	3.3*	1.3	1.5
Propanil	07	2.0	1.3	1.3	1.5
Propanil	14	1.0	1.0	3.5*	4.0*
Whip	00	6.0*	5.0*	3.8*	1.5
Whip	03	2.3	2.5*	1.5	1.5
Whip	07	1.0	1.0	2.8*	3.3*
Whip	14	1.0	1.0	2.0	2.3*

Whip and propanil applied on June 14 (00), 17 (03), 21 (07), and 28 (14); Phytotoxicity ratings 0 = none to 9 = severe; lsd (0.05) June 23 = 1.5, July 6 = 1.1; * = significantly different by lsd from respective check.

RICE WATER WEEVIL CONTROL: PROPANIL, WHIP, CARBOFURAN INTERACTION WITH MERCURY

J.F. Robinson, S.S. Quisenberry, G.B. Trahan, and R.M. Michot

Location: Rice Research Station, Crowley, LA

Soil: Crowley silt loam

Variety: Mercury

Seeding Rate: 100 lb/A

Seeding Depth: 1.5 in

Planting Method: Drill seeded, small-plot drill, Apr 20, 1988

Plot Size: Planted: 7 rows, 12.5-ft (length) x 7-in (row spacing)
Harvested: 4 rows, 12.5-ft (length), 29.2 sq ft

Fertilization: 30-60-60 lb/A N-P-K, at planting
120 lb/A N, May 31

Water Management: Flushed Apr 25 and 29, May 5, 11, and 18
Flooded June 1
Drained for harvest Aug 12

Herbicides: Propanil 4 lb ai/A, May 16 and 30
Whip 0.2 lb ai/A and propanil 4.0 lb ai/A applied June 14, 17, 21, and 28 with a CO_2 hand boom delivering 15 gpa @ 42 psi

Insecticide: Carbofuran applied June 14 with a shaker jar

Experimental Design: Randomized complete block with four reps; carbofuran plots were not leveed off. Rice water weevil immature counts were made on June 29. Plant heights were measured from the soil surface to the panicle node on Sept 6.

Harvested: Sept 7

Comments: The rice water weevil immature counts averaged 32.4 per core in the untreated plots and 7.3 per core in the carbofuran treated plots. Comparisons between treated and untreated means showed that with the exceptions of the propanil 3-day and 14-day treatments and the whip 3-day treatment, yields in the carbofuran treated plots were higher ($P = 0.05$) than those in the untreated plots.

Application of whip, averaged over timings and carbofuran treatments, decreased yield 711 lb/A more than the application of propanil. Comparisons between treatments and their respective check (P = 0.05) showed that the whip 0-day and 14-day treatments reduced yield in the untreated plots and the whip 0-day, 3-day, and 14-day treatments reduced yield in the carbofuran treated plots. The difference in yield between the check and the whip treatments averaged over timings in the untreated plots was 426 lb/A (8.4% reduction), and the difference in yield between the check and the whip treatments averaged over timings in the carbofuran treated plots was 864 lb/A (14.4% reduction). Yield in the whip plots treated with carbofuran averaged 508 lb/A more than those in the untreated plots.

The data collected in this test indicate that the variety Mercury is susceptible to damage by whip. The higher percentage yield reduction in the whip-carbofuran treated plots when compared to the whip untreated plots suggests that there is a low level phytotoxic interaction between these materials when applied to the rice variety Mercury. Further studies will be needed to prove this point.

Table 1. The effects of propanil, whip, and carbofuran on the yield and height of 'Mercury' rice. Rice Research Station, Crowley, LA. 1988.

Herbicide	Applied days after carbofuran	Yield (lb/A) Carbofuran 0.00	Yield (lb/A) Carbofuran 0.50	Height (cm) Carbofuran 0.00	Height (cm) Carbofuran 0.50	Immatures/Core Carbofuran 0.00	Immatures/Core Carbofuran 0.50
Check	--	5044	5990	68.8	76.1	31.6	5.8
Propanil	00	5223	5606	68.8	74.1	32.5	3.3
Propanil	03	5202	5983	70.7	74.4	34.0	9.7
Propanil	07	5128	6285	70.7	74.4	33.3	10.9
Propanil	14	5413	5821	67.5	74.8	39.3	5.7
Whip	00	4226*	5092*	62.9*	67.2*	29.3	5.1
Whip	03	5455	5259*	67.3	71.7*	28.4	9.1
Whip	07	4753	5570	65.0*	65.8*	31.7	8.1
Whip	14	4036*	4581*	56.4*	59.4*	31.1	7.3

Whip and propanil applied on June 14 (00), 17 (03), 21 (07), and 28 (14); lsd (0.05) yield = 493, height = 3.8; * = significantly different by lsd from respective check; C.V. yield = 6.3.

Table 2. Phytotoxicity ratings from propanil, whip, and carbofuran on 'Mercury' rice. Rice Research Station, Crowley, LA. 1988.

Herbicide	Applied days after carbofuran	June 23 Carbofuran 0.00	June 23 Carbofuran 0.50	July 6 Carbofuran 0.00	July 6 Carbofuran 0.50
Check	--	1.3	1.0	1.5	1.0
Propanil	00	2.0	5.8*	1.5	1.3
Propanil	03	1.0	3.0*	1.5	1.5
Propanil	07	1.0	1.0	1.5	1.0
Propanil	14	1.0	1.0	2.3*	2.3*
Whip	00	4.3*	4.5*	4.3*	2.5*
Whip	03	1.3	1.0	2.3*	1.8*
Whip	07	1.0	1.0	2.3*	2.0*
Whip	14	1.0	1.0	2.0	1.8*

Whip and propanil applied on June 14 (00), 17 (03), 21 (07), and 28 (14); lsd (0.05) June 23 = 0.8, July 6 = 0.8; * = significantly different by lsd from respective check.

DISEASE CONTROL STUDIES

RICE DISEASE RESISTANCE EVALUATIONS - 1988[1/]

D. Groth, M. Frey, and J. Nugent

SHEATH BLIGHT DISEASE NURSERY

Location: Rice Research Station, Crowley, LA

Soil Type: Crowley silt loam

Variety/Seed Rate: Various, 100 lb/A

Planting Method/Date: Drill seeded - April 26, 1988

Fertilization: 150-75-75

Plot Size: 2 rows x 4 ft

Water Management: Flushed Apr 27, May 5, May 12; Permanent flood May 26; Drained Aug 8

Herbicides: 4 lb/A Propanil + 1.5 pt/A Basagran May 25, Bolero June 14,

Insecticides: 20 lb/A Furadan May 31, 1.5 qt/A liquid Sevin July 21

Fungicides: None

Disease Ratings: Sheath blight severity (0-9 scale), Brown spot (0-9), leaf smut (0-9), and narrow brown spot (0-9) Aug 30

Results: Table 1. Summary of 1984-1988.

Comments: Sheath blight severity was moderate, brown spot low, leaf smut very low, and narrow brown spot moderate to low.

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

RICE BLAST DISEASE NURSERY

Location: Rice Research Station, Crowley, LA

Soil Type: 1/3 sand and 1/3 peat moss

Variety/Seed Rate: Various, 150 lb/A

Planting Method/Date: Drill seeded - May 10, 1988

Fertilization: 200-0-0, May 9

Plot Size: 2 rows x 3 ft

Water Management: Sprinkler irrigated

Herbicides: None

Insecticides: None

Fungicides: None

Disease Ratings: Blast (0-9) 40 days after planting

Results: Table 1.

Comments: Blast severity was low to moderate.

Table 1. Reaction of various varieties to sheath blight, brown spot, leaf smut, narrow brown leaf spot and blast in disease nurseries at the Rice Research Station, Crowley, LA, in 1984, 1985, 1986, 1987, and 1988.

(1988	Sheath blight						Brown spot						Leaf smut						Narrow brown leaf spot						Blast		
Variety URN#)	84	85	86	87	88	x	84	85	86	87	88	x	84	85	86	87	88	x	84	85	86	87	88	x	87	88	x
VELG																											
Labelle (16)	7	8	7	6	8	7.2	3	2	3	-	0	2.0	5	3	2	7	1	3.6	3	7	6	4	2	4.4	3	3	3.0
Tebonnet (13)	6	7	7	5	6	6.2	3	3	4	-	4	3.5	3	4	1	6	0	3.5	3	4	6	5	2	4.0	2	4	3.0
Skybonnet (15)	7	9	7	5	9	7.4	2	3	2	-	2	2.3	3	5	0	5	2	3.8	3	3	8	4	0	3.6	3	3	3.0
Bond	6	8	6	7	-	6.8	2	1	4	-	-	2.3	4	2	1	8	-	3.8	3	4	4	6	-	4.3	-	-	-
Gulfmont (56)	9	8	9	7	8	8.2	0	0	2	-	0	0.5	4	7	1	7	1	4.0	0	4	9	8	4	5.0	5	3	4.0
L202 (119)	8	7	7	7	6	7.0	2	1	6	-	3	3.0	2	0	5	6	2	3.8	1	1	0	1	0	0.6	-	4	4.0
ELG																											
Leah	5	5	5	-	4	4.8	3	0	3	-	5	2.8	1	5	3	-	2	2.8	3	4	6	-	3	4.0	-	3	3.0
Lemont (55)	8	7	8	7	8	7.6	4	3	3	-	5	3.8	2	6	1	7	3	3.8	3	4	7	7	4	5.0	4	3	3.5
Lebonnet (36)	8	9	7	8	8	8.0	4	0	3	-	6	3.3	4	7	1	3	5	4.0	3	5	6	5	0	3.8	4	3	3.5
Bellemont	8	9	8	-	-	8.3	2	3	3	-	-	2.6	5	5	5	-	-	5.0	5	4	6	-	-	5.0	-	-	-
2201 (45)	-	-	9	8	5	7.3	-	-	3	-	3	3.0	-	-	1	3	1	1.7	-	-	7	5	4	5.3	4	2	3.0
MLG																											
Bellevue	6	4	6	-	-	5.3	3	0	3	-	-	2.5	4	8	5	-	-	5.7	1	5	3	-	-	3.0	-	-	-
Newbonnet (54)	6	8	6	5	7	6.4	0	0	0	-	5	1.3	2	5	1	5	1	2.8	3	1	8	6	5	4.6	5	5	5.0
Starbonnet (76)	4	5	6	4	-	4.8	4	0	3	-	-	2.3	4	6	1	5	-	4.0	3	2	3	6	-	3.5	5	6	5.5
1179 (44)	-	-	-	3	6	4.5	-	-	-	-	3	3.0	-	-	-	5	1	3.0	-	-	-	6	4	5.0	3	2	2.5
Medium																											
Mars (33)	4	5	3	5	3	4.0	4	0	2	-	2	2.0	1	6	1	6	1	3.0	1	4	2	4	3	2.8	8	3	5.5
Saturn	5	7	7	-	-	6.3	3	2	4	-	-	3.0	5	4	5	-	-	4.7	6	2	4	-	-	4.0	-	-	-
Pecos (118)	4	4	2	4	6	4.0	3	2	2	-	3	2.5	4	5	0	3	0	2.4	0	0	1	2	2	1.0	-	4	4.0
Brazos (160)	6	5	5	4	6	5.4	3	0	3	-	4	2.5	3	4	0	6	0	2.6	0	0	0	3	0	0.6	-	2	2.0
Mercury (35)	-	6	2	5	7	5.0	-	2	3	-	4	3.0	-	7	2	7	2	4.5	-	0	3	3	1	1.8	6	6	6.0
Rico-1 (75)	-	4	6	4	6	5.0	-	0	6	-	6	4.0	-	7	1	4	5	4.3	-	3	3	5	2	3.3	3	2	2.5
Special																											
Toro-2 (53)	7	6	5	4	4	5.2	3	0	4	-	3	2.5	1	6	2	4	0	2.6	1	3	4	0	0	1.6	3	3	3.0
Newrex (158)	9	7	7	6	8	8.0	4	3	5	-	3	3.8	6	6	3	5	0	4.0	0	0	3	2	0	1.0	-	5	5.0
Della (159)	5	7	6	4	6	5.6	3	2	4	-	5	3.5	5	2	2	5	0	2.8	6	4	4	3	2	3.8	-	3	3.0
Rexmont (34)	-	-	-	8	9	8.5	-	-	-	-	2	2.0	-	-	-	5	1	3.0	-	-	-	4	3	3.5	6	7	6.5

RICE FUNGICIDE EVALUATIONS - 1988[1/]

D. Groth, M. Frey, J. Nugent, and M. Rush

COMMERCIAL RICE FUNGICIDE TRIAL

Location: Rice Research Station, Crowley, LA

Soil Type: Crowley silt loam

Variety/Seed Rate: Lemont, 100 lb/A

Planting Method/Date: Drill seeded - April 12, 1988

Fertilization: 75-75-75, Apr 11; 80-0-0 May 11; 46-0-0, June 7

Plot Size: 16 x 4 ft

Emergence Date: Apr 25

Water Management: Flushed Apr 14, Apr 22, Apr 27; Permanent flood May 12; Drained Aug 8

Herbicides: 4 lb/A Propanil + 1.5 pt/A Basagran May 10, Whip June 13,

Insecticides: 20 lb/A Furadan May 31, 1.5 qt/A liquid Sevin July 21

Fungicides: Various fungicides, rates and timing -- See Table 1.

Application Equipment: CO_2 backpack sprayer, 8002 tips, 20 gal/A

Application Dates: (PI Stage) June 23, (Boot Stage) July 7, (Heading Stage) July 19

Harvest: August 23

Experimental Design: Randomized block design with four replications

Disease Ratings: Sheath blight severity (0-9 scale) July 22
Infestation levels (0-100%) Aug 12

Results: Table 1.

Comments: Sheath blight severity was moderate, other diseases were very low.

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

Table 1. Effects of rice foliar fungicides on sheath blight control and yield. Rice Research Station, Crowley, LA. 1988.

Treatment	Rate[1]	Timing[2]	Sheath blight[3]	Sheath blight infestation[4]	Yield lb/A	Change from check
Uninoculated control	--	--	3.0	18	6750	1377
Inoculated control	--	--	6.8	55	5373	---
Benlate 50WP	1 lb	B+H	5.0	49	6156	783
Benlate 50DF	1 lb	B+H	5.3	40	5861	488
Benlate 50DF+CS7	1 lb	B+H	5.8	52	5957	584
Benlate 50DF	1 lb	PI+B	6.0	64	5784	411
Rovral 50WP	1 lb	B+H	4.8	39	6026	653
Rovral 50WP	1 lb	PI+B	5.5	45	6005	632
Rovral 50WP+CS7	1 lb	B+H	5.0	45	5706	334
Rovral/Benlate	1/1 lb	B/H	4.3	38	5423	50
Rovral 50WP	0.6 lb	PI+B+H	4.5	59	6065	692
Rovral 48SC	.5 lb ai	B+H	5.0	49	5462	89
Rovral 48SC+CS7	.5 lb ai	B+H	5.0	36	5847	474
Rovral 230F	.5 lb ai	B+H	4.0	45	5600	227
Rovral 230F+CS7	.5 lb ai	B+H	5.0	36	6025	652
Tilt 3.6EC	6 oz	PI+B	5.5	50	5975	602
Tilt 3.6EC	6 oz	2"+B	4.5	42	6011	638
Tilt 3.6EC+CS7	6 oz	PI+B	5.0	55	6355	982
Tilt 3.6EC	10 oz	PI	6.5	62	5391	18
Tilt/Benlate	10/1 lb	PD/H	6.0	41	5550	177
Tilt/Rovral	10/1 lb	B/H	4.5	32	6225	852
Folatec	12 oz	B+H	5.8	48	5901	528
Rovral+Triton B1956	1 lb	B+H	4.8	42	5711	339
Topsin-M	1 lb	B+H	5.5	53	5347	-26
Rovral/Topsin-M	1/1 lb	B/H	4.5	39	5888	515
Dithane M45	4 lb	B+H	4.8	37	5515	142
Dithane+CS7	4 lb	B+H	5.3	55	5791	418
Monceren 75WP	.33 lb	PI+B	3.5	18	6429	1056
Monceren 75WP	.33 lb	B+H	3.5	21	6158	785
Monceren/Benlate	.33/1 lb	B/H	4.5	24	5812	437
Monceren/Benlate	.33/.5 lb	B/H	4.0	33	6157	784
Monceren/Rovral	.33/1 lb	B/H	4.5	23	5969	596
SN84364 50WP	.5 lb	PI+B	5.0	51	6226	853
SN84364+CS7	.5 lb	PI+B	4.5	32	6618	1245
SN84364/Benlate	.5/1 lb	B/H	4.0	33	6183	810
SN84364/Rovral	.5/1 lb	B/H	3.8	28	6068	693
SN539865 25WP	1 lb	PI+B	4.5	32	6326	935
SN539865+CS7	1 lb	PI+B	4.8	28	6406	1033
LSD (0.05)			1.3	23	602	

[1] Rate in formulated product except where noted. Triton CS-7 at the rate of 16 oz/100 gal.; ai = active ingredient.

[2] Timing: PI = panical initiation, B = boot (½" panicle), and H = heading.

[3] Sheath blight rated on 0-9 scale where 0 = no disease and 9 = plants dead.

[4] Percent tillers infected with sheath blight.

OFF STATION RICE FUNGICIDE TRIAL

Location: Lake Arthur

Soil Type: Silt loam

Variety/Seed Rate: Lemont, 130 lb/A

Planting Method/Date: Water seeded, May 5, 1988

Fertilization: 66-51-51, May 3; 36-0-0, June 30

Plot Size: 8 x 20 ft

Water Management: Pinpoint flood, drained Aug 16

Herbicides: 3 lb Bolero, .5 oz Londax

Insecticides: 17 lb Furadan

Fungicides: Various fungicides, rates and timing -- See Table 2.

Application Equipment: CO_2 backpack sprayer, 8002 tips, 20 gal/A

Application Dates: Panicle Differentiation, July 12; Boot, July 19; Heading, July 27

Harvest: Aug 26

Experimental Design: Randomized block design with four replications

Disease Ratings: Sheath blight severity (0-9) scale Aug 26
Infestation levels (0-100%) Aug 26
Brown spot (0-9 scale) Aug 26

Results: Table 2.

Comments: Sheath blight severity was high, brown spot severity was moderate

Table 2. Effects of rice foliar fungicides on sheath blight, brown spot, and yield. Lake Arthur, LA. 1988.

Treatment, rate/A, and timing[1]	Sheath blight Rating[2]	Sheath blight Infestation[3]	Brown spot[2]	Yield lb/A
Untreated check	7.3	73	5.0	5480
Benlate 50 DF 1 lb (B+H)	5.8	45	2.3	6338
Benlate 50 DF 1 lb + Triton CS7 16 oz/100 gal (B+H)	5.8	43	3.0	6030
Folatec 12 oz (B+H)	7.5	70	4.8	5275
Rovral 1 lb (B+H)	6.3	40	3.5	6009
Rovral 1 lb + Triton CS7 16 oz/100 gal (B+H)	5.3	36	4.3	5991
Rovral .6 lb (PD+B+H)	6.0	49	4.0	6157
Tilt 3.6 EC 6 oz (PD+B)	4.8	31	3.8	5885
Tilt 3.6 EC 10 oz (B)	5.3	34	4.3	6197
Tilt 3.6 EC 10 oz/Benlate 50 DF 1 lb (B/H)	6.5	50	4.3	5997
Tilt 3.6 EC 10 oz/Rovral 50 WP 1 lb (B/H)	5.0	37	4.0	5972
Pencycuron 75 WP .3 lb (B+H)	3.0	15	4.8	6096
Flutolanil 50 WP .5 lb (PD+B)	3.5	20	4.3	6109
LSD (P = 0.05)	1.6	19	2.3	610

[1] PD = panicle differentiation, B = boot, H = heading, and B/H = first fungicide applied at boot and second at heading.

[2] Rated with a 0-9 scale with 0 = no disease and 9 = maximum disease development possible.

[3] Percent tillers infected.

ROVRAL SPREADER STICKER STUDY

Location: Rice Research Station, Crowley, LA

Soil Type: Crowley silt loam

Variety/Seed Rate: Lemont, 100 lb/A

Planting Method/Date: Drill seeded - Apr 19, 1988

Fertilization: 75-75-75, Apr 18; 80-0-0, May 19; 46-0-0, June 7

Plot Size: 16 x 4 ft

Emergence Date: May 2

Water Management: Flushed Apr 22, Apr 27, May 5, May 12;
Permanent flood May 20

Herbicides: 4 lb/A Propanil + 1.5 pt Basagran, May 15

Insecticides: 20 lb/A Furadan, May 31; 1.5 qt/A liquid Sevin, July 21

Fungicides: Various fungicides, rates and timing -- See Table 3.

Application Equipment: CO_2 backpack sprayer, 8002 tips, 20 gal/A

Application Dates: (Boot Stage) July 8, (Heading Stage) July 18

Harvest: Aug 29

Experimental Design: Randomized block design with four replications

Disease Ratings: Sheath blight severity (0-9 scale) July 21
Infestation levels (0-100%) July 21

Results: Table 3.

Comments: Sheath blight severity was high, other diseases were very low.

Table 3. Effects of spray adjuvants on Rovral for control of sheath blight and yield response. Rice Research Station, Crowley, LA. 1988.

Treatment, rate, timing[1]	Adjuvant[2]	Sheath blight[3]	Sheath blight infestation[4]	Yield (lb/A)	Change
Untreated control	---	7.3	63	6409	----
Rovral 50 WP, 1 lb, B+H	---	5.3	51	6968	559
"	+ Triton CS7	4.5	39	6596	187
"	+ Nuflim	4.8	37	6920	511
"	+ LFJ	4.3	41	6428	19
"	+ X77	4.0	35	6503	94
"	+ Penetrator	4.3	40	6448	39
"	+ Surfix	4.5	39	6390	-11
LSD (0 = 0.05)		0.9	19	542	

[1] B = Boot, H = Heading.

[2] Adjuvants added at 16 oz/100 gal.

[3] Sheath blight severity rated on 0-9 scale where 0 = no disease and 9 = plants dead.

[4] Percent tillers infected with sheath blight.

BENLATE SPREADER STICKER STUDY

Location: Rice Research Station, Crowley, LA

Soil Type: Crowley silt loam

Variety/Seed Rate: Lemont, 100 lb/A

Planting Method/Date: Drill seeded, Apr 12, 1988

Fertilization: 75-75-75, Apr 11; 80-0-0, May 11

Plot Size: 16 x 4 ft

Emergence Date: Apr 25

Water Management: Flushed Apr 14, Apr 22, Apr 27; Permanent flood May 12

Herbicides: 4 qt/A Propanil + 1.5 pt/A Basagran May 10
1.5 pt/A Basagran June 28

Insecticides: 20 lb/A Furadan May 31; 1.5 lb/A liquid Sevin July 21

Fungicides: Various fungicides, rates and timing -- See Table 4.

Application Equipment: CO_2 backpack sprayer, 8002 tips, 20 gal/A

Application Date: (Boot Stage) July 8, (Heading Stage) July 21

Harvest: Aug 23

Experimental Design: Randomized block design with four replications

Disease Ratings: Sheath blight severity (0-9 scale) July 21
Infestation levels (0-100%) July 21

Results: Table 4.

Comments: Sheath blight severity was moderate, other diseases were very low.

Table 4. Effect of spray adjuvants on Benlate for control of sheath blight and yield. Rice Research Station, Crowley, LA. 1988.

Treatment, Rate, Timing	Adjuvant[1]	Sheath blight[2]	Sheath blight infestation[3]	Yield (lb/A)	Change
Untreated control	---	5.8	45	5841	---
Benlate 50 DF 1 lb B+H	---	4.8	34	6709	868
"	+ Triton CS7	4.8	28	6751	910
"	+ Nuflim	5.5	44	6863	1022
"	+ Triton B1956	4.5	32	6551	710
"	+ X-77	4.5	25	6378	537
"	+ Surfix	4.5	26	6953	1112
"	+ Penetrator	4.0	33	6590	749
"	+ LFJ	4.3	35	6708	867
LSD (P = 0.05)		0.9	21	555	

[1] Adjuvants added at a rate of 16 oz/100 gal.

[2] Sheath blight rating based on 0-9 scale where 0 = no disease and 9 = plants dead.

[3] Percent tillers infected.

TIME OF FUNGICIDE APPLICATION

Location: Rice Research Station, Crowley, LA

Soil Type: Crowley silt loam

Variety/Seed Rate: Lemont, 100 lb/A

Planting Method/Date: Drill seeded, May 16, 1988

Fertilization: 70-70-70, May 13; 100-0-0 June 9

Plot Size: 16 x 4 ft

Emergence Date: May 24

Water Management: Flushed, May 20; Permanent flood, June 10; Drained Sept 6

Herbicides: 4 qt/A Propanil + 1.5 pt/A Basagran June 6; 4 lb/A Bolero June 14

Insecticides: 1.5 lb/A liquid Sevin July 21; 20 lb/A Furadan July 26

Fungicides: Various fungicides, rates and timing -- See Table 5.

Application Equipment: CO_2 backpack sprayer, 8002 tips, 20 gal/A

Application Dates: July 27, July 29, Aug 17

Harvest: Sept 14

Experimental Design: Randomized block design with four replications

Disease Ratings: Sheath blight severity (0-9 scale) Sept 7
Infestation levels (0-100%) Sept 7

Results: Table 5.

Comments: Sheath blight severity was high, other diseases were very low.

Table 5. Effect of application time of day on effacacy of rice fungicides. Rice Research Station, Crowley, LA. 1988.

Treatment, rate, timing[1]	Time of Day[2]	Sheath blight[3]	Sheath blight infestation[4]	Yield (lb/A)	Change
Untreated Control	---	7.3	85	5475	---
Tilt 3.6 EC, 6 oz, PD+B	8:00 AM	6.3	64	6246	771
	10:00 AM	5.5	43	6396	921
	12:00 Noon	5.8	72	5258	783
	2:00 PM	5.8	39	6475	1000
	4:00 PM	6.0	59	6180	705
	6:00 PM	6.0	54	6729	1254
Rovral 50 WP, 1 lb, B+H	8:00 AM	4.3	41	6603	1128
	10:00 AM	4.5	42	6446	971
	12:00 Noon	4.3	29	6459	984
	2:00 PM	4.3	42	6390	915
	4:00 PM	4.5	40	6132	657
	6:00 PM	4.3	34	6385	910
Benlate 50 DF, 1 lb, B+H	8:00 AM	5.3	73	6503	1028
	10:00 AM	6.0	67	6410	935
	12:00 Noon	5.8	87	6387	912
	2:00 PM	6.0	82	6115	640
	4:00 PM	5.5	56	6491	1016
	6:00 PM	6.0	69	6550	1075
LSD (P = 0.05)		1.0	29	406	

[1] PD = panical differentiation, B = boot, and H = heading.

[2] Time of fungicide application ± 15 min.

[3] Sheath blight rated on 0-9 scale where 0 = no disease and 9 = plants dead.

[4] Percent tillers infected with sheath blight.

	PD			Boot			Head		
	Wind	Rain	Dew	Wind	Rain	Dew	Wind	Rain	Dew
8:00 AM	L	-	H	L	-	H	N	-	H
10:00 AM	L	-	L	L	-	H	N	-	M
12:00 NOON	L	+	N	L	-	L	L	-	L
2:00 PM	H	-	Wet	M	-	D	M	+	N
4:00 PM	M	-	D	H	-	D	M	-	Wet
6:00 PM	N	-	D	N	-	D	H	-	D

Dew: H = heavy; L = moderate light; D = dry.
Rain: + = rainfall in next 2 hours.
Wind: N = none; L = light; M = moderate; H = high wind conditions.

HEADING SALVAGE SPRAY

Location: Rice Research Station, Crowley, LA

Soil Type: Crowley silt loam

Variety/Seed Rate: Lemont, 100 lb/A

Planting Method/Date: Drill seeded, Apr 19, 1988

Fertilization: 80-0-0, May 19; 46-0-0, June 7

Plot Size: 16 x 4 ft

Emergence Date: May 2

Water Management: Flushed Apr 22, Apr 27, May 5, May 12;
Permanent flood May 20

Herbicides: 4 qt/A Propanil + 1.5 pt/A Basagran May 18; Drained Aug 15

Insecticides: 17 lb/A Furadan May 31; 1.5 lb/A liquid Sevin July 21

Fungicides: Various fungicides, rates, and timing -- See Table 6.

Application Equipment: CO_2 backpack sprayer, 8002 tips, 20 gal/A

Application Dates: (Heading Stage) July 27

Harvest: Aug 29

Experimental Design: Randomized block design with three replications

Disease Ratings: Sheath blight severity (0-9 scale) Aug 19
Infestation levels (0-100%) Aug 19

Results: Table 6.

Comments: Sheath blight severity was very high, other diseases were very low.

Table 6. Effect of single heading sprays on sheath blight and yield of rice. Rice Research Station, Crowley, LA. 1988.

Treatment, rate, timing	Sheath blight[1]	Sheath blight infestation[2]	Yield (lb/A)	Change
Untreated check	7.4	65	6050	---
Benlate 50 DF, 1 lb, Heading	5.0	62	6410	360
Benlate 50 DF, 2 lb, Heading	5.0	49	6836	786
Rovral 50 WP, 1 lb, Heading	4.3	43	6250	200
LSD (P = 0.05)	1.2	20	542	---

[1] Sheath blight rated using 0-9 scale where 0 = no disease and 9 = plants dead.
[2] Percent tillers infected.

STEM ROT FUNGICIDE TRIAL

Location: Rice Research Station, Crowley, LA

Soil Type: Crowley silt loam

Variety/Seed Rate: Lemont, Mercury, 100 lb/A

Planting Method/Date: Drill seeded, Apr 19, 1988

Fertilization: 80-0-0, May 19; 46-0-0, June 7

Plot Size: 16 x 4 ft

Emergence Date: May 2

Water Management: Flushed Apr 22, Apr 27, May 5, May 12; Permanent flood May 20; Drained Aug 15

Herbicides: 4 qt/A Propanil + 1.5 pt/A Basagran May 18; 1.5 pt/A Basagran Jun 15

Insecticides: 14 lb/A Furadan May 31; 1.5 qt/A liquid Sevin July 21

Fungicides: Various fungicides, rates, and timing -- See Table 7.

Application Equipment: CO_2 backpack sprayer, 8002 tips, 20 gal/A

Application Dates: (PD Stage) July 8; (Boot Stage) July 18; Heading Stage (July 27)

Harvest: Aug 29

Experimental Design: Randomized block design with four replications

Disease Ratings: Stem rot severity (0-9 scale) July 21, Aug 19
Infestation levels (0-100%) Aug 29

Results: Table 7.

Comments: Stem rot severity was moderate, other diseases were low.

Table 7. Effects of rice foliar fungicides on stem rot development and yield on Lemont and Mercury varieties. Rice Research Station, Crowley, LA. 1988.

Treatment, rate/A, and timing[1]	Stem Rot Rating[2]	Stem Rot Infestation[3]	Yield (lb/A)	Change
Lemont				
Untreated inoculated control	5.5	93	6317	---
Tilt 3.6 EC 6 oz (PD+B)	4.5	69	7030	713
Tilt 3.6 EC 10 oz (PD)	4.3	68	6261	-56
Tilt 3.6 EC 10 g/Benlate 50 DF 1 lb (B/H)	4.3	65	7161	844
Benlate 50 DF 1 lb (B+H)	3.3	63	6865	548
Rovral 50 WP 1 lb (B+H)	4.0	73	6490	173
Folatec 12 oz (B+H)	3.5	63	6716	399
Pencycuron 75 WP .33 lb (B+H)	4.5	75	6977	660
Flutalanil 50 WP .5 lb (PD+B)	5.2	78	6385	68
LSD (P = 0.05)	1.2	19	626	---
Mercury				
Untreated inoculated control	4.0	73	6231	---
Tilt 3.6 EC 6 oz (PD+B)	2.8	52	6539	308
Tilt 3.6 EC 10 oz (PD)	4.0	30	6636	405
Tilt 3.6 EC 10 g/Benlate 50 DF 1 lb (B/H)	3.0	38	6848	617
Benlate 50 DF 1 lb (B+H)	2.0	38	6916	685
Rovral 50 WP 1 lb (B+H)	2.3	67	6674	443
Folatec 12 oz (B+H)	3.3	73	6668	437
Pencycuron 75 WP .33 lb (B+H)	3.5	85	6882	651
Flutalanil 50 WP .5 lb (PD+B)	4.0	74	6940	709
LSD (P = 0.05)	.9	20	582	---

[1] PD = panicle differentiation, B = boot, and H = heading.

[2] Stem rot rated on 0-9 scale where 0 = no disease and 9 = plants dead and collapsed.

[3] Percent tillers infected.

SHEATH BLIGHT INOCULATED NITROGEN FERTILIZATION X VARIETY TRIAL - 1988

D. Groth and P. Bollich

Location: Rice Research Station, Crowley, LA

Soil Type: Crowley silt loam

Variety/Seed Rate: Lemont, Mars, Tebonnet, and Mercury, 150 lb/A

Planting Method/Date: Water seeded, May 31, 1988

Fertilization: 0-60-60, May 27; 0-90 lb N/A preplant, May 28; topdressed, 30 lb N/A

Plot Size: 7 x 25 ft

Water Management: Flooded May 30, Drained June 14, Permanent flood June 15

Herbicides: 4 qt/A Propanil June 14

Insecticides: 20 lb/A Furadan July 11

Fungicides: None

Harvest: Sept 22

Experimental Design: Split block in a randomized block design with four replications

Disease Ratings: Sheath blight severity, N rates and timing whole plots, varieties split plots, brown spot, leaf smut and narrow brown spot severity (0-9 scales) Sept 21

Results: Table 1.

Comments: Sheath blight severity was high, other diseases were moderate.

Table 1. Effect of nitrogen fertilization rate and timing on yield, plant height, and disease rating on various rice varieties. Rice Research Station, Crowley, LA. 1988.

Variety	Plant height (cm)	Yield (lb/A)	Sheath blight	Brown spot	Leaf smut	Narrow brown spot
Mars						
0	85	4759	3.3	1.5	4.8	3.5
30	90	4958	3.8	1.5	4.5	2.5
60	103	5506	3.8	0.5	5.5	2.8
90	110	5488	4.5	0.0	5.5	2.5
60-30	106	5749	4.8	0.0	6.0	2.8
60-30	105	5916	4.5	0.0	4.5	3.5
120	120	6443	5.8	0.3	5.8	2.0
150	118	5643	5.5	0.0	6.0	2.5
Lemont						
0	66	3619	5.5	5.3	3.8	3.8
30	76	4659	5.8	3.0	3.8	4.0
60	78	4784	7.3	2.8	5.0	3.5
90	81	4385	7.5	0.8	6.0	3.0
60-30	80	5239	7.5	1.0	6.0	3.5
60-30	74	7463	7.3	2.8	5.3	3.5
120	81	5449	7.0	0.0	6.5	3.8
150	93	4613	7.3	0.5	6.5	3.5
Tebonnet						
0	81	3908	4.5	3.3	2.8	4.8
30	96	5042	6.3	2.3	4.5	5.0
60	107	5499	6.5	2.0	3.5	4.5
90	117	5468	7.0	1.8	4.5	4.0
60-30	107	5802	7.5	0.8	5.3	4.5
60-30	94	5568	6.8	2.3	4.5	4.5
120	121	5117	7.3	0.0	5.5	3.5
150	122	5321	7.8	0.3	5.5	3.5
Mercury						
0	74	4112	3.0	3.3	4.0	3.3
30	77	5148	4.3	3.3	4.5	3.5
60	82	5432	5.5	1.5	5.0	3.0
90	86	5670	5.0	0.5	5.5	3.0
60-30	84	5784	5.3	0.8	5.5	2.0
60-30	87	5687	6.0	0.8	5.8	2.8
120	94	5781	4.8	0.0	5.8	2.3
150	101	5620	5.8	0.0	4.5	2.3

WHEAT FUNGICIDE TRIAL - 1988

D. Groth, M. Frey, and J. Nugent

Location: Rice Research Station, Crowley, LA

Soil Type: Crowley silt loam

Variety/Seed Rate: Florida 302, Coker 797, 100 lb/A

Planting Method/Date: Kincaid row planter; Nov 2, 1988

Fertilization: 25-75-75 broadcast and incorporated prior to planting; 80-0-0 (21%) Feb 9

Plot Size: 4 x 25 ft

Emergence Date: Nov 10

Herbicides: None

Insecticides: None

Fungicides: Various fungicides, rates, and timing -- See Table 9.

Application Equipment: CO_2 backpack sprayer, 8002 tips, 20 gal/A

Application Dates: Mar 11, Apr 8

Harvest: May 18

Experimental Design: Randomized block design with four replications

Disease Ratings: Bacterial streak, scab and septoria leaf blotch, May 10 Rated on 0-9 scales where 0 = no disease and 9 = maximum disease possible.

Results: Table 1.

Comments: Septoria leaf blotch severity was moderate, scab was high on Florida 302. Coker 797 low yields were due to a late frost.

Table 1. Foliar fungicide control of Septoria leaf blotch on wheat. Rice Research Station, Crowley, LA. 1988.

Cultivar, treatment, and rate/A	Bacterial streak[1]	Scab[1]	Septoria leaf blotch[1]	Yield (lb/A)
Coker 797				
Unsprayed check	3.6		6.6	2022
Dithane M45 2 lb	4.0		5.0	2190
Dithane M45 2 lb + CS7 16 oz/100 gal	4.0		5.0	2200
Bayleton 50 Bayleton 4 oz	3.6		5.0	2193
Bayleton 50 WP 4 oz + CS7 16 oz/100 gal	4.0		4.3	2066
Bayleton M78 32 oz	3.6		4.3	2274
Bayleton M78 32 oz + CS7 16 oz/100 gal	4.0		3.3	2049
Tilt 3.6 EC 4 oz	3.6		3.3	2209
HWG1608 1.2 EC 12 oz	4.0		3.3	2223
HWG1608 1.2 EC 18 oz	3.6		4.0	2223
Manzate 200 0.4 gal	4.0		4.6	2224
Manzate 200 0.4 gal + CS7 16 oz/100 gal	4.0		5.3	2105
LSD (0 = 0.05)	0.7		0.9	194
Florida 302				
Control	5.0	4.3	4.0	3703
Dithane M45 2 lb	4.8	4.3	2.8	4027
Dithane M45 2 lb + CS7 16 oz/100 gal	4.8	3.8	2.5	4005
Bayleton 50 WP 4 oz	4.8	4.5	2.3	3912
Bayleton 50 WP 4 oz + CS7 16 oz/100 gal	4.8	4.0	2.8	3949
Bayleton M78 32 oz	4.3	4.0	2.0	3826
Bayleton M78 32 oz + CS7 16 oz/100 gal	4.5	4.0	1.5	3818
LSD (P = 0.05)	0.8	0.8	1.0	157

[1] Diseases rated on 0-9 scale where 0 = no disease and 9 = maximum disease possible.

GRAIN SORGHUM FUNGICIDE TRIAL - 1988

D. Groth, M. Frey, and J. Nugent

Location: Rice Research Station, Crowley, LA

Soil Type: Crowley silt loam

Variety/Seed Rate: DK-64, 8 lb/A

Planting Method/Date: Row planted, Apr 20, 1988

Fertilization: 40-80-40 (preplant) 80-0-0 May 20

Plot Size: 2 rows x 30 ft

Emergence Date: Apr 28

Herbicides: 3 pt/A Atrazine (preemerge)

Insecticides: None

Fungicides: Various fungicides and rates -- See Table 8.

Application Equipment: CO_2 backpack sprayer, 8002 tips, 20 gal/A

Application Date: (50% pollenation) July 20

Harvest: Sept 9

Experimental Design: Randomized block design with four replications

Disease Ratings: Head mold (0-9 scale) Aug 25

Results: Table 1.

Comments: Head mold severity was high, other diseases were low.

Table 1. Effects of foliar fungicides applied to grain sorghum heads on grain mold. Rice Research Station, Crowley, LA. 1988.

Treatment and rate[1]	Head mold[2]	Yield (lb/A)	Change from unsprayed check
Unsprayed control	6.3	3494	---
Pencycuron 75 WP .33 lb	5.5	3699	205
Tilt 3.6 EC 6 oz	5.0	3450	-44
Folatec 3.8 F 12 oz	5.3	4358	864
Flutalanil 50 WP .5 lb	5.3	3558	64
SN539865 25 WP 1 lb	5.3	3693	199
Rovral 50 WP 1 lb	4.0*	5299	1805
Benlate 50 DF 1 lb	4.8*	4064	570
Topsin-M 70 W 1 lb	5.3	4486	992
Dithane M45 1 lb	4.8*	4403	909
Folacur 1.2 EC 12 oz	4.5*	4653	1159
Ridomil 1.2 EC 12 oz	5.5	3629	135
LSD (P = 0.05)	1.4	960	

[1] Applied on July 30 at 50% pollination growth stage.
[2] Rated on 0-9 scale with 0 = no disease and 9 = head sterile.

CHEMICAL CONTROL OF BLAST IN LOUISIANA[1]

G. D. Lindberg and M. C. Rush

INTRODUCTION

Chemical control of rice blast is one part of a broader program of chemical control of foliar diseases of rice. Coordination of all chemical control studies in rice provides us with a better knowledge of the full capabilities of all of the materials that are used.

MATERIALS AND METHODS

The blast susceptible California rice variety M-201 was planted April 8, 1988. A randomized complete block design with five replicates was used for this test. The plots measured 4 ft x 20 ft with seven drill rows on a 7 inch spacing. All of the fertilizer was applied at the rate of 120-60-60 lb of total N, P, and K per acre. The chemicals were applied with a 2 nozzle (8002) boom at the rate of 20 gal/A and approximately 40 psi. Fourteen fungicide rates were used with an application at the booting stage (July 1) and one at the heading stage (July 2) (Table 1). Five samples of 20 panicles in each plot were counted and the percent rotten-neck determined based on the mean percentage of panicles infected. The center four rows were harvested (46.7 sq. ft.) with a small-plot combine (August 25, 1988).

RESULTS AND DISCUSSION

Blast development was light in 1988. The unsprayed check plots averaged 24 percent of panicles with rotten-neck blast (RNB) (Table 1). The Beam 75 WP treatments and Benlate 50 DF at 2 lb/A significantly reduced RNB.

Yields were not significantly increased with any fungicide treatment, although the Beam 75 WP treatment of 0.67 lb/A increased yield over the unsprayed plots by 777 lb/A of rough rice. The cultivar M-201 is a California cultivar that is susceptible to most of the races of *Pyricularia oryzae* Cav. that occur in the United States. The cultivar is poorly suited for growing in the South and normally yields lower than adapted cultivars.

[1]Mention of trade names of the fungicides or other chemicals described in this report are for identification purposes only and does not imply endorsement by Louisiana State University Agricultural Center.

Table 1. Effect of fungicidal spray applications on yield and control of neck blast of rice. Rice Research S. Crowley, LA. 1988.

Treatment	Timing	Rate (lb or pt/A) formulated)	Mean yield (lb/A)	Panicles with neck blast (%)
Unsprayed			3405	23.8
SN 539865 25WP	B,H	2.00 lb	3670	18.0
SN 539865 25WP	B,H	3.00 lb	3301	20.6
Prochloraz 40EZ	B,H	1.20 pt	3105	27.0
Roval 50WP and Benlate 50 DF	B H	1.00 lb 1.00 lb	3210	20.8
DPX-E965 (Delsene)	B,H	1.00 lb	3440	18.0
Benlate 50 DF	B,H	1.00 lb	3373	18.8
Benlate 40 DF	B,H	2.00 lb	3915	10.6*
Tilt 3.2EC and Benlate 50 DF	B H	0.63 pt 1.00 lb	3863	17.8
Mertect 340F	B,H	0.75 pt	3331	21.8
Mertect 340F	B,H	1.50 pt	3023	25.4
Mertect 340 F + ME-269	B,H	1.50 pt + 3.8 g/gal	3320	20.2
Beam 75WP	B,H	0.35 lb	3477	8.6*
Beam 75WP	B	0.67 lb	3744	9.4*
Beam 75WP	H	0.67 lb	4182	9.0*
Mertect 340F + ME-269	B,H	3.00 pt + 3.8 g/gal	3125	16.6
LSD 0.05			NS	8.5

* Significant at 0.05 level.

LR 86-20001 - A NEW SOURCE FOR SHEATH BLIGHT RESISTANCE

Xie, Q. J., M. C. Rush and J. Cao

INTRODUCTION

No commerical cultivars are highly resistant to sheath blight. The more resistant cultivars such as Tetep and Tadukan have poor agronomic characteristcs. Hence, it is very important to find sources of resistance with characteristics of the American long-grain cultivars.

LR86-20001, a somaclonal line regenerated from the sheath blight susceptable cultivar Labelle was first screened in the field in 1986. This somaclone was evaluated for sheath blight resistance and combining ability of agronomic characteristics in green house and field tests in subsequent years (3). The preliminary results were very promising.

MATERIALS AND METHODS

In 1987, forty single panicle lines of LR 86-20001, six panicle lines of 86-2002, a somaclone regenerated from Labelle, and four sets of the parent cultivar Labelle were planted in single five foot rows with 10-inch spacing between rows. The rows were inoculated with R. solani at the boot stage using 25 ml inoculum for each row.

In 1988, four lines 87-30005, 87-30008, 87-30033 and 87-30041, selected from the forty 86-20001 lines, the susceptible cultivars Labelle and Lemont, and the highly resistant variety Taducan were tested in the field for sheath blight resistance. The varieties and lines were planted in 25 square foot plots with six rows in each plot, a row spacing of ten inches and a row length of five feet. Fertilizer was applied at a rate of 600 lb/A 20-10-10 (N-$P_2O_5K_2O$) before flooding. A randomized complete block design with three replications was used. The plots were inoculated at the booting stage and disease ratings were made when the rice was mature. The 0-9 disease rating system was used (1, 2).

Crosses were made between several 86-20001 lines and Labelle or Lemont in 1987. The F_1 plants from these crosses were inoculated with R. solani in the green house. F_2 populations were grown in the field in 1988. Inoculation and evaluation for sheath blight resistance was carried out as previously described.

RESULTS AND DISCUSSION

Although all of the panicle lines of 85-20001 were much more resistant to sheath blight than the parent cultivar Labelle and the susceptable somaclone 86-20002, there were still some small differences in sheath blight resistance among the lines (Table 1). Two lines 87-30008 and 87-30033 were rated 0 in 1987, the 87-30005 line rated 3, and the 87-30041 line had a 4 rating in a preliminary rating. The lines received a similar rating at maturity in 1988 (Table 2). These lines were bulk harvested for further testing.

All the lines from LR 86-20001 tested in 1988 were more resistant to sheath blight than the parent cultivar Labelle. The degree of sheath blight resistance in different 86-20001 lines was in accordance with those rated in the previous year.

In 1987, several selections from LR 86-20001 were crossed with Labelle and Lemont. The disease resistance of the F_1 plants from these crosses were intermediate between 86-20001 and Labelle. The preliminary result of the F_2 segregation pattern indicated that the resistance of LR 86-20001 to sheath blight might be controlled by a single gene with susceptable being incompletely dominant. The agronomic characteristics of both F_1 plants and plants in the F_2 populations were acceptable. The possibility of selecting a Lemont type with LR 86-20001 resistance should be high.

LITERATURE CITED

1. Hoff, B. J., M. C. Rush, W. O. McIlrath, and Alan Morgan. 1976. 1976 Disease nurseries. Ann. Prog. Rpt., Rice Expt. Stn., La. Agri. Exp. Stn., L. S. U. Agricultural Center, 68:142-192.

2. Groth, D. E. and M. C. Rush. 1985. Rice disease assessment keys. Ann. Prog. Rpt., Rice Expt. Stn., L. S. U. Agricultural Center, 77:250-257.

3. Xie, Q. J., M. C. Rush, and J. Cao. 1987. Somaclonal variation for rice improvement. Ann. Prog. Rpt., Rice Expt. Stn., L. S. U. Agricultural Center, 79:237-241.

Table 1. The distribution of somaclone panicle rows for sheath blight resistance (1987)

Cultivar or	Disease rating (0-9 scale)									
somaclone	0	1	2	3	4	5	6	7	8	9
Labelle							1	1	2	
86-20001	9	14	7	8	1					
86-20002										6

Table 2. Comparison of sheath blight resistance among four selections from the somaclone LR 20001 and three cultivars. Rice Research Station, Crowley, 1988.

Line	1987[a/] Pre-rating	1988[a/] Disease rating	
	(0-9)	(0-9)	
87-30033	0	0.83	A
Taducan		1.00	A
87-30008	0	1.33	B
87-30041	4	4.33	C
87-30005	3	4.83	D
Lemont		8.67	E
Labelle	7.25	9.00	F
$LSD_{0.05}$ =		0.23	

[a/] Disease rating based on the 0 to 9 scale where
0 = no disease and 9 = plants dead at maturity.

FUNGICIDAL CONTROL OF RICE FOLIAR AND STEM DISEASES[1]

M. C. Rush, G. D. Lindberg, and D. E. Groth

INTRODUCTION

Field testing of foliar applications of fungicides for the control of disease caused by fungi was initiated in 1972. Theoretically, the fungal diseases occurring on rice in Louisiana can be controlled by foliar applications of fungicides. The diseases which are economically significant include blast (Pyricularia oryzae), brown spot (Biplaris oryzae), sheath blight (Rhizoctonia solani), stem rot (Sclerotium oryzae), narrow brown leaf spot (Cercospora oryzae), and leaf smut (Entyloma oryzae). These diseases are endemic in the Louisiana rice area becoming epidemic periodically. Certain of our presently grown commerical varieties are very susceptible to these diseases. Ultimately, control of these diseases will be by an integrated disease management system using a combination of pesticides, disease resistance, cultural practices, biological control, and legislative-regulatory procedures. It is important that effective fungicides are found, developed, and made available to Louisiana rice growers for use in disease management programs.

MATERIALS AND METHODS

A test was conducted at the Rice Research Station, Crowley, LA, during the 1988 season to screen fungicides for their efficacy in controlling foliar and stem diseases on Lemont rice. The tests were conducted on Crowley silt loam soil with a pH of 6.0. Plots were 20-ft, 7-row, drill strips with 7-inch row spacing and 14-inch alleys. Each treatment was replicated five times using a randomized complete block design. The plots in this test were inoculated with Rhizoctonia solani as previously described (2) and infections by the target fungi were from this inoculation or from natural sources of inoculum. Six hundred lb/A of 20-10-10 fertilizer was applied by a drill application to the test area at planting. Plots were planted April 27, and 4 lb/A of propanil was applied over the test area before applying the permanent flood. Fungicide applications were made at the green ring (June 22), early boot (July 8), and heading (July 25) stages of growth. Fungicides were applied in 20 gal/A of water with a backpack type CO_2 sprayer. The treatments were as indicated in Table 1.

Plots were rated for sheath blight, brown spot, narrow-brown spot, and leaf smut incidence 2 days before harvest. Rating systems for the foliar diseases (1) and for stem rot (2) were previously reported. The plots were harvested with a small-plot combine on August 31. Rough rice weights were corrected to 12% moisture.

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1 Mention of trade names of the fungicides or other chemicals described in this report are for identification purposes only and does not imply endorsement by Louisiana State University Agricultural Center.

RESULTS AND DISCUSSION

Thirteen of 46 fungicidal treatments gave significant yield increases in the foliar fungicide test (Table 1). Monceren 75WP at boot followed by Benlate 50DF at heading increased yield over unsprayed plots by 1443 lb/A of rough rice. Monceren 75WP applications at boot and heading increased yield by 1135 lb/A. Other fungicides giving significant yield increases included DPX-E965 50SF (1319 lb/A), Rovral 485C with Triton CS-7 at boot and head 1204 lb/A), Moncut 50WP at green ring and boot (988 lb/A), Mertect 340-F at boot and heading (981 lb/A), Rovral 50 WP and Triton CS-7 at boot and heading (1007 lb/A), and Benlate 50DF at boot and heading (879 lb/A). The fungicides Monceren 75WP, Moncut 50 WP, Tilt 3.6 EC at boot followed by Rovral 50 WP at heading, and Rovral formualtions were the most effective fungicides for reducing sheath blight severity (Table 1).

Several fungicidal treatments gave significant control of narrow brown spot, brown spot and leaf smut (Table 2). The treatments DPX-A9987 75WP, Benlate 50 DF + HM 8703, Monceren 75 WP + Folicur 1.2E, SAN 619F 100 SL + Triton CS-7, Tilt 3.6 EC at boot followed by Benlate 50DF at heading, and Rovral 50WP at green ring followed by Tilt 3.6 EC at boot gave significant control of all three diseases (Table 2).

The three disease rating systems were all significantly negatively correlated with yield. This suggests that any of the rating systems could accurately predict the effects of foliar fungicide treatments on yield.

LITERATURE CITED

1. Groth, D. E. and M. C. Rush. 1985. Rice disease assessment keys. Ann. Prog. Rpt., Rice Res. Sta., La. Agr. Expt. Sta., LSU Agricultural Center 77:250-257.

2. Hoff, B. J., M. C. Rush, W. O. McIlrath, and Alan Morgan. 1976. 1976 disease nurseries. Ann. Prog. Rept., Rice Res. Sta., La. Agr. Expt. Sta., Crowley, LA 68:142-192.

Table 1. Effects of foliar fungicides on sheath blight control and yield in 1988. Rice Research Station; Crowley, LA.

Treatment	Rate (formulated/A)	Timing	Yield (lb/A)	Change from unsprayed (lb/A)	Mean[a/] % tillers infected at maturity	Mean[a/] % tillers dead at maturity	Mean[a/] disease rating at maturity (0-9)
Uninoculated	--	--	5568*	791	19.8**	2.0**	2.8**
Inoculated-unsprayed	--	--	4777	--	84.8	64.0	8.4
Benlate 50DF	1 lb	B,H	5656*	879	58.6**	22.0**	5.5**
SN 539865 25WP + CS-7	1 lb + 9.5ml/gal	GR,B	4974	197	60.6**	35.0**	6.6*
SN 539865 25WP + CS-7	0.5 lb + 9.5ml/gal	GR,B	5446	669	60.0**	44.0*	6.8*
SN 84364 50WP (Moncut)	0.7 lb	GR,B	5765*	988	71.2	48.0	7.0
DPX-A9987 75WP	0.17 lb	GR,B	5003	226	74.0	50.0	7.0
DPX-A9987 75WP	0.33 lb	GR,B	5687*	910	68.0	35.0**	6.0**
DPX-U9482 75WP	0.17 lb	GR,B	4616	-161	84.0	61.0	8.2
DPX-U9482 75WP	0.33 lb	GR,B	5622*	845	73.8	33.0**	6.4*
DPX-E965 50SF (Delsene)	1 lb	GR,B	4895	118	85.2	57.0	8.0
DPX-E965 50SF (Delsene)	1 lb	B,H	6096**	1319	60.2**	24.0**	6.0**
Rovral 50WP and Benlate 50DF	1 lb 1 lb	B H	5549	772	62.8*	27.0**	6.0**
Tilt 3.6EC and Benlate 50DF	0.38 pt 1 lb	B H	5482	705	50.4**	17.0**	4.8**

Continued

Table 1. (Cont'd)

Treatment	Rate (formulated/A)	Timing	Yield (lb/A)	Change from unsprayed (lb/A)	Mean[a/] % tillers infected at maturity	Mean[a/] % tillers dead at maturity	Mean[a/] disease rating at maturity (0-9)
Benlate 50DF + HM 8703	1 lb + 1 pt	B,H	5651*	874	69.6	35.0**	6.8*
Benlate 50DF + HM 8703	1 lb + 2 pt	B,H	5666*	889	70.6	40.0*	7.2
Benlate 50DF + HM 8703	1 lb + 4 pt	B,H	4985	208	83.6	52.0	7.6
Benlate 50DF + Surfix	1 lb + 1 pt	B,H	5129	352	65.2*	20.0**	6.0**
Benlate 50DF + Penetrator	1 lb + 1 pt	B,H	5319	542	84.6	55.0	8.2
Monceren 75WP	0.33 lb	B,H	5912**	1135	8.6**	0.0**	1.8**
Monceren 75WP and Benlate 50DF	0.33 lb 1 lb	B H	6220**	1443	10.2**	5.0**	2.5**
Monceren 75WP + Folicur 1.2E	0.33 lb + 0.75 pt	B,H	5522	745	5.8**	0.0**	1.4**
Folicur 1.2E (HWG 1608)	0.75 pt	B,H	4845	68	71.2	40.0*	6.2**
SN84364 50WP	0.5 lb	B,H	5731*	954	42.6**	15.0**	4.4**
Tilt 3.6EC	0.38 pt	GR,B	4725	-52	82.4	59.0	8.0
Tilt 3.6EC	0.63 pt	B	4998	221	89.6	73.0	9.0
Tilt 3.6EC and Rovral 50WP	0.63 pt 1 lb	B H	5179	402	58.2**	10.0**	4.6**

Continued

Table 1. (Cont'd)

Treatment	Rate (formulated/A)	Timing	Yield (lb/A)	Change from unsprayed (lb/A)	Mean[a/] % tillers infected at maturity	Mean[a/] % tillers dead at maturity	Mean[a/] disease rating at maturity (0-9)
Tilt 3.6EC and Benlate 50DF	0.63 pt 1 lb	B H	5117	340	57.2**	16.0**	5.2**
Mertect 340-F	0.75 pt	B,H	5506	729	80.2	44.0*	7.4
Mertect 340-F	1.5 pt	B,H	5758*	981	56.6**	24.0**	5.6**
Mertect 340-F + ME-269	0.75 pt + 4 g/gal	B,H	5348	571	81.4	29.0**	7.0
Mertect 340-F + ME-269	1.5 pt + 4 g/gal	B,H	5165	388	63.8*	22.0**	5.4**
Rovral 48SC	1 pt	B,H	5447	670	54.6**	11.0**	4.4**
Rovral 23SC	2 pt	B,H	5055	278	49.2**	24.0**	6.2**
Rovral 50WP	1 lb	B,H	5411	634	58.4**	24.0**	5.8**
Tilt 3.6EC and Rovral 50WP	0.63 pt 1 lb	GR H	5107	330	48.6**	12.0**	4.0**
Rovral 50WP and Benlate 50DF	1 lb 1 lb	B H	5137	360	68.6	25.0**	6.0**
Rovral 50WP and Tilt 3.6EC	1 lb 0.38 pt	GR B	5236	459	76.0	39.0*	7.0
Rovral 50WP and CS-7	1 lb + 9.5ml/gal	B,H	5784*	1007	55.0**	18.0**	5.0**

Continued

Table 1: (Cont'd)

Treatment	Rate (formulated/A)	Timing	Yield (lb/A)	Change from unsprayed (lb/A)	Mean[a] % tillers infected at maturity	Mean[a] % tillers dead at maturity	Mean[a] disease rating at maturity (0-9)
Rovral 48SC + CS-7	1 lb + 9.5ml/gal	B,H	5981**	1204	56.4**	29.0**	5.4**
SAN 619F 100SL + CS-7	0.65 lb + 9.5ml/gal	GR,B	5033	256	80.4	55.0	8.0
San 619F 100SL + CS-7	1 lb + 9.5ml/gal	GR,B	5304	527	76.6	40.0*	7.8
PP523 0.5SC + CS-7	1 pt + 4.5ml/gal	GR,B	4693	-84	73.0	46.0	7.8
G 696 4F	0.5 pt	B,H	4659	-118	84.6	68.0	8.4
G 696 4F	1 pt	B,H	5311	534	88.2	49.0	8.2
G 696 4F	2 pt	B,H	5303	526	76.2	54.0	7.8
Rovral 50WP and Topsin M + Trinton B1956	1 lb 1 lb + 9.4ml/gal	B H	5282	505	91.8	59.0	8.6
LSD 0.01			1039		23.5	25.6	2.1
LSD 0.05			885		17.8	19.4	1.6

[a] Means marked with asterisks were significantly different at the 0.01 (**) or 0.05 (*) levels.

Table 2. Effects of foliar fungicides on control of narrow brown leaf spot, brown spot, and leaf smut. Rice Research Station, Crowley, LA.1988.

Treatment	Rate (formulated/A)	Timing	Mean[a] disease rating NBLS (*Cercospora oryzae*)	Mean[a] disease rating BS (*Bipolaris oryzae*)	Mean[a] disease rating LS (*Entyloma oryzae*)
Uninoculated	—	—	4.2	5.2	2.0**
Inoculated-unsprayed	—	—	5.0	5.8	4.0
Benlate 50DF	1 lb	B,H	2.2**	4.8	1.4**
SN 539865 25WP + CS-7	1 lb + 9.5 ml/gal	GR,B	3.2	3.4**	0.8**
SN 539865 25WP + CS-7	0.5 lb + 9.5 ml/gal	GR,B	3.4	3.0**	1.6**
SN 84364 50WP (Moncut)	0.7 lb	GR,B	4.6	3.8**	1.2**
DPX-A9987 75WP	0.17 lb	GR,B	2.6*	3.8**	0.2**
DPX-A9987 75WP	0.33 lb	GR,B	4.0	4.0*	1.0**
DPX-U9482 75WP	0.17 lb	GR,B	4.2	4.6	0.8**
DPX-U9482 75WP	0.33 lb	GR,B	3.6	2.8**	0.2**
DPX-E965 50SF (Delsene)	1 lb	GR,B	4.6	3.4**	0.4**
DPX-E965 50SF (Delsene)	1 lb	B,H	3.2	4.4*	0.8**

Continued

Table 2. (Cont'd)

Treatment	Rate (formulated/A)	Timing	Mean[a/] disease rating NBLS (*Cercospora oryzae*)	Mean[a/] disease rating BS (*Bipolaris oryzae*)	Mean[a/] disease rating LS (*Entyloma oryzae*)
Rovral 50WP and Benlate 50DF	1 lb 1 lb	B H	2.4**	5.2	1.2**
Tilt 3.6 EC and Benlate 50DF	0.38 pt 1 lb	B H	1.4**	4.2*	0.2**
Benlate 50DF + HM 8703	1 lb + 1 pt	B,H	3.0*	4.4*	1.0**
Benlate 50DF + HM 8703	1 lb + 2 pt	B,H	3.0*	4.2*	1.0**
Banlate 50DF + HM 8703	1 lb + 4 pt	B,H	3.0*	4.2*	0.4**
Benlate 50DF + Surfix	1 lb + 1 pt	B,H	3.6	4.2*	0.8**
Benlate 50DF + Penetrator	1 lb + 1 pt	B,H	3.4	4.2*	0.8**
Monceren 75WP	0.33 lb	B,H	5.0	5.2	2.8
Monceren 75WP and Benlate 50DF	0.33 lb 1 lb	B H	1.2**	5.0	1.0**
Monceren 75WP + Folicur 1.2E	0.33 lb + 0.75 pt	B,H	0.8**	3.6**	0.0**

Continued

Table 2. (Cont'd)

Treatment	Rate (formulated/A)	Timing	Mean[a/] disease rating NBLS (*Cercospora oryzae*) (0-9)	Mean[a/] disease rating BS (*Bipolaris oryzae*) (0-9)	Mean[a/] disease rating LS (*Entyloma oryzae*) (0-9)
Folicur 1.2E (HWG 1608)	0.75 pt	B,H	2.2**	4.2*	0.6**
SN 84364 50WP	0.5 lb	B,H	4.0	3.6**	0.6**
Tilt 3.6EC	0.38 pt	GR,B	3.4	4.6	1.0**
Tilt 3.6EC	0.63 pt	B	3.0*	3.4**	0.8**
Tilt 3.6EC and Rovral 50WP	0.63 pt 1 lb	B H	2.4**	2.8**	0.6**
Tilt 3.6EC and Benlate 50DF	0.63 pt 1 lb	B H	1.6**	3.8**	0.0**
Mertect 340-F	0.75 pt	B,H	4.0	3.6**	1.8**
Mertect 340-F	1.5 pt	B,H	4.2	3.2**	2.4
Mertect 340-F + ME-269	0.75 pt + 4 g/gal	B,H	4.6	4.2*	1.6**
Mertect 340-F + ME-269	1.5 pt + 4 g/gal	B,H	4.0	4.2*	1.4**
Rovral 48SC	1 pt	B,H	3.8	2.8**	2.0**

Continued

Table 2. (Cont'd)

Treatment	Rate (formulated/A)	Timing	Mean[a/] disease rating NBLS (*Cercospora oryzae*) (0-9)	Mean[a/] disease rating BS (*Bipolaris oryzae*) (0-9)	Mean[a/] disease rating LS (*Entyloma oryzae*) (0-9)
Rovral 23SC	2 pt	B,H	4.8	4.8	2.2*
Rovral 50WP	1 lb	B,H	4.0	3.6**	2.0**
Tilt 3.6EC and Rovral 50WP	0.63 pt 1 lb	GR H	3.8	3.2**	2.0**
Rovral 50WP and Benlate 50DF	1 lb 1 lb	B H	3.0*	4.8	1.4**
Rovral 50WP and Tilt 3.6EC	1 lb 0.38 pt	GR B	3.0*	3.6**	0.8**
Rovral 50WP + CS-7	1 lb + 9.5 ml/gal	B,H	4.6	2.8**	1.0**
Rovral 48SC + CS-7	1 lb + 9.5 ml/gal	B,H	4.2	3.4**	1.4**
SAN 619F 100SL + CS-7	0.65 lb + 9.5 ml/gal	GR,B	4.2	3.8**	0.4**
SAN 619F 100SL + CS-7	1 lb + 9.5 ml/gal	GR,B	1.8**	4.2*	0.2**

Continued

Table 2. (Cont'd)

Treatment	Rate (formulated/A)	Timing	Mean[a/] disease rating NBLS (*Cercospora oryzae*)	Mean[a/] disease rating BS (*Bipolaris oryzae*)	Mean[a/] disease rating LS (*Entyloma oryzae*)
PP 523 0.5SC + CS-7	1 pt + 4.5 ml/gal	GR,B	4.6	4.0*	0.6**
G 696 4F	0.5 pt	B,H	5.6	4.4*	1.0**
G 696 4F	1 pt	B,H	4.8	3.6**	0.0**
G 696 4F	2 pt	B,H	4.2	4.0*	0.8**
Rovral 50WP and Topsin M + Triton B1956	1 lb 1 lb + 9.4 ml/gal	B H	2.6*	4.0*	2.0**
LSD 0.01			2.5	1.9	2.0
LSD 0.05			1.9	1.4	1.5

[a/]Means marked with asterisks were significantly different at the 0.01 (**) or 0.05 (*) levels using the 0 to 9 rating scale.

CHEMICAL CONTROL OF RICE SEEDLING DISEASES - 1988[1]

M. C. Rush and Richard Dunand

INTRODUCTION

Seed-rot and damping-off diseases are common in the Southern rice area causing stand reduction and irregularities in water-planted and, to a lesser extent, drill-planted rice. Losses are incurred directly through the costs of replanting and indirectly through the inefficient use of space and light in irregular stands, and by increased competition with weeds. Rice seed germination and growth of seedlings is often poor under the weather conditions normally encountered in March and early April in the Southern rice area. Considerable damage to water-planted seed is encountered under these cool weather conditions regardless of the seed treatment fungicides used. The fungi causing seed rotting and water-mold in water-seeded rice included species of _Achlya, Pythium,_ and _Fusarium._ Drill-seeded rice can be injured by several seedborne fungi including _Helminthosporium oryzae. Curvularia lunata, Fusarium roseum,_ and _Fusarium moniliforme._

Theoretically, seed and seedling diseases of rice can be economically controlled by seed-treatment fungicides. For this reason, a program to develop more effective fungicidal seed treatments has been conducted at the LSU Rice Research Station since the early 1970's. Fungicides or formulation of fungicides are field screened in experimental tests each year. Those formulations performing well in the experimental tests are advanced to further field testing in subsequent years.

MATERIALS AND METHODS

A single lot of Lemont rice seed was treated in February and the first week in March 1988 with fungicides at the rates listed in Table 1. The formulated fungicides were placed into water (2 ml/0.25 lb seed) in glass jars, stirred with a magnetic stirrer bar until in suspension, and the suspended material was used to coat the inside of each jar. Weighed seed samples were poured into the coated jars, shaken by hand for 1 to 2 minutes, and placed onto a jar mill to revolve for 10 minutes. Treated seed were stored in heavy manila seed envelopes until planted.

Simulated water- and drill-seeded methods were used to plant treated seed at the Rice Research Station, Crowley, LA. Water-seeded tests consisted of 40 treatments with five replications of 200 presoaked seeds per plot. Seed were soaked in five volumnes of tap water for 24 to 30 hours before planting. Plots consisted of cylinders 1-ft high and 2-ft in diameter made of 1/8-inch mesh hardware cloth. After planting, each cylinder was covered with 1/2-inch mesh hardware cloth to keep our birds and rats. The cylinders were arranged in a completely randomized block design, 2-ft apart within blocks, with a 6-ft alley between blocks. The treated seeds were planted in 4 to 5 inches of water.

[1]Mention of trades names of the seed protectant fungicides described in this paper is for identification purposes only and does not imply endorsement by the Louisiana Agricultural Experiment Station, Louisiana State University Agriculture Center.

Two individually leveed plot areas were planted at each planting date using identical procedures. In one plot area, the water was removed after 3 days and the plots were flushed as needed. In the other plot area, the flood was maintained at 2 to 4 inches until 3 days before the stands were counted.

Drill-planted plots consisted of the same 40 treatments planted in single 10-ft rows with 200 seed per row. Plots were replicated five times in a randomized complete block design in each test. Rows were spaced 10 inches apart within blocks with 6-ft alleys between blocks. Seeds were planted with a drop-seeder.

In 1988, treatments with the growth regulator gibberellic acid (GA) were used either alone or in combination with the seed-protectant fungicides to see if seedling growth could be enhanced. This research was conducted based on data that suggested that GA could enhance emergence of semidwarf rice in drill-seeded plots (1).

RESULTS AND DISCUSSION

Twelve fungicide treatments gave significant stand increases in the drill-seeded experiment (Table 2). The Nusan 30 + Apron Fl and the Experimental AF treatment increased stands by more than 40 percent. Treatment with ABG-3067 did not improve stands either alone or with the seed-protectant fungicides. Treatment with 8 oz of ABG-3067 per hundredweight seed significantly decreased stand.

Nine fungicide treatments significantly increased stands in the water-seeded and drained experiment (Table 3). The Champion SD + Zinc Starter and the Nusan 30 + Apron Fl treatments increased stand by more than 20 percent. The ABG-3067 treatments alone or with fungicides did not increase stands in this test. The higher rates of ABG-3067 were significantly phytotoxic.

Eleven fungicide treatments significantly increased stands in the water-seeded, continuous flood test (Table 4). Seven treatments increased stand by 20 to 30 percent. The Nusan 30 + Apron Fl and the Experimental AF treatments were the most effective.

In the drill-seeded test the growth regulating compounds AC 94377 and ABG-3067 significantly increased plant height (Table 5).

In the water-seeded, drained test the fungicide treatments Vitavax 200 Fl and Ridomil 2E (12 oz/cwt) significantly increased seedling height (Table 6). ABG-3067 only gave a significant height increase at the highest (8 oz/cwt) rate. The Experimental AF fungicide significantly reduced seedling height although it gave a stand increase.

In the water-seeded, continuous flood test the Dithane F-45 and Experimental AF fungicide treatments significantly decreased seedling height even through they gave increased stands. Only the highest rate of ABG-3067 gave a significant increase in seedling height (Table 7).

In general it appeared that increases in seedling height produced by the GA compounds did not result in stand increases. In the water-seeded tests and across all tests there was a significant negative correlation between height and stand (Table 8).

LITERATURE CITED

1. Dunand, R., R. Dilly, Jr., and G. Meche. 1987. Plant growth regulator research in rice: gibberellin - enhanced emergence in rice. Ann. Prog. Rpt., Rice Res. Sta., La. Agri. Expt. Sta., LSU Agricultural Center 79:145-147.

Table 8. Correlation coefficient between height and stand in the 1988 seed-protectant fungicide and growth regulators on stands in drill-seeded rice, in water-seeded, drained drained rice, and in continuously flooded rice at the Rice Research Station, Crowley, LA.

	Height			
	drained	drilled	continuous flood	overall
Number of seedlings	-0.38*[a/]	-0.29	-0.41**[a/]	-0.51**[a/]

[a/] Mean number of plants from 200 seeds per plot. Means followed by asterisks were significantly different from the mean for untreated seeds at the 0.01 (**) or 0.05 (*) level.

Table 1. Experimental fungicides used in the 1988 experimental seed-protectant fungicide tests at the Rice Research Station, Crowley, LA.

Fungicide or combination	Rate (Oz or fl oz/cwt formulated)	Manufacturer or supplier
San 619 25WP	0.2	Sandoz Crop Protection
San 619 25WP	0.25	Sandoz Crop Protection
San 619 25WP	0.4	Sandoz Crop Protection
NTN 19701 75WP	3.2	Mobay Corporation Agricultural Chemical Division
Nusan 30 + Apron EC	1 + 0.75	Wilbur-Ellis Chemical Company + Gustafson, Incorporated
Nusan 30 + Apron EC	1.25 + 0.75	Wilbur-Ellis Chemical Company + Gustafson, Incorporated
Gus FA 12 + Gus FM 12	0.125 + 0.25	Gustafson, Incorporated
Gus FA 22 + Gus FM 12	0.16 + 0.25	Gustafson, Incorporated
Vitavax 200 Fl	4	Gustafson, Incorporated
Dithane F-45	4	Rohm and Haas Company
Champion SD	4	Agtrol Chemical Products
Zinc Starter	6	Agtrol Chemical Products
Champion SD + Zinc Starter	4 + 6	Agtrol Chemical Products
Expt. NF	4	Agtrol Chemical Products
Expt. NF	6	Agtrol Chemical Products

Continued

Table 1. (Cont'd)

Fungicide or combination	Rate (Oz or fl oz/cwt formulated)	Manufacturer or supplier
AC 94377 (PGR Composition)	10	American Cyanamid Company
AC 94377 (PGR Composition)	12	American Cyanamid Company
Expt. AF	5	Agtrol Chemical Products
Ridomil 2E	4	Ciba-Geigy Corporation
Ridomil 2E	8	Ciba-Geigy Corporation
Ridomil 2E	12	Ciba-Geigy Corporation
Ridomil 2E	2	Ciba-Geigy Corporation
ABG-3067 (PGR Composition,4% GA)	0.5	Abbott Laboratories
ABG-3067	1	Abbott Laboratories
ABG-3067	1.5	Abbott Laboratories
ABG-3067	2	Abbott Laboratories
ABG-3067	3	Abbott Laboratories
ABG-3067	4	Abbott Laboratories
ABG-3067	5	Abbott Laboratories
ABG-3067	8	Abbott Laboratories
NTN 19701 75WP + Ridomil 2E	3.2 + 2	Mobay Corporation Agricultural Chemical Division + Ciba-Geigy Corporation

Continued

Table 1. (Cont'd)

Fungicide or combination	Rate (Oz or fl oz/cwt formulated)	Manufacturer or supplier
NTN 19701 75WP + ABG-3067	3.2 + 2	Mobay Corporation + Abbott
Vitavax 200 Fl + ABG-3067	4 + 2	Gustafson, Incorporated + Abbott
Vitavax 200 Fl + ABG-3067	4 + 1	Gustafson, Incorporated + Abbott
Vitavax 200 Fl + ABG-3067	4 + 4	Gustafson, Incorporated + Abbott
Dithane F-45 + ABG-3067	8.4 + 1	Rohm and Haas Company + Abbott
Dithane F-45 + ABG-3067	8.4 + 2	Rohm and Haas Company + Abbott
Champion SD + ABG-3067	4 + 1	Agtrol Chemical Products + Abbott
Champion SD + Zinc Starter + ABG-3067	4 + 6 + 1	Agtrol Chemical Products + Abbott

Table 2. (Cont'd)

Treatment	Rate (Oz or fl oz/cwt formulated)	Rep (Stand counts) I	II	III	IV	V	Mean[a]	Change from control (%)	Stand (%)
Expt. NF	6	101	117	124	126	88	111.2**	42.2	55.6
AC 94377	10	73	97	79	94	86	85.8	9.7	42.9
AC 94377	12	79	78	86	90	84	83.4	6.6	41.7
Expt. AF	5	107	128	114	103	125	115.4**	47.6	57.7
Ridomil 2E	4	95	96	100	100	79	94.0*	20.2	47.0
Ridomil 2E	8	104	108	89	91	77	93.8*	19.9	46.9
Ridomil 2E	12	84	93	79	87	94	87.4	11.8	43.7
Ridomil 2E	2	103	119	99	110	80	102.2*	30.7	51.1
ABG-3067	0.5	73	81	108	92	89	88.6	13.3	44.3
ABG-3067	1	73	94	96	102	91	91.2	16.6	45.6
ABG-3067	1.5	72	120	89	90	88	91.8	17.4	45.9
ABG-3067	2	78	107	78	68	63	78.8	0.8	39.4
ABG-3067	3	60	100	77	73	85	79.0	1	39.5
ABG-3067	4	59	81	71	87	62	72.0	-7.9	36.0
ABG-3067	5	82	92	102	98	84	91.6	17.1	45.8
ABG-3067	8	40	68	62	70	66	61.2*(-)	-21.7	30.6

Continued

Table 2. (Cont.)

Treatment	Rate (Oz or fl oz/cwt formulated)	Rep (Stand counts) I	II	III	IV	V	Mean[a]	Change from control (%)	Stand (%)
NTN19701 75WP + RIDOMIL 2E	3.2 + 2	110	86	80	90	86	90.4	15.6	45.2
NTN19701 75WP + ABG-3067	3.2 + 2	79	93	84	72	77	81.0	3.6	40.5
Vitavax 200Fl + ABG-3067	4 + 2	86	106	92	78	86	89.6	14.6	44.8
Vitavax 200Fl + ABG-3067	4 + 1	97	94	85	93	66	87.0	11.2	43.5
Vitavax 200Fl + ABG-3067	4 + 4	95	84	73	86	115	90.6	15.8	45.3
Dithane F-45 + ABG-3067	8.4 + 1	79	98	104	106	109	99.2**	26.8	49.6
Dithane F-45 + ABG-3067	8.4 + 2	80	76	73	91	88	81.6	4.3	40.8
Champion SD + ABG-3067	4 + 1	86	94	58	94	92	84.8	8.4	42.4
Champion SD + Zinc Starter + ABG-3067	4 + 6 + 1	92	107	87	102	92	96.0*	22.8	48.0
LSD 0.05							13.7		
LSD 0.01							18.1		

[a]Mean number of plants from 200 seeds per plot. Means followed by asterisks were significantly different from the mean for untreated seeds at the 0.01 (**) or 0.05 (*) level.

Table 3. Effect of seed-protectant fungicides, and growth regulators on stand in water-seeded, drained rice (Water-seeded on April 19, drained in 3 days, and flushed as needed, stand counts on May 24, 1988), Rice Research Station, Crowley, LA.

Treatment	Rate (Oz or fl oz/cwt formulated)	Rep (Stand counts) I	II	III	IV	V	Mean[a/]	Change from control (%)	Stand (%)
Untreated Lemont		106	111	103	130	105	111	0	55.0
San 619 25WP	0.2	99	122	109	128	107	113	1.8	56.5
San 619 25WP	0.25	115	115	119	111	97	111.4	0.4	55.7
San 619 25WP	0.4	109	119	119	133	124	120.8	8.8	60.4
NTN 19701 75WP	3.2	103	118	120	85	107	106.6	-4.0	63.3
Nusan 30 + Apron Fl	1 + 0.75	126	146	139	147	126	136.8**	23.2	68.4
Nusan 30 + Apron Fl	1.25 + 0.75	121	148	119	142	113	128.6**	15.8	64.3
Gus FA 12 + Gus FM 12	0.125 + 0.25	109	138	139	149	122	131.4**	18.4	65.7
Gus FA 22 + Gus FM 12	0.16 + 0.25	104	131	94	138	124	118.2	6.5	59.1
Vitavax 200 Fl	4	93	127	118	133	124	119.0	7.2	59.5
Dithane F-45	4	96	126	107	139	96	112.8	1.6	56.4
Champion SD	4	116	138	117	141	134	129.2**	16.4	64.6
Zinc Starter	6	97	110	98	123	102	106.0	-4.5	53.0
Champion SD + Zinc Starter	4 + 6	120	148	151	154	130	140.6**	26.7	70.3
Expt. NF	4	109	125	126	135	124	123.8*	11.5	61.9

Continued

Table 3. (Cont'd)

Treatment	Rate (Oz or fl oz/cwt formulated)	Rep (Stand counts)					Mean[a]	Change from control (%)	Stand (%)
		I	II	III	IV	V			
Expt. NF	6	99	136	133	138	138	128.8**	16.0	64.4
AC 94377	10	96	100	102	97	107	100.4	-9.5	50.2
AC 94377	12	104	108	105	113	104	106.8	-3.8	53.4
Expt. AF	5	128	163	137	150	113	138.2**	24.5	69.1
Ridomil 2E	4	122	115	120	130	94	116.2	4.7	58.1
Ridomil 2E	8	97	132	122	132	115	119.6	7.7	59.8
Ridomil 2E	12	102	126	110	124	82	108.8	-2.0	54.4
Ridomil 2E	2	129	123	124	127	120	124.6*	12.2	62.3
ABG-3067	0.5	118	138	111	120	112	119.8	7.9	59.9
ABG-3067	1	101	122	113	115	86	107.4	-3.2	53.7
ABG-3067	1.5	98	103	116	109	79	101.0	-9.0	50.5
ABG-3067	2	85	105	104	115	102	102.2	-7.9	51.1
ABG-3067	3	91	111	112	98	84	99.2	-10.6	49.6
ABG-3067	4	107	94	96	92	82	94.2**(-)	-15.1	47.1
ABG-3067	5	89	123	94	127	108	108.2	-2.5	54.1
ABG-3067	8	84	85	87	124	82	92.4**(-)	-16.8	46.2

Continued

Table 3. (Cont'd)

Treatment	Rate (Oz or fl oz/cwt formulated)	Rep (Stand counts) I	II	III	IV	V	Mean[a/]	Change from control (%)	Stand (%)
NTN19701 75WP + Ridomil 2E	3.2 + 2	107	103	113	111	112	109.2	-1.6	54.6
NTN19701 75WP + ABG-3067	3.2 + 2	102	97	105	104	91	99.8	-10.1	49.9
Vitavax 200 Fl + ABG-3067	4 + 2	92	88	99	120	81	96.0*(-)	-13.5	48.0
Vitavax 200 Fl + ABG-3067	4 + 1	99	117	100	113	88	103.4	-6.8	51.7
Vitavax 200 Fl + ABG-3067	4 + 4	99	106	106	112	76	99.8	-10.1	49.9
Dithane F-45 + ABG-3067	4.4 + 1	89	124	102	116	82	102.6	-7.6	51.3
Dithane F-45 + ABG-3067	4.4 + 2	89	120	99	115	86	101.8	-8.3	50.9
Champion SD + ABG-3067	4 + 1	102	113	119	133	120	117.4	5.8	58.7
Champion SD + Zincs Starter + ABG-3067	4 + 6 + 1	112	102	129	136	122	120.2	8.3	60.1
LSD 0.05							12.68		
LSD 0.01							16.74		

a/Mean number of plants from 200 seeds per plot. Means followed by asterisks were significantly different from the mean for untreated seeds at the 0.01 (**) or 0.05 (*) level.

Table 4. Effect of seed-protectant fungicides, and growth regulators on stand in water-seeded, continuous flood rice (water-seeded on April 19, stand counts on May 24, 1988), Rice Research Station, Crowley, LA.

Treatment	Rate (Oz or fl oz/cwt formulated)	Rep (Stand counts) I	II	III	IV	V	Mean[a/]	Change from control (%)	Stand (%)
Untreated Lemont		70	102	81	78	75	81.2	0	40.6
San 619 25WP	0.2	75	92	94	80	78	83.8	3.2	41.9
San 619 25WP	0.25	83	99	74	83	91	86.0	5.9	43.0
San 619 25WP	0.4	78	91	72	75	93	81.8	0.7	40.9
NTN 19701 75WP	3.2	64	99	87	89	87	85.2	4.9	42.6
Nusan 30 + Apron Fl	1 + 0.75	86	97	81	89	93	89.2	9.8	44.6
Nusan 30 + Apron Fl	1.25 + 0.75	104	121	102	107	86	104.0**	28.1	52.0
Gus FA 12 + Gus FM 12	0.125 + 0.25	82	116	95	102	100	99.0*	21.9	49.5
Gus FA 22 + Gus FM 12	0.16 + 0.25	71	92	83	94	73	82.6	1.7	41.3
Vitavax 200 FL	4	96	101	93	90	104	96.8**	19.2	48.4
Dithane F-45	4	77	119	85	85	80	89.2	9.8	44.6
Champsion SD	4	84	102	98	114	100	99.6**	22.7	49.8
Zinc Starter	6	79	98	133	82	96	97.6**	16.8	48.8
Champion SD + Zinc Starter	4 + 6	82	111	103	110	90	99.2**	22.2	49.6
Expt. NF	4	65	97	92	95	97	89.2	9.8	44.6
Expt. NF	6	78	120	92	93	107	98.0**	20.7	49.0

Continued

Table 4. (Cont'd)

Treatment	Rate (Oz or fl oz/cwt formulated)	Rep (Stand counts) I	II	III	IV	V	Mean[a/]	Change from control (%)	Stand (%)
AC 94377	10	81	93	71	80	89	82.8	1.9	41.4
AC 94377	12	74	83	70	97	78	80.4	-1.0	40.2
Expt. AF	5	94	139	103	132	100	113.6**	39.9	56.8
Ridomil 2E	4	101	106	98	107	90	100.4**	23.6	50.2
Ridomil 2E	8	88	112	83	105	97	97.0**	19.4	48.5
Ridomil 2E	12	84	89	78	115	93	91.8	13.0	45.9
Ridomil 2E	2	81	106	81	90	95	90.6	11.6	45.3
ABG-3067	0.5	86	107	80	89	108	94.0*	13.6	47.0
ABG-3067	1	69	94	63	98	88	82.4	1.5	41.2
ABG-3067	1.5	70	93	78	94	70	81.0	-0.2	40.5
ABG-3067	2	64	84	72	101	63	76.8	-5.4	38.4
ABG-3067	3	83	96	78	89	85	86.2	6.2	43.1
ABG-3067	4	77	79	67	85	69	75.4	-7.1	37.7
ABG-3067	5	78	93	70	93	83	83.4	2.7	41.7
ABG-3067	8	59	87	74	69	75	72.8	-10.3	36.4
NTN19701 75WP + Ridomil 2E	3.2 + 2	83	106	94	93	102	95.6*	17.7	47.8

Continued

Table 4. (Cont'd)

Treatment	Rate (Oz or fl oz/cwt formulated)	Rep (Stand counts)					Mean[a]	Change from control (%)	Stand (%)
		I	II	III	IV	V			
NTN19701 75WP + ABG-3067	3.2 + 2	76	90	76	90	84	83.2	2.5	41.6
Vitavax 200 Fl + ABG-3067	4 + 2	64	99	77	68	68	75.2	-7.4	37.6
Vitavax 200 Fl + ABG-3067	4 + 1	85	81	73	99	84	84.4	3.9	42.2
Vitavax 200 Fl + ABG-3067	4 + 4	78	87	99	95	72	86.2	6.2	43.1
Dithane F-45 + ABG-3067	8.4 + 1	78	108	87	89	70	86.4	6.4	43.2
Dithane F-45 + ABG-3067	8.4 + 2	65	87	59	69	75	71.0	-12.5	35.5
Champion SD + ABG-3067	4 + 1	82	119	97	114	109	104.2**	28.3	52.1
Champion SD + Zinc Starter + ABG-3067	4 + 6 + 1	76	110	87	88	92	90.6	11.6	45.3
LSD 0.05							11.5		
LSD 0.01							15.2		

[a]Mean number and plants from 200 seeds per plot. Means followed by asterisks were significantly different from the mean for untreated seeds at the 0.01 (**) or 0.05 (*) level.

Table 5. Effect of seed-protectant fungicides, and growth regulators on height of water-seeded rice (Drill-seeded on April 19, height measured on May 24, 1988). Rice Research Station, Crowley, La.

Treatment	Rate (Oz or fl oz/cwt formulated)	Rep (Height)					Mean[a/]	Change from control (%)
		I	II	III	IV	V		
Untreated Lemont		5.32	5.62	6.20	5.12	4.55	5.36	0
San 619 25WP	0.2	4.90	5.18	4.85	5.35	5.58	5.17	-3.5
San 619 25WP	0.25	5.30	5.48	4.20	5.68	5.35	5.20	-3.0
San 619 25WP	0.4	5.35	5.95	5.28	5.28	5.60	5.49	2.4
NTN19701 75WP	3.2	5.55	6.22	4.48	5.30	4.48	5.20	-3.0
Nusan 30 + Apron Fl	1 + 0.75	5.80	6.40	5.20	6.45	5.10	5.79	8.0
Nusan 30 + Apron Fl	1.25 + 0.75	5.78	5.00	5.10	5.70	4.05	5.12	-4.5
Gus FA 12 + Gus FM 12	0.125 + 0.25	6.68	5.58	5.65	6.18	4.70	5.76	7.5
Gus FA 22 + Gus FM 12	0.16 + 0.25	4.90	6.05	5.08	5.68	5.62	5.46	1.9
Vitavax 200 Fl	4	5.82	5.68	5.28	5.18	4.90	5.37	0.2
Dithane F-45	4	5.70	5.55	4.62	5.52	6.10	5.50	2.6
Champion SD	4	5.45	5.12	5.15	4.40	5.30	5.08	-5.2
Zinc Starter	6	5.28	5.80	5.88	5.75	4.82	5.50	2.6
Champion SD + Zinc Starter	4 + 6	5.02	5.30	6.35	4.92	4.75	5.27	-1.7
Expt. NF	4	5.52	5.82	3.45	6.18	5.15	5.22	-2.6
Expt. NF	6	5.32	6.38	5.55	6.22	4.85	5.66	5.6

Continued

Table 5. (Cont'd)

Treatment	Rate (Oz or fl oz/cwt formulated)	Rep (Height)					Mean[a]	Change from control (%)
		I	II	III	IV	V		
NTN 19701 75WP + ABG-3067	3.2 + 2	6.38	4.62	5.00	5.98	6.10	5.62	4.8
Vitavax 200 Fl + ABG-3067	4 + 2	6.35	5.58	5.52	5.75	5.70	5.78	7.8
Vitavax 200 Fl + ABG-3067	4 + 1	6.38	5.92	5.48	5.58	5.55	5.78	7.8
Vitavax 200 Fl + ABG-3067	4 + 4	6.10	6.30	5.65	5.82	5.88	5.95*	11.0
Dithane F-45 + ABG-3067	4.4 + 1	6.18	5.55	5.85	6.45	5.75	5.96*	11.2
Dithane F-45 + ABG-3067	4.4 + 2	6.00	5.82	5.55	6.00	6.18	5.91	10.3
Champion SD + ABG-3067	4 + 1	5.50	5.08	5.52	4.68	4.05	4.96	-7.5
Champion SD + Zinc Starter + ABG-3067	4 + 6 + 1	6.10	5.38	4.72	5.52	5.35	5.42	1.1
LSD 0.05							0.57	
LSD 0.01							0.74	

[a] Mean number of plants from 200 seeds per plot. Means follow by asterisks were significantly different from the mean for untreated seeds at the 0.01 (**) or 0.05 (*) level.

Table 6. Effect of seed-protectant fungicides, and growth regulators on height of water-seeded, drained rice (water-seeded on April 19, drained in 3 days, and flushed as needed, 1988), Rice Research Station, Crowley, LA.

Treatment	Rate (Oz or fl oz/cwt formulated)	Rep (Height) I	II	III	IV	V	Mean[a]	Change from control (%)
Untreated Lemont		5.75	6.75	6.38	5.85	5.35	6.02	0
San 619 25WP	0.2	5.45	6.12	5.35	5.28	5.45	5.53*	-8.1
San 619 25WP	0.25	7.42	6.12	5.38	5.65	4.90	5.90	-2.0
San 619 25WP	0.4	6.02	6.80	6.75	5.85	6.28	6.34	5.3
NTN19701 75WP	3.2	7.25	4.98	7.20	4.65	7.32	6.28	4.3
Nusan 30 + Apron Fl	1 + 0.75	7.68	4.80	4.70	5.98	5.48	5.72	-5.0
Nusan 30 + Apron Fl	1.25 + 0.75	7.42	5.50	6.00	5.60	5.10	5.92	-1.7
Gus FA 12 + Gus FM 12	0.125 + 0.25	8.15	5.70	5.82	4.90	6.02	6.12	1.7
Gus FA 22 + Gus FM 12	0.16 + 0.25	6.28	6.70	6.68	5.10	5.65	6.08	-1.0
Vitavax 200 Fl	4	8.12	6.02	7.72	6.68	6.80	7.07**	17.4
Dithane F-45	4	7.22	4.22	5.85	5.60	6.12	5.80	-3.6
Champion SD	4	7.12	5.85	5.78	6.25	5.60	6.12	1.7
Zinc Starter	6	7.05	6.38	5.70	5.40	7.08	6.32	5.0
Champion SD + Zinc Starter	4 + 6	7.50	5.82	5.20	5.38	3.92	5.56	-7.6

Continued

Table 6. (Cont'd)

Treatment	Rate (Oz or fl oz/cwt formulated)	Rep (Height)					Mean[a/]	Change from control (%)
		I	II	III	IV	V		
Expt. NF	4	6.35	5.90	6.35	5.95	6.48	6.20	3.0
Expt. NF	6	6.78	5.45	5.68	5.60	6.18	5.94	-1.3
AC 94377	10	6.42	6.92	5.65	6.30	6.68	6.40	6.3
AC 94377	12	7.20	6.08	6.28	6.12	5.72	6.28	4.3
Expt. AF	5	6.28	4.92	6.72	4.70	4.90	5.50*(-)	-8.6
Ridomil 2E	4	7.15	6.15	6.32	6.12	6.68	6.48	7.6
Ridomil 2E	8	6.42	6.05	6.40	5.85	5.40	6.02	0
Ridomil 2E	12	7.75	7.42	7.30	7.48	6.80	7.35**	22.1
Ridomil 2E	2	6.58	6.68	6.10	6.18	5.52	6.21	3.2
ABG-3067	0.5	7.22	5.80	6.00	5.60	5.45	6.02	0
ABG-3067	1	7.05	5.78	6.68	5.05	5.25	5.96	-1
ABG-3067	1.5	5.88	6.80	5.95	5.55	5.32	5.90	-2
ABG-3067	2	-	5.82	6.35	5.78	5.55	5.88	-2.3
ABG-3067	3	6.05	5.20	6.08	5.98	5.20	5.70	-5.3
ABG-3067	4	7.22	6.52	6.48	6.10	5.82	6.43	6.8
ABG-3067	5	6.92	6.25	6.10	6.28	6.85	6.48	7.6
ABG-3067	8	7.15	8.22	6.38	6.50	5.98	6.84**	13.6

Continued

Table 6. (Cont'd)

Treatment	Rate (Oz or fl oz/cwt formulated)	Rep (Height)					Mean[a]	Change from control (%)
		I	II	III	IV	V		
NTN19701 75WP + Ridomil 2E	3.2 + 2	6.90	5.30	5.90	6.30	6.80	6.24	3.6
NTN19701 75WP + ABG-3067	3.2 + 2	6.12	5.75	6.12	5.58	6.12	5.94	-1.3
Vitavax 200 Fl + ABG-3067	4 + 2	6.52	5.80	6.72	6.40	6.08	6.30	4.6
Vitavax 200 Fl + ABG-3067	4 + 1	5.82	6.80	6.02	6.00	5.72	6.08	1
Vitavax 200 Fl + ABG-3067	4 + 4	7.28	7.20	5.72	4.85	6.28	6.26	4.0
Dithane F-45 + ABG-3067	8.4 + 1	6.65	6.50	6.48	6.02	6.35	6.40	6.3
Dithane F-45 + ABG-3067	8.4 + 2	6.55	6.22	6.92	5.82	6.00	6.30	4.6
Champion SD + ABG-3067	4 + 1	5.92	5.90	6.40	6.00	6.02	6.05	0.5
Champion SD + Zinc Starter + ABG-3067	4 + 6 + 1	5.65	6.22	5.35	5.75	4.92	5.58	-7.3
LSD 0.05							0.49	
LSD 0.01							0.64	

[a]Mean number of plants from 200 seeds per plot. Means followed by asterisks were significantly different from the mean for untreated seeds at the 0.01 (**) or 0.05 (*) level.

Table 7. Effect of seed-protectant fungicides, and growth regulators on height on water-seeded, continuous flood rice (water-seeded on April 19, continuous flood, 1988), Rice Research Station, Crowley, LA.

	Rate (Oz or fl oz/cwt formulated)	Rep (Height)					Mean[a/]	Change from control (%)
		I	II	III	IV	V		
Untreated Lemont		9.25	8.82	8.85	9.75	8.48	9.03	0
San 619 25WP	0.2	9.78	9.25	8.62	9.00	8.62	9.06	0.3
San 619 25WP	0.25	9.55	8.32	8.62	9.32	8.68	8.90	-1.4
San 619 25WP	0.4	9.40	9.10	9.38	9.35	8.80	9.20	1.9
NTN19701 75WP	3.2	9.70	7.85	8.75	9.42	9.00	8.94	-1.0
Nusan 30 + Apron F1	1 + 0.75	9.18	8.80	9.52	9.05	8.90	9.09	-0.7
Nusan 30 + Apron F1	1.25 + 0.75	9.45	8.30	9.07	8.92	8.45	8.84	-2.1
Gus FA 12 + Gus FM12	0.125 + 0.25	8.40	8.45	9.32	9.10	8.70	8.80	-2.5
Gus FA 22 + Gus FM12	0.16 + 0.25	8.98	9.18	8.58	9.00	9.05	8.96	-0.8
Vitavax 200 F1	4	8.22	9.21	9.15	9.35	9.45	9.08	-0.6
Dithane F-45	4	8.20	8.40	8.62	9.00	8.35	8.52*(-)	-5.6
Champion SD	4	8.38	8.82	8.85	9.00	8.62	8.74	-3.2
Zinc Starter	6	7.58	8.60	9.25	9.68	9.02	8.82	-2.3
Champion SD + Zinc Starter	4 + 6	9.18	8.82	8.95	9.25	8.40	8.92	-1.2
Expt. NF	4	9.15	8.65	8.85	9.52	8.82	9.00	-0.3

Continued

Table 7. (Cont'd)

Treatment	Rate (Oz or fl oz/cwt formulated)	Rep (Height)					Mean[a]	Change from control (%)
		I	II	III	IV	V		
Expt. NF	6	8.92	8.00	8.90	9.45	9.62	8.98	-0.6
AC 94377	10	9.62	8.18	9.52	9.60	9.22	9.23	2.2
AC 94377	12	9.30	9.18	9.45	9.08	9.25	9.25	2.4
Expt. AF	5	8.50	8.78	8.35	8.75	8.75	8.62*(-)	-4.5
Ridomil 2E	4	9.15	7.82	9.18	9.00	9.35	8.90	-1.4
Ridomil 2E	8	9.22	8.92	9.20	9.35	8.98	9.14	1.2
Ridomil 2E	12	9.12	9.55	9.10	9.20	9.22	9.24	2.3
Ridomil 2E	2	8.90	9.70	8.75	9.50	9.00	9.17	1.6
AGB-3067	0.5	8.72	8.10	9.6	9.32	8.92	8.94	-1.0
AGB-3067	1	8.88	8.50	8.72	9.20	8.78	8.82	-2.3
AGB-3067	1.5	9.42	8.80	9.32	9.58	9.12	9.25	2.4
AGB-3067	2	8.82	9.12	9.30	9.10	9.25	9.12	-1.0
AGB-3067	3	9.08	8.80	8.88	8.90	9.15	8.96	-0.8
AGB-3067	4	8.98	8.65	8.55	8.80	9.68	8.93	-1.1
AGB-3067	5	8.78	8.90	9.45	9.30	8.48	8.98	-0.6
AGB-3067	8	9.25	9.00	9.62	9.92	9.08	9.38*	3.9
NTN19701 75WP + Ridomil 2E	3.2 + 2	9.22	8.18	8.62	9.82	9.00	8.97	-0.7

Continued

Table 7. (Cont'd)

Treatment	Rate (Oz or fl oz/cwt formulated)	Rep (Height)					Mean[a]	Change from Control (%)
		I	II	III	IV	V		
NTN19701 75WP + AGB-3067	3.2 + 2	9.82	8.12	8.70	9.25	9.32	9.04	-4.8
Vitavax 200 Fl + AGB-3067	4 + 2	9.10	8.45	8.02	9.22	8.22	8.60*(-)	-4.8
Vitavax 200 Fl + AGB-3067	4 + 1	9.25	8.85	9.20	9.52	9.12	9.19	1.8
Vitavax 200 Fl + AGB-3067	4 + 4	9.65	8.82	9.50	9.52	9.52	9.40*	4.1
Dithane F-45 + AGB-3067	8.4 + 1	9.05	8.88	9.32	8.58	8.62	8.89	-1.6
Dithane F-45 + AGB-3067	8.4 + 2	9.10	8.55	9.08	9.45	9.00	9.04	-0.1
Champion SD + AGB-3067	4 + 1	8.95	8.75	9.08	8.38	8.95	8.82	-2.3
Champion SD + Zinc Starter + AGB-3067	4 + 6 + 1	9.32	8.55	9.22	9.20	8.98	9.06	-0.3
LSD 0.05							0.34	
LSD 0.01							NS	

a/Mean number of plants from 200 seeds per plot. Means followed by asterisks were significantly different from the mean for untreated seeds at the 0.01 (**) or 0.05 (*) level.

ROTATIONAL CROPS RESEARCH[1/]

R.J. Habetz

INTRODUCTION

Soybeans [*Glycine max* (L.) Merr.] are a major agronomic crop in Louisiana. Southwest Louisiana, where soybeans are grown primarily as a rotational crop with rice, is one of the major soybean producing areas in the state. Some of the soybean acreage is double cropped with wheat (*Triticum aestivum* L.). In recent years, grain sorghum [*Sorghum bicolor* (L.) Moench] acreage has increased. In the southwest area, grain sorghum may serve as an alternate crop to soybeans and may fit well into a rotation system with rice. Soybean, grain sorghum, and wheat varieties differ in their adaptability to soil types and climatic conditions. Consequently, variety trials are conducted at locations throughout the state to aid producers in selecting varieties best adapted to their area. Studies are conducted at the Rice Research Station each year to compare performance of newly released and established soybean, grain sorghum, and wheat varieties and weed control and to determine the impact of integrating these alternate crops into rotation systems with rice.

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, G.T. Berggren, J.P. Snow, and W. Hall

Location: Rice Research Station

Soil Type: Crowley silt loam

Seeding Rate: 10 seed/row ft

Planting Date: Group IV, Apr 20, 1988; Groups V, VI, VII, VIII, May 26, 1988

Row Spacing: 32 in

Fertilizer: 0-80-80 ($N-P_2O_5-K_2O$) banded at planting

Plot Size: 4 rows x 30 ft

Treated: 2.0 pt/A Dual applied broadcast after planting

Insecticide: 4 oz/A Pounce for loopers

Rainfall: Group IV - 1st week after planting, 0 in; 2nd week, 2.2 in; 3rd week, 0 in; 4th week, .24 in

Groups V, VI, VII, VIII - 1st week, .04 in; 2nd week, 2.9 in; 3rd week, 0 in; 4th week, .95 in

Harvested: at maturity for each variety

Experimental Design: Random complete block with four replications

Comments: Yields for 1988 were generally a little higher than in the previous year, despite the heavy infestation of aerial blight that infected the field later in the growing season. Five varieties produced more than 50 bu/A (Table 1). The Group IV variety, Asgrow 4906, yielded 55.4 bu/A. The averages of Groups V, VI, and VIII, which consisted of over 60 varieties, averaged more than 40 bu/A. Comparing 3-year average yields, 12 varieties produced more than 35 bu/A, with Deltapine 105 averaging more than 40 bu/A. Three-year average yields of the Groups V, VI, VII, and VIII varieties were highest for Deltapine 105 (40.2 bu/A), Ring Around 606 (38.3 bu/A), Asgrow 7986 (37.9 bu/A), and Hartz 8112 (30.5 bu/A), respectively.

Table 1. Performance of commercial varieties grown on Crowley silt loam soil at the Rice Research Station, Crowley, LA. 1988.

Maturity group and variety/brand	Yield per acre	Three-year (1986-88) average yield	Date matured	Plant height at maturity	Height of lower pod above ground	Lodging[1/]	Aerial blight rating[2/]
	(bu)	(bu/A)		(in)	(in)		
Group IV							
Asgrow 4906	55.4	-	9/14	35	3.8	1.0	-
Ring Around 452	44.0	-	9/23	31	4.5	1.0	-
Coker 6984	42.1	-	9/13	27	3.2	1.0	-
TN4-86	36.9	-	9/5	27	3.0	1.0	-
Crawford	30.4	-	9/2	24	2.0	1.0	-
Pioneer 5482	28.6	-	9/5	16	1.5	1.0	-
Asgrow 4595	28.0	-	9/2	21	2.0	1.0	-
Williams 82	18.6	-	8/23	20	2.0	1.0	-
Sparks	18.3	-	8/31	22	2.0	1.0	-
Fayette	16.0	-	8/26	21	2.0	1.0	-
CV (%)	15.5						
LSD (0.05)	7.1						
Group V							
Wilstar 550	48.4	39.8	10/12	31	4.0	1.0	3.5-3.0
Deltapine 105	47.8	40.2	10/7	30	4.3	1.3	2.8-2.0
Capehart Stone	47.8	-	10/6	29	4.3	1.0	2.5-2.0
McNair 500	47.2	-	10/7	26	4.3	1.0	3.8-3.5
Hutcheson	46.6	-	10/7	22	3.0	1.0	2.8-1.8
Deltapine 415	46.2	-	10/4	26	4.0	1.0	2.3-1.5
LA78-465	45.3	-	10/12	32	4.5	1.0	4.0-3.0
Coker 485	45.0	36.6	10/3	30	6.3	1.0	2.3-1.3
Bay	44.4	-	10/4	39	4.8	1.0	2.3-1.5
Coker 6995	44.2	-	10/13	31	5.0	1.0	2.5-2.0
Terra-Vig 505	43.6	39.2	10/4	30	5.5	1.8	3.0-1.5
LA77-8519	43.4	-	10/7	33	5.5	1.3	3.3-2.3
Agra-Tech 550	42.8	-	10/13	33	4.8	1.0	3.5-3.3
Pioneer 9581	42.7	36.5	10/13	27	4.8	1.0	2.8-2.3
TN 5-85	42.6	-	10/7	27	4.5	1.5	3.0-2.0
Hartz 5370	42.4	34.6	9/27	30	6.0	1.0	2.3-2.3
Riverside 577	42.1	38.4	10/13	27	4.0	1.0	3.3-2.0
Capehart/FFR544	41.9	-	10/5	25	5.0	1.0	3.8-1.5
Capehart/FFR565	41.7	-	10/11	28	5.3	1.0	2.0-1.8
Agra Tech 575	41.0	-	10/3	26	4.5	1.0	3.5-3.3
Pioneer 9561	40.6	33.3	10/7	28	5.0	1.0	2.5-1.8
Bedford	40.1	-	10/7	34	5.5	1.5	2.8-2.0
Terra-Vig 515	40.1	-	10/7	29	5.5	1.0	1.3-1.5

Continued.

Table 1. Continued.

Maturity group and variety/brand	Yield per acre (bu)	Three-year (1986-88) average yield (bu/A)	Date matured	Plant height at maturity (in)	Height of lower pod above ground (in)	Lodging[1/]	Aerial blight rating[2/]
Group V (continued)							
Hartz 5164	38.4	32.8	10/12	25	4.3	1.0	3.3-2.0
Terra-Vig 553	37.9	31.2	9/25	26	4.3	1.0	2.5-2.8
Asgrow 5403	37.6	-	10/7	29	4.8	1.0	3.3-2.0
CV (%)	8.6						
LSD (0.05)	5.3						
Group VI							
Hartz 6686	51.4	-	10/24	30	4.5	1.0	3.3-2.3
Pioneer 9641	51.0	-	10/16	26	3.8	1.0	3.5-3.8
Asgrow 6785	50.6	37.4	10/13	29	4.0	1.0	3.0-2.5
Terra-Vig 616	49.4	32.7	10/18	31	4.3	1.0	1.5-1.3
S69-54	49.1	34.0	10/18	28	4.5	1.0	2.8-1.8
Davis	49.0	36.5	10/18	30	3.8	1.3	3.8-3.3
Riverside 677	49.0	-	10/24	27	4.5	1.0	3.3-1.3
Ring Around 606	48.9	38.3	10/16	30	3.5	1.0	2.0-1.5
Coker 686	48.5	28.2	10/12	31	4.5	1.0	3.3-2.0
E.H.J.U. 7	46.8	-	10/13	35	5.3	1.0	2.3-2.0
Riverside 699	45.4	-	10/15	30	4.3	1.0	3.5-2.0
Asgrow 6297	44.2	-	10/18	23	3.2	1.0	3.8-2.0
Hartz X2043	43.7	-	10/24	31	5.0	1.0	3.8-2.3
Baldwin	43.4	-	10/15	34	4.0	1.0	3.3-2.0
Victory	43.3	-	10/7	31	5.5	1.0	2.8-2.8
LA77-9729	42.9	-	10/18	32	4.8	1.0	4.0-2.3
Hartz 6200	42.8	-	10/13	26	3.8	1.0	2.8-1.8
Ring Around 680	42.4	27.2	10/15	33	4.3	1.0	1.8-1.0
Buckshot 603	42.2	-	10/24	30	4.5	1.0	3.0-2.0
Sharkey	41.3	-	10/20	34	4.5	1.3	3.8-3.0
B2J	41.1	-	10/7	29	5.0	1.0	3.0-1.8
Centennial	40.9	28.9	10/16	32	3.8	1.0	3.0-2.0
Agra Tech 685	40.6	-	10/17	33	5.3	1.3	2.3-2.8
E.H.J.U. 5	40.1	-	10/20	33	4.8	1.3	2.8-1.8
Capehart/FFR Exp 45027	39.6	-	10/15	26	3.0	1.0	3.8-4.0
LA79-1133	39.4	-	10/24	28	3.5	1.0	2.5-1.8
Deltapine 566	39.2	24.2	10/20	31	3.8	1.0	3.3-1.5
LA77-11842	38.0	-	10/18	28	3.5	1.0	4.3-2.8
E.H.J.U. 9	37.8	-	10/12	30	4.8	1.0	3.5-3.0
LA87-6011	37.4	-	10/13	33	4.5	1.0	2.3-1.8

Continued.

Table 1. Continued.

Maturity group and variety/brand	Yield per acre (bu)	Three-year (1986-88) average yield (bu/A)	Date matured	Plant height at maturity (in)	Height of lower pod above ground (in)	Lodging[1/]	Aerial blight rating[2/]
Group VI (continued)							
Riverside 696	37.3	23.8	10/15	30	4.5	1.0	1.8-1.5
Hartz 6344	37.3	-	10/16	26	4.0	1.0	3.8-3.0
Cajun	36.4	-	10/24	26	3.8	1.0	4.3-3.8
Deltapine 726	35.5	-	10/18	33	4.3	1.0	2.0-1.3
Lloyd	34.7	-	10/21	31	5.0	1.0	4.0-3.8
E.H.J.U. 11	33.6	-	10/16	29	3.3	1.0	3.0-2.8
Capehart/ FFR 606	32.3	-	10/24	28	4.8	1.0	3.5-2.3
LA78-3208	30.1	-	10/24	29	3.3	1.0	2.3-1.3
Hartz 6385	29.8	-	10/18	29	3.3	1.0	3.2-2.0
CV (%)	12.8						
LSD (0.05)	7.5						
Group VII							
Buckshot 703	47.1	-	10/20	35	5.8	1.5	2.8-2.3
Agra Tech 700	47.0	-	11/2	38	5.3	1.5	2.5-2.0
LA78-5286	46.2	-	10/28	32	5.0	1.3	3.5-2.5
Rally	44.5	-	11/4	35	6.5	1.0	2.5-1.8
Hartz 7126	44.3	37.7	11/1	38	5.3	1.0	2.5-1.8
Asgrow 7986	42.8	37.9	11/1	34	5.0	1.3	2.3-2.0
Deltapine 207	42.1	-	11/4	37	5.5	1.5	1.3-1.0
Coker 6727	41.6	-	10/20	31	4.8	1.8	3.3-1.3
Pioneer 9791	41.0	34.7	10/29	29	4.3	1.3	4.0-2.0
LA79-11123	40.4	-	11/1	37	5.8	1.5	4.0-2.8
Hartz X1893	40.2	-	10/26	33	5.3	1.3	2.3-1.0
Riverside 757	40.2	-	11/4	34	5.3	1.3	2.5-1.8
McNair 700	39.5	-	10/26	30	5.8	1.0	4.3-3.0
Thomas	39.3	-	10/18	31	5.0	1.0	1.8-1.3
Terra-Vig 708	38.9	-	10/29	36	5.3	1.3	4.0-2.8
LA78-6307	38.6	-	11/1	34	5.3	1.8	1.8-1.3
Starr	38.4	35.0	10/26	34	6.0	1.0	4.0-3.3
Coker 6847	38.2	-	10/25	32	5.5	1.8	3.3-2.0
Riverside 707	38.0	31.0	11/2	39	4.8	2.0	2.5-2.0
Deltapine 417	36.6	-	10/28	39	7.3	1.5	3.3-2.8
Terra-Vig 717	36.6	-	10/26	34	5.0	1.0	2.0-1.8
S72-60	36.3	31.2	10/26	36	6.0	2.8	3.5-3.0
E.H.J.U. 3	35.9	-	10/26	35	6.5	1.0	2.8-2.0
Pioneer 9751	35.3	-	10/27	31	4.3	1.0	2.0-2.0

Continued.

Table 1. Continued.

Maturity group and variety/brand	Yield per acre (bu)	Three-year (1986-88) average yield (bu/A)	Date matured	Plant height at maturity (in)	Height of lower pod above ground (in)	Lodging[1/]	Aerial blight rating[2/]
Group VII (continued)							
Ransom	34.8	33.0	10/29	36	5.8	1.0	3.5-2.3
Gregg	33.7	-	10/27	34	5.5	1.5	2.5-1.8
Winner	33.6	-	10/26	34	5.5	1.0	3.3-2.0
LA87-7010	32.0	-	10/29	42	6.3	2.3	3.3-2.0
LA87-7022	31.7	-	10/29	42	7.3	1.5	2.0-1.8
LA87-7030	28.6	-	10/27	42	6.5	2.3	2.3-1.3
LA77-403	28.6	-	10/25	38	6.8	2.3	3.3-2.5
CV (%)	10.4						
LSD (0.05)	5.3						
Group VIII							
Hartz 8112	52.2	30.5	11/4	35	5.5	1.0	1.5-1.0
Deltapine X878	41.2	-	11/1	35	5.8	1.0	1.3-1.0
Coker 6738	31.7	-	10/25	35	5.8	1.0	1.3-1.0
CV (%)	4.2						
LSD (0.05)	5.5						

1/ 1 = no lodging; 5 = all plants lodged.

2/ 1st number = severity, where 1 = less than 20% and 5 = greater than 80% damage to a plant or plants within the variety; 2nd number = spread, where 1 = less than 20% spread and 5 = greater than 80% spread within the variety.

GRAIN SORGHUM VARIETY TEST

R.J. Habetz, D.E. Groth, M.S. Kang, and W. Hall

Location: Rice Research Station

Soil Type: Crowley silt loam

Planting Date: Apr 20, 1988

Row Spacing: 32 in

Fertilizer: 40-80-80 ($N-P_2O_5-K_2O$) banded at planting; 80-0-0 (21%) on May 30

Plot Size: 4 rows x 30 ft

Treated: 3 pt/A atrazine applied broadcast after planting

Rainfall: 1st week after planting, 0 in; 2nd week, 2.2. in; 3rd week, 0 in; 4th week, .24 in

Harvested: Sept 9

Experimental Design: Randomized complete block with four replications

Comments: In 1988, four early maturity, 25 medium maturity, and 16 full season varieties were evaluated. For the early maturity varieties in 1988, S9750, a recommended variety, and Oro xtra, both had a yield of over 4000 pounds. Another recommended variety Cargill 1022 had a yield of 3600 pounds (Table 1). For the medium early varieties, 10 varieties produced more than 5000 pounds, with an overall average of 4965 pounds, reflecting the good yields of 1988 (Table 2). GS712 had the highest yield with 5519 lb/A. In the 3-year average yields, 11 of the 16 eligible varieties were recommended. Three-year average yields were more than 4000 lb/A for Topaz, GS712, NK2665, and DK50. In the full season varieties for 1988, all of the varieties produced more than 4500 lb/A (Table 3). The five varieties 1330 DR, DK64, WACD 701G, Champion, and Cargill 5572 all had a yield above 5000 lb/A, with HSC Wings being close with a yield of 4999 lb/A. Three-year average yields showed WACD 701G and 1330DR with more than 4000 lb/A averages.

Table 1. Performance of early maturity, bird-susceptible grain sorghum hybrids at Crowley, LA. 1988.

Company/Brand	Hybrid	Yield 1988	Yield Three-year average	Grain moisture	Head blight rating[1/]
		------(lb/A)-----		(%)	
New Northrup King	S9750[2/]	4384	3623	13.7	3.3
Oro Hybrids	Oro xtra	4370	-	13.2	4.3
Funk Seeds Int.	G1602	3671	2838	13.4	3.8
Cargill Seed	Cargill 1022[2/]	3600	3280	13.5	4.3
Mean		4006			
CV (%)		8		1.97	14.27
LSD (0.05)		505		0.42	0.88

1/ 1-5 scale, 1 = low infection, 5 = maximum infection.

2/ Recommended variety.

Table 2. Performance of medium maturity, bird-susceptible grain sorghum hybrids at Crowley, LA. 1988.

Company/brand	Hybrid	Yield 1988	Yield Three-year average	Grain moisture	Head blight rating[1/]
		-----(lb/A)-----		(%)	
Asgrow Seed	GS712[2/]	5519	4125	13.4	3.8
Dekalb-Pfizer Genet.	M565[2/]	5405	3852	13.5	3.5
Summit Seed	XS7711	5399	-	12.5	3.5
New Northrup King	2665[2/]	5372	4119	12.7	3.3
Triumph Seed	Two 70-D	5180	-	13.3	4.0
Asgrow Seed	Topaz[2/]	5119	4318	13.5	3.0
Funk Seeds Int.	HW7380	5088	-	13.1	2.5
Taylor-Evans Seed	T-E Dinero[2/]	5088	3843	13.0	3.3
George Warner Seed	W-844E	5033	-	13.9	2.0
Hy Performer Seed	1225DR[2/]	5024	3995	12.7	3.8
Cargill Seed	Cargill R1090	4986	3110	12.5	3.3
Pioneer Hi-Bred Int.	8222	4980	3484	14.1	2.3
George Warner Seed	W-839DR[2/]	4956	3777	12.8	3.8
Funk Seeds Int.	G522DR[2/]	4952	3909	13.5	3.3
Asgrow Seed	Osage	4906	-	14.6	1.8
Taylor-Evans Seed	T-EY-75	4904	3530	13.7	2.3
Pioneer Hi-Bred Int.	8333[2/]	4898	3723	13.3	3.0
Terral-Norris Seed	Sunbelt 444	4854	3646	13.0	3.5
Dekalb-Pfizer Genet.	DK50[2/]	4822	4055	13.4	2.0
Hy Performer Seed	HSC Cherokee	4784	-	14.6	2.3
Capehart Seed	Contender	4748	-	12.9	3.0
Cargill Seed	Cargill 4462	4598	3177	14.5	3.5
Summit Seed	HT 126DR[2/]	4587	3868	13.2	3.0
New Northrup King	KS737	4474	-	13.6	3.8
Pioneer Hi-Bred Int.	8230	4455	-	13.9	1.8
Mean		4965			
CV (%)		7.5		4.30	18.72
LSD (0.05)		528		0.81	0.79

[1/] 1-5 scale, 1 = low infection, 5 = maximum infection.

[2/] Recommended variety.

Table 3. Performance of full season, bird susceptible grain sorghum hybrids at Crowley, LA. 1988.

Company/brand	Hybrid	Yield 1988	Yield Three-year average	Grain moisture	Head blight rating[1/]
		-----(lb/A)-----		(%)	
Hy Performer Seed	1330DR[2/]	5179	4050	15.0	3.4
Dekalb-Pfizer Genet.	DK64[2/]	5119	3998	16.2	2.8
Seedtec Int.	WACD 701G[2/]	5112	4215	15.6	3.5
Capehart Seed	Champion	5090	-	15.6	3.5
Cargill Seed	Cargill 5572	5051	-	15.9	3.5
Hy Performer Seed	HSC Wings	4999	-	15.6	3.3
Triumph Seed	Two 80-D	4871	-	15.6	2.8
Funk Seeds Int.	RA 808[2/]	4856	3896	15.7	4.3
Cargill Seed	Cargill 6670[2/]	4817	3886	14.7	3.3
George Warner Seed	W-851DR	4749	3600	15.7	3.3
Funk Seeds Int.	G1711[2/]	4731	3978	16.0	3.3
Capehart Seed	Challenger	4696	-	15.0	3.5
New Northrup King	KS 780	4646	-	15.7	3.8
Cargill Seed	Cargill DR1125[2/]	4641	3772	15.5	4.0
Oro Hybrids	Oro Baron	4621	-	16.6	2.3
Funk Seeds Int.	RA 787[2/]	4518	3731	15.7	3.8
Mean		4859			
CV (%)		10.8		5.28	13.58
LSD (0.05)		751		1.18	0.66

[1/] 1-5 scale, 1 = low infection, 5 = maximum infection.

[2/] Recommended variety.

WHEAT VARIETY TEST

R.J. Habetz and S.A. Harrison

Location: Rice Research Station

Soil Type: Crowley silt loam

Seeding Rate: 90 lb/A

Planting Date: Nov 2, 1987

Fertilizer: 30-90-90 ($N-P_2O_5-K_2O$) broadcast and incorporated prior to planting; 75-0-0 (21%) on Feb 5

Plot Size: 4 x 35 ft

Harvested: May 18

Experimental Design: Randomized complete block with four replications

Comments: The average yield of all varieties for 1988 was 59.6 bu/A (Table 1). Traveler, a new variety in 1988 and a sister line to Florida 302, had the highest yield (76.5 bu/A) followed by Florida 302 (75.9 bu/A), Coker 9877 (75.3 bu/A), another new variety, and Coker 9766 (73.0 bu/A). Two entries, Traveler and Coker 983, had test weights greater than 60 lb/bu. Leaf and stem rust were present and reached significant levels on susceptible varieties. The average incidence of leaf and stem rust was 12 and 8%, respectively (Table 1). The performance of entries across 2 years is presented in Table 2. The average 2-year mean yield of 13 varieties was 55.4 bu/A (Table 2). Florida 302 had the highest (71.7 bu/A) 2-year average yield. Coker 9766 and McNair 1003 yielded greater than 60 bu/A. McNair 1003 is highly susceptible to leaf and stem rust, and Coker 9766 is susceptible to stem rust. In addition to Florida 302, Coker 916, Coker 983, McNair 1003, Terral 812, Terral 817, Florida 301, and Rosen are recommended varieties for southwest Louisiana.

Table 1. Performance of entries in the wheat performance trials at the Rice Research Station, Crowley, LA. 1988.

Variety	Yield[1/]	Test weight	Head date[2/]	Leaf rust	Stem rust[3/]	Bacteria[4/] Height	Severity
	(bu/A)	(lb/bu)		-----(%)-----			
Traveler	76.5	60.1	83	0	0	9.0	4.5
Florida 302	75.9	57.4	89	0	0	9.0	4.0
Coker 9877	75.3	58.2	86	0	0	6.5	4.5
Coker 9766	73.0	58.0	87	0	25	9.0	4.0
Rosen	66.9	57.9	87	50	10	9.0	3.5
McNair 1003	66.8	57.0	89	18	15	9.0	3.5
Terral 812	66.6	58.5	89	8	8	9.0	4.0
Coker 983	65.2	60.6	88	12	2	9.0	3.0
Coker 9323	61.8	58.0	80	12	18	9.0	4.0
Coker 9733	61.4	59.5	82	0	0	9.0	4.5
Keiser	61.1	57.3	88	10	2	9.0	3.0
Coker 9227	57.8	59.8	87	0	8	9.0	4.0
Terral 817	53.0	59.0	90	5	2	9.0	3.5
Florida 303	47.6	58.3	74	0	8	9.0	5.0
Florida 301	45.8	58.9	72	22	0	9.0	4.5
Coker 916	45.0	55.5	90	40	30	9.0	3.0
Florida 7927-G29	39.1	58.4	73	0	20	9.0	6.5
Florida 301H	33.7	58.0	71	35	0	9.0	5.0
Mean	59.6	58.4	84	12	8	8.9	4.1
CV (%)	9	2	-	82	108	9	18
LSD (0.05)	7.5	1.3	-	20	19	ns	1.6

1/ Adjusted to 13% moisture.
2/ Days after January 1.
3/ Percent of plant and leaf coverage rated on a modified Cobb's scale.
4/ Bacteria is primairly Xanthomonas campestris (bacterial stripe). Rated as height on the plant from ground level (0) to top of the plant (9); and severity of infection from none (1) to very severe (9). Overall comparisons of disease severity may be made by adding the height and severity indexes together and comparing the sum of different entries.

Table 2. Performance of entries in the wheat performance trials at the Rice Research Station, Crowley, LA, for two years, 1987-88.

Variety	Yield[1/]	Test weight[1/]	Head date[2/]	Leaf rust	Stem rust[3/]	Bacteria
	(bu/A)	(lb/bu)		------(%)------		(score)
Florida 302	71.7	55.7	92	2	1	55
Coker 9766	64.4	56.0	92	1	16	62
McNair 1003	60.8	56.0	91	21	13	61
Terral 812	59.7	55.9	88	5	8	60
Coker 983	59.2	58.3	88	10	10	58
Rosen	58.9	56.4	91	62	14	59
Coker 9323	54.7	57.4	84	12	12	65
Keiser	54.7	56.0	92	15	4	58
Coker 916	52.7	54.8	94	24	21	52
Coker 9227	49.4	58.4	86	1	6	70
Terral 817	48.7	56.9	88	5	5	54
Coker 9733	46.8	56.9	85	0	0	76
Florida 301	38.6	57.0	78	11	1	56
Mean	55.4	56.5	88	13	8	60
CV (%)	10.0	3.2	0	56	96	10
LSD (0.05)	15.1	2.0	7	22	14	ns

1/ Mean of tests in 1987 and 1988 adjusted to 13% moisture.

2/ Days after January 1.

3/ Percent of plant and leaf coverage rated on a modified Cobb's scale.

SOYBEAN INOCULATION STUDY

R.J. Habetz and G.A. Breitenbeck

Location: Rice Research Station

Soil Type: Crowley silt loam

Seeding Rate: 10 seed/row ft

Planting Date: May 30, 1988

Row Spacing: 32 in

Fertilizer: 0-96-96 ($N-P_2O_5-K_2O$) banded at planting

Plot Size: 4 rows x 30 ft

Treated: 2.5 pt/A Dual and .5 lb lexone/A applied broadcast after planting

Rainfall: 1st week after planting, 2.9 in; 2nd week, 0.00 in; 3rd week, .70 in; 4th week, 1.0 in

Harvested: at maturity for each variety

Experimental Design: Split plot design, randomized complete block with four replications

Comments: Ideal soil conditions at planting combined with good climatic conditions led to above average yields for this soybean inoculation study. Weed and insect control was very good but there was some evidence of damage from aerial blight in later maturing varieties. Harvest conditions were good, although Hartz 8112 and Coker 368 were slow in maturing and were not harvested until the third week in November. Experiments to assess the effects of seed inoculation on grain yield of eight soybean cultivars planted in fields previously used for flooded rice or soybean production indicated that preplant inoculation of seed with Agracetus's Gold Coat did not significantly increase yield. Yields of Centennial soybeans inoculated with a preparation containing molybdenum were similar to those treated with Gold Coat. There was no significant influence of previous cropping history on grain yield or response to inoculation. Inoculation significantly decreased yield of one cultivar, Hartz 8112.

Data obtained in 1987 on a field previously used for flooded rice at Northeast Research Station showed that inoculation of Centennial soybean seed with Agracetus VM557 led to significant yield increase. However, in 1988, inoculation with Gold Coat did not significantly increase yield of any of eight cultivars planted after flooded rice at Crowley (Table 1).

Table 1. Effects of previous crop and inoculation on grain yield of eight soybean cultivars. Rice Research Station, Crowley, LA. 1988.

Cultivar	Inoculation[1/]	Soybean yield: Planted after beans	Soybean yield: Planted after rice	Soybean yield: Average
		(bu/A)		
Asgrow 5980	-	40.1	42.5	41.3
	+	39.4	38.6	39.0
Wilstar 550	-	46.1	50.2	48.2
	+	46.7	48.4	47.5
Centennial	-	38.6	37.8	38.2
	+	38.3	37.2	37.7
Davis	-	43.3	44.3	43.8
	+	42.7	43.3	43.0
Braxton	-	36.8	41.7	39.3
	+	38.0	41.1	39.6
Hartz 7126	-	42.8	48.2	45.5
	+	43.7	48.5	46.1
Hartz 8112	-	40.0	48.0	44.0
	+	39.3	33.1	36.2
Coker 368	-	29.8	25.6	27.7
	+	29.6	26.5	28.0
Centennial + Mo	+	39.2	39.4	39.3
Average		39.7	40.8	40.3

[1/] - = no inoculation, + = inoculation.

SOYBEAN EVALUATION STUDY

R.J. Habetz

INTRODUCTION

Soybean varieties differ in their adaptability to soil types and climatic conditions. Consequently, a soybean demonstration type study was conducted at the South Unit of the Rice Research Station. This study evaluated three cultivars that showed to be potentially high producing varieties.

MATERIALS AND METHODS

Varieties were drill seeded on May 25 at a seeding rate of approximately 75 lb/A. Fertilizer at a rate of 0-60-60 (N-P_2O_5-K_2O) was applied and incorporated before planting. A tank mix of Dual at 2.0 pt/A and Sencor at .3 lb/A was surface applied after planting. Pounce at 4 oz/A and Benlate at 1 lb/A were applied at the appropriate times. Varieties were combine-harvested after maturity. Seed yield was calculated from yield per plot and adjusted to 13% moisture.

RESULTS AND DISCUSSION

On June 4 and 5 there were over 3 inches of rainfall, and a decision was made to replant half of the test area. On June 10, with a no-till planter, one-half of the test was replanted in a stale seedbed on 30-in rows. Dual at 1.0 pt/A and paraquat at 1.5 pt/A were applied after planting.

Yields were taken from the row and drill planted soybeans separately. The row planted soybeans were harvested as four rows by 100 ft replicated four times. The drill planted soybeans were harvested 100 x 100 ft. The row planted soybeans Hartz 6686, Asgrow 6785, and Coker 6847 had yields of 32.7, 31.6, and 30.3 bu/A, respectively. In the drill planted soybeans, the yields were Asgrow 6785, 29.2 bu/A; Hartz 6686, 26.7 bu/A; and Coker 6847, 25.5 bu/A.

SOYBEAN WEED CONTROL RESEARCH

R.J. Habetz

INTRODUCTION

Southwest Louisiana has an abundance of weed species, some not commonly found in other areas of the state. Our climatic conditions are favorable to prolific weed growth and subsequent competition with crop species. We have a unique situation at the Rice Research Station in that a large portion of the soybean growers in the southwest drill-plant their soybeans. Also, at times we get large amounts of rainfall which can cause herbicide injury which can result in replanting.

Selected weed areas on the Rice Research Station were used and had uniform weed populations.

Weed species evaluated for control were: pitted morningglory (*ipomoea lacunosa* L.), cocklebur (*Xanthium strumarium* L.), sicklepod (*Cassia obtusifolia* L.), indian jointvetch (*Aeschynomene indica* L.), and annual grasses. Specific information on location, soil type, variety, row spacing, treatment data, sprayer type, etc., for each experiment is individually presented followed by a table of results.

Weed control and crop injury ratings for all experiments are based on a scale of 0 to 100%, where 0 equals no control or crop injury and 100 equals complete control or crop injury. In the crop tolerance test, crop yields were obtained and adjusted to 13% moisture.

Experiment: Soybean Tolerance to Pre- and Postemergence Herbicides

Location: Rice Research Station

Soil Type: Crowley silt loam

Variety/Seeding Rate: Centennial, 50 lb/A

Planting Date: June 10, 1988

Row Spacing: 30 in

Fertilizer: 0-60-60 broadcast and incorporated

Plot Size: 3 rows x 25 ft (treat two rows)

Treated: June 10 (PES); July 5 (EP)

Crop Size: V3 (9 in)

Sprayer: Tractor compressed air - 20 GPA, 11003 nozzles, 25 psi

Rated: July 11

Rainfall: 1st week after planting, .70; 2nd week, .34; 3rd week, .70

Experimental Design: Randomized complete block, four replications

Table 1. Soybean tolerance to pre- and postemergence herbicides. Rice Research Station, Crowley, LA. 1988.

Treatment	Rate of application	Application time	Phytotoxicity 7/11	Mature plant height	Mature pod height	Yield
	-(lb ai/A)-		-----(%)-----	-----(in)----		(bu/A)
Sencor (75% DF)	0.38	PES	5	32	6	27.6
	0.76	PES	7	33	6	25.2
Scepter (1.5 EC)	0.13	PES	6	33	6	27.1
	0.25	PES	5	33	7	28.4
Canopy (75% DF)	0.38	PES	4	35	6	28.0
	0.76	PES	4	33	7	27.1
Scepter/Scepter	0.13/0.13[1/]	PES/EP	12	32	6	26.5
	0.13/0.25[1/]	PES/EP	11	32	6	27.4
Canopy/Classic (25% DF)	0.38/.008[1/]	PES/EP	10	33	6	24.5
	0.38/.016[1/]	PES/EP	16	32	7	26.5
Command (4 EC)	0.75	PES	2	34	6	27.9
	1.50	PES	2	33	6	28.7
Lorox (4 F)	0.75	PES	6	32	6	27.1
Gemini (60% WP)	0.75	PES	4	33	6	25.1
Basagran (4 EC) +	0.50 +	EP	18	32	6	26.1
Blazer (2 EC)	0.25[1/]	EP				
Blazer	0.50[1/]	EP	24	33	6	24.8
Cobra (2 EC)	0.20	EP	21	30	5	24.4
	0.20[1/]	EP	25	28	5	23.4
	0.20[2/]	EP	28	28	5	22.0
Check	---		0	32	6	26.2
LSD (0.05)			5	3	1	3.0
CV (%)			35.2	6.6	3.5	8.1

[1/] Ag 98 nonionic surfactant added at 0.25% (v/v).

[2/] Agridex crop oil concentrate added at 1 pt/A.

Experiment: General Broadleaf Test

Location: Rice Research Station

Soil Type: Crowley silt loam

Variety/Seeding Rate: Centennial, 50 lb/A

Planting Date: May 23, 1988

Row Spacing: 30 in

Fertilizer: 0-60-60 broadcast and incorporated prior to planting

Plot Size: 3 rows x 25 ft (treat two rows)

Treated: May 23 (PES); June 10 (EP)

Weed Size: CB 2-4 leaf (2-3 in); PMG 2 leaf (2 in); AG 3-4 leaf (2 in); JV 2-4 leaf (2-3 in); SP 2-4 leaf (2-3 in)

Crop Size: V4 (5-6 in)

Sprayer: Tractor compressed air - 20 GPA, 11003 nozzles, 25 psi

Rate: June 29

Rainfall: 1st week after planting, .06 in; 2nd week, 4.0 in; 3rd week, 2.1 in

Experimental Design: Randomized complete block, four replications

Table 2. Annual grasses (AG), cocklebur (CB), and pitted morningglory (PMG) control, and soybean (SB) injury using pre- and postemergence herbicides. Rice Research Station, Crowley, LA. 1988.

Treatment[1/]	Rate of application (lb ai/A)	Application time	Weed control/ phytotoxicity 6/29 AG	CB	PMG	SB
Turbo	2.00	PES	95	66	70	8
Dual/Blazer	2.00/0.50	PES/EP	96	96	97	3
Dual/Cobra	2.00/0.20	PES/EP	97	97	97	9
Squadron	0.88	PES	86	83	81	7
Scepter	.125	PES	78	80	84	9
Canopy	0.25	PES	84	83	84	20
Canopy	0.38	PES	90	80	85	20
Dual/Canopy	2.00/0.38	PES	96	82	87	10
Lasso EC/Canopy	2.50/0.38	PES	94	82	89	21
Dual/Scepter	2.00/.125	PES	93	69	82	10
Lasso EC/Scepter	2.50/.125	PES	94	76	85	6
Gemini	0.50	PES	90	84	88	13
Command	1.00	PES	96	89	63	4
Dual/Sencor	2.00/0.38	PES	96	71	84	10
Prowl/Scepter	1.00/.125	PES	94	90	92	8
Scepter/Scepter	.125/.125	PES/EP	95	98	92	13
Dual/Sencor/Classic	2.00/0.38/.008	PES/PES/EP	97	98	97	19
Cinch/Canopy	1.00/0.38	PES	97	91	91	20
Dual/Reflex	2.00/.313	PES/EP	97	91	94	4
LSD (0.05)			8	14	10	8
CV (%)			6.0	11.5	8.3	50.6

1/ Ag 98 nonionic surfactant added at 0.25% (v/v) to all postemergence treatments.

Table 3. Annual grasses (AG), sicklepod (SP) control, and soybean (SB) injury using pre- and postemergence herbicides. Rice Research Station, Crowley, LA. 1988.

Treatment[1/]	Rate of application (lb ai/A)	Application time	Weed control/ phytotoxicity 6/29 AG	SP	SB
Turbo	2.00	PES	94	84	7
Dual/Blazer	2.00/0.50	PES/EP	98	93	4
Dual/Cobra	2.00/0.20	PES/EP	95	92	8
Squadron	0.88	PES	92	92	8
Scepter	.125	PES	88	88	6
Canopy	0.25	PES	84	86	11
Canopy	0.38	PES	88	91	13
Dual/Canopy	2.00/0.38	PES	91	80	8
Lasso EC/Canopy	2.50/0.38	PES	94	90	13
Dual/Scepter	2.00/.125	PES	92	85	11
Lasso EC/Scepter	2.50/.125	PES	94	91	12
Gemini	0.50	PES	93	87	13
Command	1.00	PES	91	79	6
Dual/Sencor	2.00/0.38	PES	95	87	7
Prowl/Scepter	1.00/.125	PES	91	87	8
Scepter/Scepter	.125/.125	PES/EP	90	89	8
Dual/Sencor/Classic	2.00/0.38/.008	PES/PES/EP	98	95	10
Cinch/Canopy	1.00/0.38	PES	95	87	10
Dual/Reflex	2.00/.313	PES/EP	98	90	4
LSD (0.05)			7	11	5
CV (%)			5.7	8.6	43.8

1/ Ag 98 nonionic surfactant added at 0.25% (v/v) to all postemergence treatments.

Table 4. Annual grasses (AG), jointvetch (JV) control, and soybean (SB) injury using pre- and postemergence herbicides. Rice Research Station, Crowley, LA. 1988.

Treatment[1/]	Rate of application (lb ai/A)	Application time	Weed control/ phytotoxicity 6/29 AG	JV	SB
Turbo	2.00	PES	94	96	2
Dual/Blazer	2.00/0.50	PES/EP	93	79	3
Dual/Cobra	2.00/0.20	PES/EP	95	97	10
Squadron	0.88	PES	86	78	7
Scepter	.125	PES	89	70	5
Canopy	0.25	PES	91	92	1
Canopy	0.38	PES	94	92	12
Dual/Canopy	2.00/0.38	PES	94	90	14
Lasso EC/Canopy	2.50/0.38	PES	97	93	11
Dual/Scepter	2.00/.125	PES	96	82	5
Lasso EC/Scepter	2.50/.125	PES	92	84	7
Gemini	0.50	PES	90	87	10
Command	1.00	PES	94	73	2
Dual/Sencor	2.00/0.38	PES	96	94	5
Prowl/Scepter	1.00/.125	PES	89	81	4
Scepter/Scepter	.125/.125	PES/EP	87	88	6
Dual/Sencor/Classic	2.00/0.38/.008	PES/PES/EP	96	97	12
Cinch/Canopy	1.00/0.38	PES	93	93	15
Dual/Reflex	2.00/.313	PES/EP	90	96	2
LSD (0.05)			5	11	6
CV (%)			3.7	6.9	53.2

[1/] Ag 98 nonionic surfactant added at 0.25% (v/v) to all postemergence treatments.

FORAGE CROPS TISSUE CULTURE RESEARCH

BERMUDAGRASS IMPROVEMENT THROUGH TISSUE CULTURE

S.S. Croughan

INTRODUCTION

Work on this project is continuing to optimize tissue culture techniques for bermudagrass biotechnology. The overall objective is to use this technology to develop improved bermudagrass varieties for Louisiana's forage producers.

EXPERIMENT 1: Production of regenerated plants.

S.S. Croughan and K.M. Hebert

Efforts focused on the production of regenerated plants from immature inflorescences. Over 2,000 immature inflorescences were collected over the growing season from plots of Coastal, Grazer, Brazos, Alicia, Oklan, Hardie, and Tifton 78. Several hundred plants have been regenerated, and more are continuing to be regenerated. Quality of the inflorescences was reduced by poor weather conditions during the growing season, resulting in lower regeneration rates this year compared to last year.

Rates of regeneration are variety specific for most crops. With bermudagrass, the variety Brazos has the highest regeneration rate. This year research was conducted to optimize the conditions for plant regeneration from immature inflorescences of Coastal bermudagrass which has a low regeneration rate. Three sucrose concentrations and six 2,4-dichlorophenoxy acetic acid (2,4-D) concentrations were tested, as well as different sequences of hormone reduction. Data is still being collected, however, preliminary results suggest that a 2,4-D concentration of 2 to 1.5 mg/l with a sucrose concentration of 4 to 6% is best for the initial transfer. Subsequent transfer to medium containing a reduced 2,4-D concentration helped induce regeneration and reduction of the sucrose level to 2% once early signs of regeneration were observed was beneficial. If a lower 2,4-D concentration is used for the initial transfer, more callus is formed but regenerable callus is rarely obtained.

EXPERIMENT 2: Screening for resistance to *Helminthosporium cynodontis*.

S.S. Croughan, P.D. Coyler, and K.M. Hebert

Of the 676 plants regenerated in 1987 from immature inflorescence, 536 were evaluated for increased resistance to *Helminthosporium cynodontis*. Leaves were floated on culture filtrates from fungal cultures grown for 7 days in potato-dextrose broth. The regenerated plants were compared for resistance to the variety from which they were developed. Approximately 10% were found to exhibit less disease symptoms than the variety from which they were derived. Of these, the most resistant ones will be tested in more detail.

EXPERIMENT 3: Screening for resistance to *Spodoptera frugiperda*.

S.S. Quisenberry, S.S. Croughan, and K.M. Hebert

Of the 676 plants regenerated in 1987 from immature inflorescence, 395 were evaluated for increased resistance to *Spodoptera frugiperda*. An additional 126 are currently being tested.

Clippings were made from each regenerated plant, as well as from the original varieties from which they were developed. These were grown in peat pots in the greenhouse to a uniform size with approximately 15 cm of top growth. Ten fall armyworm larvae at the first instar stage were put on each plant (four replicates). After 10 days the plants were evaluated for the amount of defoliation.

Of the regenerated bermudagrass plants tested, approximately 7% have been identified with increased resistance to the fall armyworm. The most resistant ones will undergo more extensive evaluation.

Researchers have found a correlation between high quality of bermudagrass and increased susceptibility to the fall armyworm. Plants that were the most defoliated from the resistance screening test were planted in field plots to evaluate these lines for improvements in quality.

EXPERIMENT 4: Field evaluation of regenerated bermudagrass plants.

S.S. Croughan, M.M. Eichhorn, B.D. Nelson, and K.M. Hebert

Field evaluations of promising lines of bermudagrass are continuing. An additional 10 regenerated lines of bermudagrass were planted at the Hill Farm Research Station in Homer, Louisiana on April 21, 1988. Data were collected from plots which had been planted in 1987. Additional information regarding these field evaluations is contained in the Hill Farm Research Station Annual Report.

At the Rice Research Station in Crowley, Louisiana, data were collected for the second year from plots established in 1987. Yield and quality were determined from four harvests. Two lines developed from the variety Brazos show promise, however, at least one more year of data will be collected before conclusions are drawn.

An additional 154 plots of regenerated bermudagrass lines were established at the Rice Research Station. These lines are undergoing preliminary evaluation for establishment rate, quality, and overall growth habit.

ALFALFA IMPROVEMENT THROUGH TISSUE CULTURE

S.S. Croughan

INTRODUCTION

EXPERIMENT 1: Production of regenerated plants.

S.S. Croughan, K.A. Fishbeck, and K.M. Hebert

Plants have continued to be regenerated from cotyledon-derived callus. Improvements are being made in the methods used to transfer regenerated plants from the petri dish to the greenhouse. Once regenerated plants are established in the greenhouse, at least six cuttings are made of each plant for evaluation of disease and insect resistance.

Work has also been initiated on obtaining regenerated plants from petiole-derived callus. A number of media have been evaluated. Early stages of plant regeneration have been observed on callus from the varieties Vangard and Apollo.

EXPERIMENT 2: Screening for resistance to *Phoma medicaginis*.

P.D. Colyer, K.A. Fishbeck, S.S. Croughan, and K.M. Hebert

Regenerated plants and seed-derived plants were screened for resistance to spring black stem and leaf spot disease (*Phoma medicaginis*). Spore cultures were prepared at 5×10^5 spores/ml with 2 drops of Tween per liter. Six to nine of the first fully expanded leaves of each variety or regenerated plant were excised, misted with spore suspension, and placed in a sterile plastic petri dish (60 x 15 mm) containing 7 ml sterile distilled water. After 10 days these leaves were scored for severity of disease symptoms.

Test 1: Sixty plants started from seeds were evaluated for inherent variability that exists within populations of four varieties: Apollo, Florida 77, Vangard, and WL 318. A bell shaped distribution was found with the varieties Apollo, Vangard, and WL 318, while a random distribution was noted for the variety Florida 77.

Test 2: Forty-two regenerated plants and their corresponding checks were evaluated for disease resistance. A number of the regenerated plants were found to be more resistant than the variety from which they were developed. Tests are being repeated to confirm these results.

EXPERIMENT 3: Field evaluation of regenerated alfalfa plants.

J.L. Rabb, S.S. Croughan, and K.M. Hebert

In December of 1987, a plot of alfalfa was established at the Red River Research Station adjacent to an alfalfa variety test. The alfalfa line was developed through tissue culture and identified as one showing potential improvements. Cuttings had been made from the original regenerated plant and grown in 2-inch peat pots. The cuttings with good root development were planted 6 inches apart in a plot 5 x 16 feet.

As shown in Table 1, yield of the tissue culture line exceeded that of several recommended varieties in the first year. Several years of data, however, are necessary to accurately evaluate alfalfa performance. A new plot of this line and a plot of another tissue culture line are currently being established to continue the field evaluations.

Table 1. Alfalfa yields from variety test conducted at the Red River Research Station, Bossier City, LA. 1988.

Variety	Harvest dates 5/30	6/30	8/1	Total
	t/a			
Selection 1	2.54	1.90	2.20	6.64
WL 320	2.32	0.93	1.50	4.75
Apollo	2.47	1.17	2.15	5.79
Florida 77	1.83	1.04	1.93	4.80

INFLUENCE OF SUPPLEMENTAL PROTEIN AND LASALOCID FOR FORAGE FED STEERS

T.W. White, M. Craig, and M. Jordan

INTRODUCTION

In previous grazing experiments at this station, supplemental protein has not improved steer performance beyond that of supplemental energy. These experiments were initiated to study the influence of lasalocid on grazing steers supplemented with protein and energy.

MATERIALS AND METHODS

Thirty-six Hereford x Angus crossbred steers averaging 533 pounds (lb) in each of 2 years were blocked by weight and randomly assigned to four supplemental treatments to grazing. The treatments were 2 lb of ground shelled corn or 1 lb of ground shelled corn and 1 lb of soybean meal per head per day with and without 200 milligrams (mg) of lasalocid per head per day. Each treatment group was assigned to a 3.3 acre dallisgrass and Coastal bermudagrass pasture initially and rotated every 28 days so that all treatment groups grazed all pastures for 28 days.

In the second experiment, 27 Hereford x Angus crossbred steers averaging 426 lb in each of 2 years were blocked by weight and randomly assigned to three supplements fed with green chopped dallisgrass and Coastal bermudagrass. The supplements were 1 lb of ground corn and 1 lb of soybean meal with and without 200 mg of lasalocid compared with 2 lb of a 6% urea-corn mixture with 200 mg of lasalocid per head per day.

In the third experiment, 27 Hereford x Angus crossbred steers averaging 489 lb were blocked by weight and randomly assigned to three supplements fed while grazing a dallisgrass-Coastal bermudagrass pasture. The supplements were .75 lb fish meal plus 1.25 lb ground corn with and without 200 mg lasalocid or 1 lb ground corn plus 1 lb soybean meal.

All experiments were initiated in May with experiment 1 continuing for 112 days and experiments 2 and 3 for 84 days. Initial and 28-day weights were taken after a 16-hour shrink.

RESULTS AND DISCUSSION

Replacing 1 lb of corn with 1 lb of soybean meal did not improve average daily gain when fed with (1.23 vs. 1.18 lb) or without (1.06 vs. 1.04 lb) lasalocid. Feeding 200 mg lasalocid improved ($P<.05$) average daily gain of grazing steers.

Average daily gain of green chopped forage-fed steers was not significantly (P>.05) improved (.74 vs. .64 lb) by feeding lasalocid, however, the same general trend existed when lasalocid was fed with soybean meal as was observed for grazing steers. Average daily gain was lower (P<.05) when lasalocid was fed with the urea-corn mixture (.49 lb) than when fed with soybean meal and corn (.74 lb). Forage dry matter consumption was 11.4, 10.9, and 10.9 lb per head per day when soybean meal with and without lasalocid and when the urea-corn mixture with lasalocid was fed, respectively. The difference in intake is not large enough to account for the difference in gain. Soybean meal, urea-corn mixtures, and corn have provided for similar gain with grazing and green chopped forage-fed steers in previous experiments. Therefore, it appears that lasalocid is not effective in improving gain when urea is included in the diet. Further research is needed in this area.

In experiment 3, lasalocid improved (P<.05) gains of steers fed fish meal while grazing (1.78 vs. 1.45 lb). Gains by steers fed soybean meal (1.65 lb) were not different (P>.05) from gains of steers fed the other supplements.

SUMMARY

Two lb of corn or 1 lb of corn and 1 lb of soybean meal provided equal responses for grazing steers. Feeding lasalocid improved the gains of grazing steers by 14 to 23% depending on which supplement was fed.

INFLUENCE OF FISH MEAL WITH AND WITHOUT SOLUBLES IN DIETS FOR FINISHING STEERS

T.W. White, F.G. Hembry, and L.S. Sticker

INTRODUCTION

Dietary protein entering the rumen is degraded and utilized by the microorganisms or escapes into the abomasum and lower gastrointestinal tract where it is degraded to amino acids that are absorbed. Some proteins are degraded less than others in the rumen and therefore may be of greater nutritional value. Fish meal is a high protein product of south Louisiana that has received only limited attention as a ruminant protein source in the United States but should have rumen by-pass qualities since heat is used in the oil extraction process.

MATERIALS AND METHODS

Seventy-five Hereford x Angus crossbred steers averaging 646 lb were implanted with 36 mg Zeranol and blocked by weight into five groups. One steer from each weight group was randomly assigned to each of five treatments. The treatments were: soybean meal control diet compared with diets containing 3 or 6% fish meal with and without solubles. The diets also contained 20% ground grass hay, 10% molasses, 1% dicalcium phosphate, .5% trace mineralized salt, .75% urea, 330 I.U. vitamin A per pound of feed and 63 to 64% ground corn.

The steers were denied feed and water for 18 hour prior to weighing initially and at 28-day intervals. Steers were slaughtered after 112 days. Carcass characteristics were evaluated by USDA graders and longissimus muscle area and fat thickness were measured on the cut surface at the 12th rib 48 hours after slaughter.

RESULTS AND DISCUSSION

The performance of steers fed fish meal with and without solubles is presented in Table 1. Feed intake was similar for all rations indicating that diets containing fish meal even with fish solubles are palatable. Average daily gains and carcass weights were not different ($P>.05$) among treatments although there was a trend for steers fed fish meal with solubles to gain faster and have heavier carcasses than steers fed the other diets. Steers fed 3% fish meal diets tended to gain faster than steers fed 6% fish meal diets. Carcass characteristics were similar for steers fed all diets.

Table 1. Performance of steers fed fish meal with and without fish solubles. Rice Research Station, Crowley, LA. 1988.

Item	Soybean meal	Percent fish meal: Without solubles 3	Without solubles 6	With solubles 3	With solubles 6
No. steers	15	15	15	15	15
Initial weight, lb	646	646	646	646	646
Days on feed	112	112	112	112	112
Dry feed intake, lb	25.7	24.7	25.1	25.7	25.8
Daily gain, lb	2.79	2.79	2.62	2.94	2.86
Carcass weight, lb	556	558	553	568	564
Marbling score[a]	9.3	10.5	10.2	10.1	9.5
Quality grade[b]	11.0	11.5	11.6	11.6	11.3
Fat thickness, in	.35	.41	.41	.41	.35
Kidney, heart, and pelvic fat, %	1.9	2.0	2.1	2.0	1.9
Longissimus muscle area, sq in	11.1	11.0	11.1	10.9	11.5

[a] Slight minus = 7; slight = 8; slight plus = 9.

[b] Select plus = 11; choice minus = 12.

INFLUENCE OF SHADE AND FEEDLOT SURFACE ON PERFORMANCE OF STEERS CONSUMING A HIGH FORAGE DIET

T.W. White, F.G. Hembry, M. Craig, and G. Romero

INTRODUCTION

Previous research at this station has shown that while gains by grazing steers were not influenced by shade, steers fed green chopped forage or an 80% hay diet in partially covered concrete pens gained more than steers in dirt pens with or without shade. Gains by steers grazing summer forage are not usually as high as in some areas, and attempts are being made to relate this to the environment. This experiment was designed to study the influence of shade and feedlot surface on performance of steers fed an 80% hay diet.

MATERIALS AND METHODS

Thirty-six Hereford x Angus crossed steers averaging 541 lb were blocked by weight into nine groups in each of two years. One steer from each weight group was randomly assigned to each of four treatments. The treatments were concrete and dirt pens with and without shade. An 80% hay ration also containing 5% corn, 3% cottonseed meal, 10% molasses, 1% urea, .5% trace mineralized salt, .5% dicalcium phosphate, and vitamin A was fed to steers on all treatments. This experiment was initiated on May 26 and continued for 84 days. All weights were taken after a 16-hr shrink without feed or water. Plain mercury and black bulb thermometers in several locations in the pens were read at 8 am, 12 noon, and 4 pm, and weather conditions recorded Monday through Friday during the experiment. Black bulb thermometers were plain mercury thermometers inserted in a 4-inch diameter black metal bulb.

RESULTS AND DISCUSSION

Performance of steers on this experiment is shown in Table 1. Shade increased ($P<.05$) average daily gains when steers were fed in concrete pens but had no influence when steers were fed in dirt pens.

Table 1. Influence of shade and feedlot surface on performance of steers fed a high forage diet. Rice Research Station, Crowley, LA. 1987.

Treatment	Average daily gain, lb	Feed intake, lb
Concrete - shade	1.81^{a}	23.0
Concrete - no shade	1.21^{b}	20.9
Dirt - shade	1.30^{b}	21.5
Dirt - no shade	1.35^{b}	21.5

[abc] Means in the same column bearing different superscripts differ ($P<.05$).

Feed intake was lowest when steers were fed in concrete pens without shade, but the differences between treatments were not great enough to explain the depressed gains.

Centigrade temperatures at various locations in the feeding area and at various times of the day are shown in Table 2. Black bulb temperatures were higher than plain bulb temperatures. Black bulb temperatures above concrete were highest ($P<.05$) with no shade and lowest ($P<.05$) with shade. Black bulb temperatures over dirt were also influenced ($P<.05$) by shade. Plain bulb temperature above the concrete surface with shade was the lowest ($P<.05$) of the plain bulb temperatures and was very similar to black bulb temperatures in the same location. When shade was not available plain bulb temperatures were higher ($P<.05$) above concrete except at 8:00 AM. Even though there were differences ($P<.05$) in average daily gains and between thermometer locations, the relationship between average daily gains and temperature appeared to be realistic in only three instances. Partial correlations coefficents ($P<.05$) were -.29, -.28, and -.27 between gain and maximum black bulb temperature at 12:00 noon, average and maximum plain bulb temperature at 8:00 AM, respectively.

SUMMARY

Thirty-six Hereford x Angus crossed steers were blocked by weight and assigned to four treatments which were concrete or dirt pens with and without shade in each of two years. All steers were fed an 80% forage diet. Shrunk weights were taken at 28-day intervals during the 84-day experiment with 8 am, 12 noon, and 4 pm plain and black bulb temperature recorded daily except on weekends. Average daily gains were highest ($P<.05$) when steers were in concrete pens with shade. Gains by steers in dirt pens were not influenced by shade. Black and plain bulb temperatures were lowest ($P<.05$) in the concrete pens with shade.

Table 2. Centigrade temperatures at various locations and times of day. Rice Research Station, Crowley, LA. 1987 and 1988.

	4:00 PM ABB[a]	4:00 PM MBB	8:00 AM ABB	8:00 AM MBB	12:00 NOON ABB	12:00 NOON MBB	4:00 PM APB	4:00 PM MPB	8:00 AM APB	8:00 AM MPB	12:00 NOON APB	12:00 NOON MPB
Concrete shade	31.7^{e}	34.5^{e}	25.1^{e}	27.0^{e}	29.6^{e}	32.2^{e}	30.5^{d}	34.5^{d}	25.0^{c}	27.0^{d}	29.5^{d}	32.2^{d}
Concrete-no shade	38.1^{b}	47.8^{b}	32.1^{b}	40.5^{b}	40.0^{b}	48.3^{b}	31.5^{b}	36.5^{b}	26.5^{b}	29.7^{c}	31.2^{b}	34.8^{b}
Dirt-shade	32.4^{d}	37.2^{d}	27.8^{d}	32.0^{d}	32.1^{d}	31.6^{d}	----	----	----	----	----	----
Dirt-no shade	36.4^{c}	45.0^{c}	30.8^{c}	38.5^{c}	37.9^{c}	45.7^{c}	31.0^{c}	35.7^{c}	26.4^{b}	32.0^{b}	30.9^{c}	34.6^{c}

[a] ABB = Average black bulb temperature; MBB = Maximum black bulb temperature;
APB = Average plain bulb temperature; MPB = Maximum plain bulb temperature.

[bcde] Means on the same line bearing different superscripts differ ($P<.05$).

INTERNATIONAL RICE TRAINING PROGRAM

Maurice F. Miller

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, farmers, students, and others interested in the production of rice.

Data regarding the classification of visitors according to countries are presented in Table 1. A total of 56 participants representing 11 countries were guests at the Rice Research Station in 1988. This was a decrease from the 132 participants in 1987. Guyana provided the largest number of visitors.

Table 1. Number of participants according to country. Rice Research Station, Crowley, LA. 1988.

Country	Number of participants
Argentina	6
Australia	1
Brazil	9
China (PROC)	4
Colombia	4
Germany (West)	10
Guyana	11
Japan	7
Netherlands	2
Pakistan	1
Sri Lanka	1
TOTAL	56

Table 2 presents information regarding the number of participants according to sponsoring organizations. The largest number was self sponsored.

Subject matter of interest to the participants varied from general rice production practices to specific interest, such as plant breeding, water management, processing, marketing, control of rice diseases, insects and weeds. There was also interest in biotechnology, rice-crawfish rotation, rice genetics, and administrative problems and practices.

Table 2. Number of visitors according to sponsoring organizations. Rice Research Station, Crowley, LA. 1988.

Sponsoring organization		Number sponsored
Cameco		11
FAA		10
FAO/USDA		1
Government (Foreign)		4
Louisiana State University (students)		2
Pilaga S.A.G.		5
Rockefeller Foundation		4
USAID		1
Self		13
Winston Churchill Memorial Trust		1
Zen-Noh Grain Corporation		4
	TOTAL	56

ECONOMICS OF ENTERPRISE SELECTION AND WHOLE FARM DECISION MAKING IN THE LOUISIANA RICE GROWING AREAS *

Arthur M. Heagler and Brian E. McManus **

Enterprise budget projections for 1989 were developed for rice, soybeans, milo, corn, wheat, wheat-soybean double crop, and rice-crawfish double cropping systems. A summary of the enterprise budgeting analysis for Southwest Louisiana is presented in Table 1. Budgeting results for rice production in Northeast Louisiana are shown in Table 2. Owner-operator and tenant-operator situations were budgeted for each enterprise with the exception of the rice-crawfish double cropping system. Other than rice, all enterprises were valued at a projected market price. The rice enterprise was valued at the loan rate price plus the deficiency payment. Under these assumptions, sufficient revenue was available to cover direct expenditures for all but the tenant-operator soybean enterprise using 6 row equipment. 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 plus the annualized cost of replacing capital assets. All tenant situations for all enterprises except rice and wheat-soybeans exhibited negative returns above the total specified expenses. The soybean enterprises were the only owner-operator situations that did not generate sufficient revenues to cover total specified expenses.

Detailed enterprise budgets and supporting data were published in A.E.A. Research Report Number 72, January 1989.

Service enterprise budgets were prepared 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 a deep well water source were estimated to be approximately $1.84, $2.57, and $1.54 for diesel, electric, and natural gas systems, respectively. Total per acre inch irrigation costs for a deep well water source were estimated to be approximately $3.13, $3.64, and $2.82 for diesel, electric, and natural gas systems, respectively. Per acre inch direct irrigation costs for a surface irrigation water source were estimated to be approximately $0.81, $0.96, and $0.67 for diesel, electric, and natural gas systems, respectively. Total per acre inch irrigation costs for a surface water source were estimated to be approximately $1.54, $1.56, and $1.38 for diesel, electric, and natural gas systems, respectively.

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* Research supported in part by funds provided by Louisiana rice producers through the Louisiana Rice Research Board.

** Associate Professor and Research Associate, respectively, Department of Agricultural Economics and Agribusiness, Louisiana Agricultural Experiment Station, Louisiana State University Agricultural Center, Baton Rouge, Louisiana.

For Northeast Louisiana, cost estimates were developed for diesel and electric power systems for both deep well and surface water sources. Per acre inch direct irrigation costs for a deep well water source were estimated to be approximately $0.60 and $0.79 for diesel and electric systems, respectively. Total acre inch irrigation costs for a deep well water source were estimated to be approximately $1.49 and $1.55 for diesel and electric systems respectively. Per acre inch direct irrigation costs for a surface irrigation water source were estimated to be approximately $0.50 and $0.47 for diesel and electric systems respectively. Total per acre inch irrigation costs for a surface water source were estimated to be approximately $1.24 and $1.07 for diesel and electric systems, respectively.

Detailed results of the irrigation cost analysis are reported in A.E.A. Research Report Number 72, January 1989.

An economic analysis of laser leveling rice fields in Louisiana was completed, and results were published in D.A.E. Research Report Number 680, September 1988. Using information obtained through a survey of laser equipment dealers and rice producers, fixed and operating costs were estimated. Operating and total costs per cubic yard of soil moved were approximately $0.25 and $0.48, respectively. Benefits from land leveling include irrigation cost savings and increased yields. Average annual benefits from cost savings and yield increases were estimated to be $0.02 and $0.24 per cubic yard, respectively. Benefits and costs will vary according to the amount of soil moved and the increased yields, and a range of cubic yards and yield increases was used for investment analysis. Using payback analysis, the payback periods were greater than 10 years at the lower yield increases; but at the median and maximum yield levels, payback periods were 4 years or less at all yardage levels. Net present values were also estimated and found to be negative at the minimum yield increases but turn positive as the yield levels increase.

Table 1. A Summary of Projected Costs and Returns per Acre for Rice, Soybeans, Corn, Milo, Wheat, Wheat-Soybean Double Crop, and Rice-Crawfish Double Crop Enterprises, Southwest Louisiana, 1989. [a/]

Crop Description [b/]	Yield Per Acre	Unit	Total Income	Direct Expenses	Returns	Fixed Expenses	Total Expenses	Returns
			---------- Dollars Per Acre ----------					
Rice Enterprises:								
Water Plant, Owner [c/]	46.10	cwt.	497.88	371.33	126.55	96.25	467.58	30.30
Water Plant, Tenant [d/]	27.66	cwt.	298.73	238.22	60.50	50.85	289.08	9.65
Dry Plant, Owner [c/]	48.55	cwt.	524.34	354.26	170.08	100.39	454.65	69.69
Dry Plant, Tenant [d/]	29.13	cwt.	314.60	224.98	89.62	54.99	279.97	34.63
Second Cutting [c/]	9.64	cwt.	104.11	69.66	34.45	32.72	102.38	1.73
Soybean Enterprise:								
6-Row, Owner [c/]	24.50	bu.	147.00	121.78	25.22	38.33	160.11	-13.11
6-Row, Tenant [d/]	19.60	bu.	117.60	120.31	-2.71	38.33	158.64	-41.04
Drill Plant, Owner [c/]	27.00	bu.	162.00	128.29	33.71	37.18	165.48	-3.48
Drill Plant, Tenant [d/]	21.60	bu.	129.60	126.67	2.93	37.18	163.86	-34.26
Corn Enterprises:								
6-Row, Owner [c/]	100.00	bu.	225.00	162.15	62.85	42.09	204.24	20.76
6-Row, Tenant [d/]	80.00	bu.	180.00	158.55	21.45	42.09	200.64	-20.64
Milo Enterprises:								
Drill Plant, Owner [c/]	44.43	cwt.	144.40	105.82	38.58	20.82	136.64	7.75
Drill Plant, Tenant [d/]	35.54	cwt.	115.52	105.82	9.70	30.82	136.64	-21.13

(Continued)

Table 1. (Continued).

Crop Description b/	Yield Per Acre	Unit	Total Income	Direct Expenses	Returns	Fixed Expenses	Total Expenses	Returns
			---------- Dollars Per Acre ----------					
Wheat Enterprises:								
Drill Plant, Owner c/	45.00	bu.	135.00	84.55	50.45	28.33	112.88	22.12
Drill Plant, Tenant d/	36.00	bu.	108.00	84.55	23.45	28.33	112.88	-4.88
Wheat-Soybean Double Crop:								
Wheat Soybean, Owner c/	45 + 25	bu.	285.00	164.95	120.05	49.65	214.60	70.40
Drill Plant, Tenant d/	36 + 20	bu.	228.00	166.20	61.80	49.65	215.85	12.15
Rice-Crawfish Double Crop: e/								
Rice-Crawfish, Owner c/	4,200 + 800	lbs.	663.00	528.10	134.90	202.45	730.54	-67.54

a/ Crop prices used were $10.80 per hundredweight for rice, $6.00 per bushel for soybeans, $3.25 per hundred weight for milo, $3.00 per bushel for wheat, and $2.25 per bushel for corn.

b/ Rental arrangements for rice 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 for all the irrigation fuel. Rental arrangements for soybeans and milo, and wheat were 1/5 crop share for land with the landlord paying 1/5 of drying and storage costs.

c/ Land costs are not included.

d/ Includes land rent based on representative crop-sharing arrangements for the area.

e/ Rice was valued at the loan rate of $6.50 per hundredweight. Average monthly prices for live crawfish were $.60, $.50, and $.40 for January, February, and March, respectively.

Table 2. A Summary of Projected Costs and Returns per Acre for Rice Production, Mississippi Delta and Ouachita Areas, Louisiana, 1989. [a/]

Description [b/]	Yield per Acre	Unit	Total Income	Direct Expenses	Returns	Fixed Expenses	Total Expenses	Returns
			---------- Dollars Per Acre ----------					
Rice, Water Planted, Owner [c/]	48.60	cwt.	524.88	290.04	234.84	83.02	373.07	151.81
Rice, Water Planted, Tenant [d/]	29.16	cwt.	314.93	240.08	74.85	50.77	290.85	24.08
Rice, Drill Planted, Owner [c/]	48.60	cwt.	524.88	284.85	240.03	87.94	372.79	152.09
Rice, Drill Planted, Tenant [d/]	29.16	cwt.	314.93	232.77	82.16	55.69	288.46	26.47

a/ Crop prices used were $10.80 per hundredweight. This is the 1989 target price for rice which consists of the loan price ($6.50 per cwt.) and deficiency payment ($4.30 per cwt.).

b/ Rental arrangements for rice were 1/5 crop share for land and 1/5 crop share for water.

c/ Land costs are not included in total specified expenses for owner-operators.

d/ Includes land rent based on representative crop-sharing arrangements for the area.

STATION PERSONNEL

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Secretary

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2/ Resigned 09/09/88
3/ Resigned 11/30/88
4/ Appointed 09/01/88

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6/ Appointed 11/01/88

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E. Allen Wilson - Bird Control in Rice
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9/ Resigned 12/31/88
10/ Resigned 04/26/88

Cooperating personnel responsible for research projects at the Rice Station include the following campus staff.

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University of Puerto Rico
Lajas, PR

John B. Baker -- Weed Control
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Physiology Department
Louisiana State University Agricultural Center

Gerard T. Berggren, Jr. ---------------------------------- Soybean Diseases
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David J. Boethel --------------------------------------- Soybean Entomology
Southeast Research Station

Gary Britenbeck --------------------------------------- Soybean Inoculation
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Patrick D. Colyer --------------------- Bermudagrass and Alfalfa Diseases
Red River Research Station

Marcus M. Eichhorn, Jr. ------------------------------------- Forage Crops
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The Rice Station is especially indebted to Mr. H. F. Morris, Jr., Feed and Fertilizer Laboratory, for the chemical analysis of research samples. Dr. Kenneth L. Koonce, Department of Experimental Statistics, and his staff aided in the research program through their help in the planning and statistical analysis of research data.

Experiment: Second crop improvement study

Location: Rice Research Station

Soil Type/Analysis: Crowley silt loam; ph: 6.5; O.M.: 0.59%; extractable nutrients (mg/kg): P-10, Na-55, K-95, Ca-1173, Mg-273, Zn-1.16, S-5.63, As-2.39

Variety/Seeding Rate: MERC, 150 lb/A

Planting Method/Date: Water-seeded, Apr 9

Fertilization: First planting, 60 lb/A P_2O_5 and K_2O + 120 lb N/A (ammonium sulfate) ppi; second planting, variable rates (ammonium sulfate)

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

Emergence Date: MERC, Apr 14

Water Management: Flooded, Apr 8; drained, June 7; reflooded, June 9; harvest drainage, July 24; second planting flooded, Aug 5; drained, Oct 31

Herbicides: 0.6 oz ai/A Londax (bensulfuron-methyl), May 13; 1.0 lb ai/A Basagran (bentazon), June 8

Insecticides: 0.6 lb ai/A Furadan (carbofuran), May 23

Fungicides: 0.28 lb ai/A Tilt (propiconazol), June 23; 0.5 lb ai/A Benlate (benomyl), July 7

Harvest: Main crop, Aug 4; second crop, Nov 9

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

Comments: Seedling vigor was very good in the first planting, and MERC responded to applied N 2 weeks after emergence. Days to 50% heading was not influenced by stubble management or N rate (Table 1). Tiller production increased as N increased. Rolling the stubble significantly decreased tiller production and grain yield. Grain yield also increased as rate of N increased.

Table 1. Effect of N rate and stubble management on tiller production, days to 50% heading, and grain yield of second crop Mercury rice. Rice Research Station, Crowley, LA. 1988.

Time of N*			Tillers				Days to 50% heading**				Second crop grain yields at 12% moisture			
Total N	H	R	Conv	Clip	Roll	N Mean	Conv	Clip	Roll	N Mean	Conv	Clip	Roll	N Mean
---(lb/A)---			--------(no/3ft^2)--------								----------(lb/A)---------			
0	--	--	205	265	133	201	151	151	152	151	1387	1301	876	1188
30	--	30	272	295	99	222	151	151	152	151	1629	1580	850	1353
45	--	45	308	290	126	241	150	151	153	151	1776	1557	990	1441
60	--	60	286	310	144	247	151	151	152	151	2168	1853	1050	1690
75	--	75	288	290	135	238	150	151	152	151	2042	1869	1043	1651
90	--	90	297	306	180	261	151	152	152	152	2235	2049	1340	1875
30	30	--	241	367	157	255	151	151	151	151	1648	1564	1241	1484
75	30	45	344	355	247	316	149	150	151	150	2211	2229	1619	2020
60	60	--	340	324	169	277	148	149	150	149	1863	1894	1193	1650
105	60	45	407	380	254	347	148	149	151	149	2393	2430	1794	2206
Stubble mean			299	318	164		150	151	152		1935	1833	1200	
C.V., %				17.77				0.53				13.51		
LSD (0.01):														
Stubble				72				1				344		
Nitrogen				50				1				241		
Nitrogen within stubble				ns				ns				ns		
Nitrogen across stubble				ns				ns				ns		

* Time of N: H = main crop heading; R = ratoon.

** Days to 50% heading is calculated from emergence of the main crop to 50% heading of the second crop.

Table 2. Influence of stubble management and N rate on yield components of second crop Mercury rice. Rice Research Station, Crowley, LA. 1988.

Time of N*			Whole plant				Panicles				Panicle weight				Grain weight			
Total N	H	R	Conv	Clip	Roll	Mean	Conv	Clip	Roll	Mean	Conv	Clip	Roll	Mean	Conv	Clip	Roll	Mean
---(lb/A)---			--------(g/ft^2)-------				------(no/3 ft^2)------				------------------($g/3\ ft^2$)------------------							
0	--	--	199	149	109	152	73	84	55	71	44	63	49	52	39	56	43	46
30	--	30	266	192	119	192	107	105	57	90	74	76	52	67	65	68	45	59
45	--	45	240	196	111	183	110	107	44	87	76	75	41	64	67	67	34	56
60	--	60	273	239	144	219	102	134	54	97	87	104	50	80	78	93	43	71
75	--	75	246	244	195	228	89	119	75	95	85	105	72	87	77	92	62	77
90	--	90	294	235	179	236	103	120	70	98	97	102	69	90	88	91	59	79
30	30	--	234	216	112	187	113	124	59	99	66	79	46	64	58	70	40	56
75	30	45	272	270	229	257	119	160	99	126	90	112	93	99	81	100	82	88
60	60	--	279	199	130	203	116	123	80	106	76	80	56	71	68	71	48	62
105	60	45	314	222	247	261	136	125	125	129	104	97	109	103	93	86	96	92
Stubble mean			262	216	158		107	120	72		80	89	64		71	80	55	
C.V., %				21.15				21.39				23.32				24.13		
LSD (0.05):																		
Stubble					32				19				12				12	
Nitrogen					36				17				15				13	
N within stubble					ns				ns				ns				ns	
N across stubble					ns				ns				ns				ns	

* Time of N: H = main crop heading; R = ratoon.

Table 3. Influence of stubble management and N rate on yield components of second crop Mercury rice. Rice Research Station, Crowley, LA. 1988.

Time of N*			Panicle weight				Grain weight				Sterile florets				Filled grains			
Total N	H	R	Conv	Clip	Roll	N Mean	Conv	Clip	Roll	N Mean	Conv	Clip	Roll	N Mean	Conv	Clip	Roll	N Mean
---(lb/A)---			----------------(g/20 panicles)----------------								---------------(no/20 panicles)---------------							
0	--	--	16	16	21	18	15	15	19	16	146	155	214	172	642	621	794	686
30	--	30	16	16	22	18	14	14	20	16	192	197	251	214	595	594	847	678
45	--	45	17	14	22	18	15	13	19	16	187	158	363	236	658	553	817	676
60	--	60	19	19	21	20	18	17	18	18	197	211	317	242	748	766	760	758
75	--	75	21	18	22	20	19	16	20	18	210	251	257	239	824	703	854	794
90	--	90	18	18	24	20	16	16	21	18	196	218	364	259	717	698	907	774
30	30	--	14	14	16	14	13	12	14	13	136	175	165	159	542	517	620	560
75	30	45	16	19	19	18	14	17	18	16	203	208	212	208	642	745	752	713
60	60	--	14	14	17	15	13	12	15	13	166	170	262	200	542	528	639	570
105	60	45	18	17	20	18	16	15	18	17	222	229	263	238	708	673	794	725
Stubble mean			17	17	20		15	15	18		185	197	267		662	640	778	
C.V., %				17.53				18.60				37.49				18.06		
LSD (0.05):																		
Stubble					2				2				46				101	
Nitrogen					3				2				ns				102	
N within stubble					ns				ns				ns				ns	
N across stubble					ns				ns				ns				ns	

* Time of N: H = main crop heading; R = ratoon.

INFLUENCE OF SEEDING RATE ON PERFORMANCE AND GRAIN YIELDS OF SELECTED RICE VARIETIES GROWN IN WATER-SEEDED AND DRY-SEEDED CULTURAL SYSTEMS

P.K. Bollich, W.J. Leonards, Jr., S.M. Rawls, and D.M. Walker

INTRODUCTION

Stand establishment is a very critical initial step toward successful rice production. Poor establishment can result in greater weed competition and increased pressure from the rice water weevil. Excessively thick stands can result in increased disease pressure and plant lodging. In either of these situations, lower grain yields will probably occur.

Rice is planted in Louisiana in three ways. Rice is water-seeded with either dry or pre-sprouted seed, drill-seeded on 7- to 10-inch spacings, or broadcast dry. According to current information, regardless of the method of planting, the optimum plant stand is 15 to 20 plants per square foot, with a minimum of 6 to 8 and a maximum of 30.

The current recommendation for seeding rate for either water seeding or dry broadcasting is 100 to 150 lb/A, and 90 to 110 lb for drill seeding. The higher seeding rates are recommended when planting during cool weather conditions, especially when water seeding, in areas where bird depradation is a problem, when planting seed with a low germination percentage, where seedbed preparation is less than desirable, or in any situation where water management or water quality (such as salt water) is a problem.

Commercial rice varieties differ in seedling vigor and in their ability to tiller, and these factors can significantly influence stand establishment in either cultural system. The recommended varieties have changed considerably in recent years, especially with the advent of the semidwarf plant type. The objective of this study is to determine the response of four of the more commonly grown rice varieties to variable seeding rate.

MATERIALS AND METHODS

Four rice varieties were compared at variable seeding rates in water- and dry-seeded culture: Tebonnet (TBNT), a very early long-grain, Mars and Mercury (MERC), early medium-grains, and Lemont (LMNT), an early long-grain. Seeding rates in the water-seeded study were 100, 125, and 150 lb/A, and 50, 75, and 100 lb/A in the drill-seeded study.

Each study was fertilized with 60 lb/A P_2O_5 and K_2O preplant incorporated. Approximately 120 lb N/A were applied preplant incorporated in the water-seeded study and preflood in the drill-seeded study. Water management typical of a water-seeded, pinpoint flood system and a drill-seeded system was followed.

Pest control (weeds, insects, disease), when necessary, was practiced according to current recommendations. Stand counts were determined at the 3-leaf growth stage (2 weeks after emergence). Individual whole plots were combine-harvested at field maturity. Days to 50% heading, plant height, lodging, grain moisture, and grain yield were measured. Yield components were determined.

SUMMARY AND CONCLUSIONS

Seeding rate studies were conducted at the Rice Research Station to determine the influence of variable seeding rates on performance, grain yields, and yield components of Tebonnet, Mars, Mercury, and Lemont in water- and dry-seeded culture.

Stand densities increased with increasing seeding rate in the drill-seeded study as expected (Table 1). Stand densities for Mars, Mercury, and Tebonnet were slightly higher than Lemont at the highest rate of 100 lb/A. Seeding rate had little influence on days to 50% heading or plant height. Seeding rate did have a slight effect on grain yield for the varieties Tebonnet, Mars, and Mercury, with maximum yield occurring at a rate of 125 lb/A. There was no response to rate for Lemont. Most yield components were not influenced by seeding rate, however, the number of filled grains was highest at a rate of 50 lb seed/A (Table 2). Most of the differences in yield components were due to variety, with Mars and Tebonnet having the highest plant weight and highest percentage of filled grain. Mercury and Tebonnet produced the greatest number of sterile florets.

Response of stand density to increasing seeding rate in the water-seeded study was similar. Average density for Mars was higher than that of the other varieties (Table 3). There was no influence of seeding rate on days to 50% heading. Plant height for Tebonnet decreased as seeding rate increased, while height for the other varieties remained relatively constant. Mars decreased slightly in grain yield as seeding rate increased, while the other varieties showed little response to variable seeding rate. A seeding rate of 100 lb/A produced greater plant weight and more panicles (Table 4). Number of sterile florets was significantly higher for Tebonnet, while the number of filled grains was lowest for Lemont.

Experiment: Seeding rate x variety trial

Location: Rice Research Station

Soil Type/Analysis: Crowley silt loam; ph: 6.7; O.M.: 0.65%; extractable nutrients (mg/kg): P-12, Na-48, K-119, Ca-1195, Mg-226, Zn-1.27, S-4.14, As-2.88

Variety/Seeding Rate: MARS, MERC, TBNT, LMNT, 100 lb/A

Planting Method/Date: Drill-seeded, Apr 8

Fertilization: 60 lb/A P_2O_5 and K_2O ppi; 120 lb N/A, nitrogen source, ammonium sulfate

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

Emergence Date: MARS, MERC, TBNT,LMNT, Apr 20

Water Management: Flushed, Apr 12, Apr 20, May 5; permanent flood, May 14; drained, June 7; reflooded, June 9; harvest drainage, Aug 8

Herbicides: 4.0 lb ai/A Stam (propanil), May 3; 3 lb ai/A Stam + 0.5 lb ai/A Basagran (bentazon), May 13; 1.0 lb ai/A Basagran, June 8; 0.6 oz ai/A Londax (bensulfuron-methyl), June 28

Insecticides: 0.6 lb ai/A Furadan (carbofuran), May 23

Fungicides: 0.28 lb ai/A Tilt (propiconazol), June 23; 0.5 lb ai/A Benlate (benomyl), July 7

Harvest: Main crop, Aug 23

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

Comments: Days to 50% heading and plant height were not influenced by seeding rate (Table 1). A seeding rate of 125 lb/A was optimum for all varieties.

Table 1. Effect of seeding rate (SR) on performance and grain yields of drill-seeded rice varieties. Rice Research Station, Crowley, LA. 1988.

	Stand count				Days to 50% heading				Plant height				Grain yield at 12%			
Variety	50	75	100	Mean	50	75	100	Mean	50	75	100	Mean	50	75	100	Mean
	---(plants/ft^2)---								---------(cm)---------				--------(lb/A)--------			
MARS	21	32	33	29	84	84	83	84	101	99	99	100	7807	8110	7920	7946
MERC	18	28	36	27	83	82	82	83	77	78	76	77	6844	7288	7027	7053
TBNT	19	24	33	26	83	82	81	82	116	115	113	115	7684	7903	7988	7858
LMNT	17	26	28	23	90	87	87	88	74	72	70	72	7565	7415	7638	7539
SR Mean	19	28	33		85	84	83		92	91	90		7475	7679	7643	
C.V., %		11.10				1.00				4.28				3.33		
LSD (0.01):																
Seed rate			4				1				ns				ns	
Variety			3				1				4				286	
V within SR			ns				2				ns				ns	
V across SR			ns				1				ns				ns	

Table 2. Effect of seeding rate (SR) on yield components of drill-seeded rice varieties. Rice Research Station, Crowley, LA. 1988.

Variety	Whole plant 50	75	100	Mean	Panicles 50	75	100	Mean	Panicle weight 50	75	100	Mean	Grain weight 50	75	100	Mean
	-----(g/ft^2)----				---(no/3 ft^2)---				------------(g/3 ft^2)-----------							
MARS	639	641	664	648	126	122	140	129	333	331	341	335	312	310	318	313
MERC	592	597	568	586	139	144	145	143	316	313	290	306	292	288	266	282
TBNT	717	612	652	661	141	141	151	145	367	325	341	345	340	301	314	318
LMNT	579	607	571	586	134	160	150	148	320	338	312	324	301	314	293	303
SR Mean	632	614	614		135	142	147		334	327	321		311	303	298	
C.V., %			10.46				10.12				9.35				9.11	
LSD (0.05):																
SR			ns				ns				ns				ns	
V			54				12				26				23	
V within SR			ns				ns				ns				ns	
V across SR			ns				ns				ns				ns	

Variety	Panicle weight 50	75	100	Mean	Grain weight 50	75	100	Mean	Sterile florets 50	75	100	Mean	Filled grains 50	75	100	Mean
	---------(g/20 panicles)--------								-----------(no/20 panicles)-----------							
MARS	58	60	54	57	55	58	52	55	177	182	193	184	2177	2275	2092	2181
MERC	49	45	42	45	46	42	41	43	422	318	427	389	1911	1688	1645	1748
TBNT	55	54	49	53	52	51	46	50	240	323	273	279	2248	2176	2001	2142
LMNT	50	43	43	45	47	42	41	43	181	226	138	182	1763	1554	1562	1626
SR Mean	53	51	47		50	48	45		255	262	258		2025	1923	1825	
C.V., %			11.92				11.57				34.41				12.22	
LSD (0.05):																
SR			4				3				ns				143	
V			5				5				74				197	
V within SR			ns				ns				ns				ns	
V across SR			ns				ns				ns				ns	

Experiment: Seeding rate x variety trial

Location: Rice Research Station

Soil Type/Analysis: Crowley silt loam; ph: 6.9; O.M.: 0.69%; extractable nutrients (mg/kg): P-12, Na-40, K-112, Ca-1270, Mg-255, Zn-1.12, S-4.24 As-3.28

Variety/Seeding Rate: MARS, MERC, TBNT, LMNT, 150 lb/A

Planting Method/Date: Water-seeded, Apr 13

Fertilization: 60 lb/A P_2O_5 and K_2O ppi; 120 lb N/A ppi, nitrogen source, ammonium sulfate

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

Emergence Date: MERC, Apr 18; MARS, Apr 19; TBNT, LMNT, Apr 20

Water Management: Flooded, Apr 12; drained, June 7; reflooded, June 9; harvest drainage, July 28

Herbicides: 0.6 oz ai/A Londax (bensulfuron-methyl), May 13; 1.0 lb ai/A Basagran (bentazon), June 8

Insecticides: 0.6 lb ai/A Furadan (carbofuran), May 23

Fungicides: 0.28 lb ai/A Tilt (propiconazol), June 23; 0.5 lb ai/A Benlate (benomyl), July 7

Harvest: Main crop, Aug 16

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

Comments: Days to 50% heading and plant height were not influenced by seeding rate for most varieties (Table 3). Grain yields were relatively constant across seeding rates.

Table 3. Effect of seeding rate (SR) on performance and grain yields of water-seeded rice varieties. Rice Research Station, Crowley, LA. 1988.

	Stand count				Days to 50% heading				Plant height				Grain yield at 12%			
Variety	100	125	150	Mean	100	125	150	Mean	100	125	150	Mean	100	125	150	Mean
	---(plants/ft^2)---								---------(cm)---------				--------(lb/A)--------			
MARS	23	27	37	29	80	80	80	80	109	110	107	109	8245	8124	7953	8107
MERC	22	26	27	25	80	80	80	80	86	86	86	86	8633	8670	8756	8686
TBNT	15	24	30	23	77	74	73	75	127	123	120	123	7813	7713	8007	7844
LMNT	18	23	25	22	80	79	79	80	81	80	79	80	8199	8297	8272	8256
SR Mean	19	25	30		79	79	78		101	100	98		8223	8201	8247	
C.V., %		17.18				1.64				4.05				4.99		
LSD (0.01):																
Seed rate			10			1					ns				ns	
Variety			5			1					5				464	
V within SR			ns			ns					ns				ns	
V across SR			ns			ns					ns				ns	

Table 4. Effect of seeding rate (SR) on yield components of water-seeded rice varieties. Rice Research Station, Crowley, LA. 1988.

Variety	Whole plant				Panicles				Panicle weight				Grain weight			
	50	75	100	Mean	50	75	100	Mean	50	75	100	Mean	50	75	100	Mean
	(g/ft^2)				(no/3 ft^2)				(g/3 ft^2)							
MARS	629	612	746	662	138	132	179	150	309	304	353	322	287	283	327	299
MERC	619	649	645	638	163	171	164	166	336	349	348	344	314	325	325	321
TBNT	692	599	690	661	144	149	194	163	348	314	357	340	318	310	323	317
LMNT	567	630	618	605	174	204	205	195	313	344	333	330	294	322	312	309
SR Mean	627	623	675		155	164	186		326	328	348		303	310	322	
C.V., %			7.75				8.67				7.18				8.34	
LSD (0.05):																
SR			34				17				ns				ns	
V			42				12				ns				ns	
V within SR			72				21				ns				ns	
V across SR			71				25				ns				ns	

Variety	Panicle weight				Grain weight				Sterile florets				Filled grains			
	50	75	100	Mean	50	75	100	Mean	50	75	100	Mean	50	75	100	Mean
	(g/20 panicles)								(no/20 panicles)							
MARS	49	48	45	47	47	45	43	45	244	235	205	228	1906	1834	1732	1824
MERC	42	44	45	44	40	41	43	41	248	247	245	247	1583	1666	1708	1652
TBNT	50	43	36	43	45	39	32	39	608	570	436	538	2090	1776	1503	1790
LMNT	37	34	34	35	34	31	32	33	190	174	152	172	1351	1225	1241	1272
SR Mean	45	42	40		41	39	37		323	306	260		1733	1625	1546	
C.V., %			10.00				9.72				35.11				10.45	
LSD (0.05):																
SR			ns				ns				ns				ns	
V			3				3				87				143	
V within SR			ns				ns				ns				248	
V across SR			ns				ns				ns				297	

NO-TILL AND STALE SEEDBED RICE PRODUCTION FOR LOUISIANA

P.K. Bollich, W.J. Leonards, Jr., S.M. Rawls, and D.M. Walker

INTRODUCTION

Rice farmers in Louisiana typically prepare a seedbed prior to planting in a number of ways. Rice land is usually worked in late fall or early spring to some extent. Operations may include disking, field cultivation, and water or dry leveling. Preparing a seedbed by some conventional means destroys weeds and provides moisture, nutrients, and air to allow for plant root penetration.

The advantages of conventional seedbed preparation are obvious. There has been considerable interest in recent years, however, to utilize no-tillage and stale seedbed planting practices in many crops. These techniques have been promoted to conserve moisture, reduce seedbed preparation costs, reduce soil erosion, and save time. Little attention has been given to adapting these tillage techniques to rice production.

A no-tillage system is the seeding of one crop into previous residue of another crop without disturbing the soil. A stale seedbed system requires some degree of early seedbed preparation, and then allowing a flush of weeds to develop prior to planting. In each of these systems a herbicide treatment is used to control or kill existing vegetation at or before planting. The objective of this study is to determine the feasibility of producing rice using stale seedbed and no-tillage practices in the water- and dry-seeded rice cultural systems.

MATERIALS AND METHODS

The stale seedbed treatment was disked twice, and vibrashanked and conditioned with a roller harrow 8 weeks prior to planting. The conventional seedbed was disked once, and vibrashanked and conditioned with a roller harrow twice immediately before planting. Roundup was applied at the rate of 1 lb/A plus 1 pint of surfactant by groundrig. Approximately 60 lb/A P_2O_5 and K_2O were banded with a no-till drill 1 to 2 inches deep. In the drill-seeded experiment, 20 lb N/A was also banded, and the test area was planted 2 days after herbicide application. In the water-seeded experiment, 90 lb N/A was banded, and the test area was flooded and planted 5 days after herbicide application. Pinpoint flood water management was practiced for the water-seeded study. The drill-seeded study was frequently flushed to encourage emergence and stand establishment. The test area was fertilized with 90 lb N/A prior to establishment of the permanent flood. Each experiment was topdressed with 30 lb N/A at midseason.

Pest control (weeds, insects, disease) was practiced, when necessary, according to current recommendations. Stand density was determined at the 2- to 3-leaf growth stage (1 to 2 weeks after planting). Individual whole plots were combine-harvested at field maturity. Grain yield and moisture were determined.

SUMMARY AND CONCLUSIONS

Seed and fertilizer placement was more precise in 1988 than in 1987 with the use of a no-till grain and fertilizer drill. Although the seedbed in the no-till treatment was very hard and compact, placement of both seed and fertilizer was uniform. Stand establishment was somewhat better than in the previous year.

The burndown herbicide (Roundup) did an excellent job in controlling existing vegetation in the no-till and stale seedbed treatments. Weeds in the stale seedbed treatment included annual seedling grasses, dayflower, and some alligatorweed. Weeds in the no-till treatment consisted primarily of large winter annual broadleaves and alligatorweed. A lesser number of annual grasses and dayflower was present. Two postemergence herbicide applications were required in the drill-seeded experiment prior to establishment of the permanent flood for control of dayflower and annual grasses. One postemergence application was required for control of ducksalad and annual grasses in the water-seeded experiment. Each experiment was also treated with an application of Londax for control of aquatic weeds in areas of low stand density.

Decreased stand density was observed in the water-seeded study in the no-till treatment. This was probably due to difficulty in seedling root penetration and interference of the dead vegetation with seedling anchorage. The decrease in stand density had no influence on grain yield, and yields were similar for all treatments. Stand densities in the drill-seed experiment were similar. Establishment was slower in the no-till treatment, although stand density in this treatment was comparable to the other treatments. There was no difference in grain yield between conventionally prepared and stale seedbed preparation. Grain yield was decreased slightly in the no-till treatment.

Results of this study indicate potential for utilizing stale and no-till seedbed techniques in Louisiana rice production. Although yields decreased in the no-till, drill-seeded system, less input was required for production. Grain yield resulting from no-till establishment in the water-seeded cultural system was equivalent to conventional management.

Experiment: Seedbed preparation alternatives

Location: Rice Research Station, South Unit

Soil Type/Analysis: Crowley silt loam; ph: 5.6; O.M.: 1.23%; extractable nutrients (mg/kg): P-26, Na-77, K-156, Ca-1507, Mg-333, Zn-2.07, S-51.01, As-3.12

Variety/Seeding Rate: LMNT, 150 lb/A

Planting Method/Date: Water-seeded, May 16

Fertilization: 60 lb/A P_2O_5 and K_2O ppi; 90 lb N/A (ammonium sulfate) ppi, May 13; 30 lb N/A topdress, July 8

Plot Size: 25 x 130 ft (3250 ft^2)

Emergence Date: May 20

Water Management: Flooded, May 15; drained, May 18; reflooded, May 23; drained, June 4; reflooded, June 7; harvest drainage, Sep 2

Herbicides: 1.0 lb ai/A Roundup (glyphosate), May 11; 4.0 lb ai/A Stam (propanil) + 1.0 lb ai/A Basagran (bentazon), June 6; 0.6 oz ai/A Londax (bensulfuron-methyl), June 14

Insecticides: 0.6 lb ai/A Furadan (carbofuran), June 22

Fungicides: 0.22 lb ai/A Tilt (propiconazol), July 10, July 21

Harvest: Sep 13

Experimental Design: Completely randomized design, six replications

Comments: Stand establishment was somewhat slower in the no-till treatment. Roundup gave good control of vegetation prior to planting. An application of Stam + Basagran was required to control dayflower, ducksalad, and annual grasses. An application of Londax was also necessary for control of aquatic weeds in areas of poor stand establishment. Although two applications of fungicide were made, severe sheath blight had a significant influence on grain yields of LMNT. Grain yields among seedbed preparation treatments were similar (Table 1).

Experiment: Seedbed preparation alternatives

Location: Rice Research Station, South Unit

Soil Type/Analysis: Crowley silt loam; ph: 5.0; O.M.: 1.34%; extractable nutrients (mg/kg): P-20, Na-76, K-208, Ca-1262, Mg-331, Zn-2.37, S-49.67, As-3.44

Variety/Seeding Rate: LMNT, 100 lb/A

Planting Method/Date: Drill-seeded, May 13

Fertilization: 20 lb N/A + 60 lb/A P_2O_5 and K_2O ppi; 90 lb N/A (urea) pf, June 16; 30 lb N/A topdress, July 21

Plot Size: 25 x 130 ft (3250 ft^2)

Emergence Date: May 27

Water Management: Flushed, May 17, May 24, May 29, June 10; permanent flood, June 17; harvest drainage, Sep 2

Herbicides: 1.0 lb ai/A Roundup (glyphosate), May 11; 4.0 lb ai/A Stam (propanil) + 1.0 lb ai/A Basagran (bentazon), June 6; 4.0 lb ai/A Stam, June 14; 0.6 oz ai/A Londax (bensulfuron-methyl), June 28

Insecticides: 0.6 lb ai/A Furadan (carbofuran), July 6

Fungicides: 0.22 lb ai/A Tilt (propiconazol), July 14

Harvest: Sep 13

Experimental Design: Completely randomized design, six replications

Comments: Stand establishment was slow, especially in the no-till treatment. Roundup gave good control of vegetation prior to planting. An application of Stam + Basagran was required to control dayflower and annual grasses, with a second application of Stam required before permanent flood establishment. An application of Londax was also necessary for control of aquatic weeds in areas of poor stand establishment. One application of a fungicide was made, and moderate sheath blight pressure had some influence grain yields. Grain yields for conventional and stale seedbeds were similar (Table 1). A reduction in grain yield was measured in the no-till treatment.

Table 1. Influence of seedbed preparation on stand density and grain yield of Lemont rice. Rice Research Station, South Unit, Crowley, LA. 1988.

Cultural system	Seedbed preparation	Stand density	Grain yield at 12% moisture
		(plants/ft^2)	(lb/A)
Water-seeded	Conventional	29	5434
	Stale seedbed	29	5341
	No-tillage	17	5571
C.V., %		27.5	8.34
LSD (0.05)		8	ns
Drill-seeded	Conventional	16	4905
	Stale seedbed	14	4896
	No-tillage	13	4446
C.V., %		22.9	3.76
LSD (0.05)		ns	220

DOUBLE-CROPPING RICE FOLLOWING RICE AS AN ALTERNATIVE TO RATOON CROPPING

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INTRODUCTION

In Louisiana, typical double-cropping systems have included wheat and soybeans, rice and crawfish, and to a lesser extent wheat and rice. Double-cropping systems offer the opportunity to produce more than one crop on the same land area annually. Various forms of reduced tillage seeding have been incorporated into double-cropped systems to take advantage of moisture and soil conservation, reduced labor and fuel costs, and earliness in getting the double crop initiated.

Rice producers in southwest Louisiana have been growing a ratoon crop, or second crop as it is commonly called, to increase total annual production per unit area for many years. With a minimum amount of input, a farmer may realize a second crop grain yield of 20-35% of the main crop. An important consideration for successful second cropping is earliness in main crop planting. Early planting and early maturing varieties are necessary for successful second cropping, since the length of the growing season during the fall is relatively short. The time required to produce a second crop for most varieties is roughly 75% of that required for the main crop.

There has been no research to determine the feasibility in growing two planted rice crops within a season. Second cropping requires fewer days from main crop harvest to second crop harvest than would a crop planted from seed. Second cropping also offers the advantage of lower input for optimum yield. Yields of the second crop generally range from 20-35% of main crop yields. Although yields are decreased somewhat in very late planted rice, a planted rice crop will generally out-yield a second crop.

The objectives of this study are to 1) determine the feasibility of planting two successive rice crops from seed within a single growing season, 2) compare a number of planting methods for the second rice crop, and 3) compare two planted rice varieties in the second rice crop to the standard ratoon crop.

MATERIALS AND METHODS

The long grain, semidwarf, California variety L202, and 2219, an experimental semidwarf line from Louisiana, were used in the study. A nitrogen rate of 120 lbs/A as ammonium sulfate was banded approximately 2 inches deep with 60 lb/A P_2O_5 and K_2O 1 day prior to flooding the continuous flood, water-seeded experiment. Presoaked L202 and 2219 were seeded at the rate of

150 lb/A into a shallow flood. Pest control (weeds, insects, disease), when necessary, was practiced according to current recommendations. The experiment was harvested at field maturity, and the main crop yield was estimated from eight individual whole plots.

Planting methods were imposed onto the experiment after completion of harvest. Conventional seedbed preparation consisted of tillage and smoothing to produce a fine, well-prepared seedbed. Rice stubble was either burned or left standing green. Presoaked L202 and 2219 were water-seeded into each seedbed type at a rate of 150 lb/A. A combine reseed treatment consisted of seed resulting from harvest loss in the first planted crop and was considered a replanted treatment. A ratoon was also produced from the L202 and 2219 planted in the first crop. Rice straw was removed from the reseed, ratoon, and stubble replant treatments. The experiment was drained after 4 days to allow for stand establishment. A herbicide application was made prior to the permanent flood for control of annual grasses. The entire experiment received 60 lb N/A and was permanently flooded. Four weeks after permanently flooding the study, all treatments except the ratoons of L202 and 2219 were topdressed with an additional 30 lb N/A.

A small plot harvester was used to remove the center of each individual plot at field maturity. Grain moisture and grain yield were measured.

SUMMARY AND CONCLUSIONS

A field experiment was conducted at the Rice Research Station to determine the feasibility of double-cropping rice following rice within a single growing season. A number of planting methods and two varieties for the second crop rice were evaluated.

Average grain yields for L202 and 2219 from the first planting were 7311 and 6789 lb/A, respectively. Highest grain yields in the second planting resulted from ratoon cropping in the conventional manner. Grain yields for L202 when planted into a conventionally prepared or burned stubble seedbed were comparable to ratoon cropping. The combine reseed treatment yielded significantly less. When L202 was seeded into green stubble, some decrease in yield was observed when compared to the ratoon. No difference was observed between these two treatments for 2219. Competition for nutrients and sunlight between the planted seed and the stubble regrowth probably contributed to the decrease in yield for L202. Stand establishment was poor for 2219, and the planted seed did not compete with the established ratoon. Yields of 2219 were significantly lower in all other reseeded treatments, with the ratoon being superior. Average grain yields for L202 were significantly higher than those of 2219.

Cool temperatures in early October and November significantly decreased yield potential of L202 and 2219 in all of the reseeded treatments. Unlike 1987, when all reseeded treatments significantly outyielded the ratoon, the ratoon system produced the highest yields. No advantage in grain yield was found for any reseeding treatment. Reseeding generally resulted in lower grain yields than those of ratoon production.

This preliminary study indicates that double-cropping rice following rice has the same risks that are associated with ratoon cropping. Very early planting will be essential, and less than optimum growing conditions during the double crop cycle (such as cool temperatures during reproductive plant growth) will have a significant effect on yield potential. Further research is necessary to identify suitable varieties and planting methods which reduce the time required for initiating the second planting.

Experiment: Rice double-cropping study

Location: Rice Research Station

Soil Type/Analysis: Crowley silt loam; ph: 6.5; O.M.: 0.67%; extractable nutrients (mg/kg): P-9, Na-46, K-125, Ca-1087, Mg-239, Zn-1.40, S-4.75, As-2.55

Variety/Seeding Rate: L202, 2219, 150 lb/A

Planting Method/Date: Water-seeded, Apr 9

Fertilization: First planting, 60 lb/A P_2O_5 and K_2O + 120 lb N/A (ammonium sulfate) ppi; second planting, 60-90 lb N/A

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

Emergence Date: L202, Apr 15; 2219, Apr 16

Water Management: Flooded, Apr 8; drained, June 7; reflooded, June 9; harvest drainage, July 20; second planting flooded, Aug 2; drained, Aug 7; reflooded, Aug 30; harvest drainage, Oct 31

Herbicides: 0.6 oz ai/A Londax (bensulfuron-methyl), May 13; 1.0 lb ai/A Basagran (bentazon), June 8; second planting- 3.0 lb ai/A Stam (propanil) + 0.75 lb ai/A Basagran, Aug 22; 4.0 lb ai/A Stam, Aug 29

Insecticides: 0.6 lb ai/A Furadan (carbofuran), May 23

Fungicides: 0.28 lb ai/A Tilt (propiconazol), June 23; 0.5 lb ai/A Benlate (benomyl), July 7

Harvest: Main crop, July 28; double crop, Dec 1

Experimental Design: Split plot in a randomized complete block with four replications, variety assigned to main plots and planting method to subplots.

Comments: Seedling vigor was good for L202 and 2219 in the first planting. L202 headed 3 days earlier than 2219. L202 and 2219 yielded 7689 and 7311 lb/A in the first planting, respectively. In the double crop, stand establishment was good for L202 in all treatments, but somewhat poor for 2219. Grain yields were low in all of the reseeded treatments, especially those of 2219 (Table 1). Average yields from the ratoon treatments were significantly higher than those of the replanted treatments.

Table 1. Grain yields of double-cropped L202 and 2219 long-grain rice planted in conventional and non-conventional seedbeds. Rice Research Station, Crowley, LA. 1988.

Seedbed preparation	Grain yield at 12% moisture		
	L202	2219	Mean
	---------(lb/A)---------		
Conventional	1695	545	1119
Burned stubble	1718	523	1121
Standing stubble	1679	1836	1757
Combine reseed	1137	532	835
Ratoon	1941	1927	1934
Variety mean	1671	1151	
C.V., %		18.43	
LSD (0.05):			
Variety		186	
Seedbed		266	
Seedbed within variety		376	
Seedbed across variety		359	

NITROGEN MANAGEMENT IN FURROW-IRRIGATED LEMONT RICE

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INTRODUCTION

Rice produced in the United States is grown under flooded conditions. Attempts have been made to grow rice under upland conditions, using sprinkler irrigation to supplement rainfall to supply the water requirement for proper plant growth. Problems encountered included increased disease pressure, decreased weed control, and maintenance of fertilizer nitrogen (N).

Research was initiated in Missouri to evaluate the potential for growing rice under upland conditions using furrow irrigation. Many of the rice farmers also grow row crops, and are familiar with traditional furrow irrigation for supplying supplemental water during periods of low rainfall. The objective of the research was to determine whether furrow irrigation could reduce the water requirement necessary for rice culture under flooded conditions. Preliminary results indicate a reduction in the traditional water requirement by 50%. Additional research is currently underway to address pest management and N fertilization in furrow-irrigated rice culture in Missouri. Arkansas has also initiated research to study the behavior of fertilizer N when introduced into the irrigation water.

Many rice farmers in Louisiana are also producing row crops such as cotton and soybeans, especially in the northeast section of the state, and emphasis on row crop irrigation to supplement rainfall is increasing. There appears to be some potential for farmers in these situations to use furrow irrigation to further diversify their farm operations. A study was initiated in 1988 to evaluate the potential for production of furrow-irrigated rice. The objective of the study was to investigate a number of N sources, N rates, and N timing to determine how N should be managed in upland rice culture.

MATERIALS AND METHODS

Approximately 21 lb N/A and 60 lb/A P_2O_5 and K_2O were preplant incorporated. Rows were formed with a 32-inch spacing, followed by conditioning with a roller harrow. Lemont rice was seeded at the rate of 100 lb/A with a no-till grain drill. Each flushing operation consisted of running irrigation water down the row middles until the seedbed was completely saturated. Nitrogen treatments were applied 3 weeks after rice emergence, at the 3- to 4-leaf growth stage. This timing is comparable to a preflood (PF) application in a traditional dry-seeded cultural system. Eleven source x rate x timing treatments were applied. Urea was applied as a single PF application of 120 lb/A or as a 2-, 3-, 4-, or 5-way split at rates ranging from 120 to 180 lb/A.

The 2-way split consisted of applying either 90 or 120 lb N/A PF, followed by 30 lb N/A at panicle initiation (PI). The 3-way split consisted of applying either 60 lb N/A PF at PI and at panicle differentiation (PD) growth stages or 120 lb N/A PF and 30 lb N/A at PD and at PD plus 10 days. The 4-way split consisted of applying 30 lb N/A every 10 days or applying 30 lb/A based on need as determined by visual observation, beginning with a PF application. The 5-way split consisted of applying 30 lb N/A every 7 days beginning with a PF application. Dicyan-diamide (DCD), a urea formulation containing 10% DCD, was applied as a single PF application of 120 lb/A. DCD is a slow-release N fertilizer and also possesses nitrification properties. Sulfur-coated urea (SCU) with a dissolution rate of 25% was applied as a single PF application of 120 lb/A. SCU is also a slow release N fertilizer. N-Hib Calcium, a liquid formulation, was applied as a single PF application of 100 lb N/A, and also supplied approximately 37.5 lb/A calcium (Ca). This formulation is currently being investigated for its potential to reduce nitrification, increase plant assimilation of ammonia N, and provide Ca as a nutrient.

Pest control (weeds, insects, disease), when necessary, was practiced according to current recommendations. Individual whole plots were combine-harvested at field maturity. Days to 50% heading, plant height, grain moisture, and grain yield were measured. Water use was also estimated.

SUMMARY AND CONCLUSIONS

A field experiment was conducted at the South Unit of the Rice Research Station to evaluate the potential for growing rice under furrow-irrigated, upland conditions and to develop strategy for N management in such a system.

Slow early-season growth of the rice and the absence of a flood reduced the effectiveness of weed control, and three herbicide applications were required. After the last application, closure of the rice canopy eliminated any additional problems, and the test area remained relatively weed-free for the remainder of the season.

There was little influence on days to 50% heading by the N treatments, with a range of 79 to 82 days. Plant height was influenced by N, generally increasing with higher levels of N and multiple split applications, suggesting that more N was available to the plant when applied over time. The lowest grain yields resulted from a single application of PF urea and from the N-Hib Calcium. Neither of these treatments supplied enough N to the rice for optimum grain yield. A PF application of DCD showed a slight increase in yield over urea alone, although not significant. The highest grain yields resulted from the multiple split applications when applied based on growth stage, visual assessment, or a 7-day schedule. Grain yield was somewhat lower when urea was applied on a 10-day schedule, and may have been the result of N deficiency occurring between splits. A single application of SCU also produced yield similar to the multiple applications.

A rough estimate of total water supplied in acre inches was determined. Approximately 25 inches of water were applied to the test area through furrow irrigation. An additional 18 inches of water were supplied through rainfall, resulting in 43 inches of total water supplied. Based on information generated at the Texas Research and Extension Center in 1988, a total of 42 inches of water were applied to a dry-seeded, flooded system. Runoff was determined to be 15 inches of water, resulting in a net water requirement of 27 inches. Runoff was not determined in this study, however, based on total water applied through irrigation and rainfall, the estimates for furrow-irrigated rice and flooded rice culture were similar. In 1988, there did not appear to be any difference in water requirement between furrow irrigation and flooded culture.

Nitrogen efficiency and stability will be influenced in an upland, furrow-irrigated system to a greater extent than in traditional flood management. More research is required to determine how N should be managed for maximum efficiency. Slow-release N formulations and materials possessing inhibitor properties need to be evaluated for their potential use in furrow-irrigated rice culture.

Experiment: Nitrogen management for furrow-irrigated rice

Location: Rice Research Station, South Unit

Soil Type/Analysis: Crowley silt loam; ph: 5.0; O.M.: 1.34%; extractable nutrients (mg/kg): P-20, Na-76, K-208, Ca-1262, Mg-331, Zn-2.37, S-49.67, As-3.44

Variety/Seeding Rate: LMNT, 100 lb/A

Planting Method/Date: Drill-seeded, May 16

Fertilization: 20 lb N/A + 60 lb/A P_2O_5 and K_2O ppi; variable rates and timing of N preflood

Plot Size: 10.67 x 25 ft (267 ft^2), 6.2-inch drill spacing

Emergence Date: May 27

Water Management: Furrow irrigated, May 17, May 24, May 29, June 10, June 17, June 29, July 26, Aug 3

Herbicides: 4.0 lb ai/A Stam (propanil) + 1.0 lb ai/A Basagran (bentazon), June 6; 4.0 lb ai/A Stam, June 14; 3.0 lb ai/A Stam + 0.75 lb ai/A Ronstar (oxadiazon), June 30

Insecticides: None

Fungicides: 1.0 lb ai/A Benlate (benomyl), July 21; 0.5 lb ai/A Benlate, Aug 22

Harvest: Sep 13

Experimental Design: Randomized complete block with 11 treatments replicated four times

Comments: Stand establishment was slow, with good uniformity across the furrowed seedbed. Three herbicide applications were required to control weeds. Furrow irrigation was generally necessary once a week until July. Rainfall supplied most of the water requirement during July and August. Sheath blight was observed at panicle differentiation in some treatments, although there did not appear to be any significant influence on grain yield. The multiple split applications and a single application of sulfur-coated urea appeared to supply adequate N to the rice for most of the growing season. Although there was little difference in grain yield among most of the treatments, the multiple split applications of urea and sulfur-coated urea resulted in the higher yields.

Table 1. Effect of N rate and timing on performance and grain yield of drill-seeded, furrow-irrigated Lemont rice. Rice Research Station, South Unit, Crowley, LA. 1988.

Source, rate, and time of application*	Days to 50% heading	Plant height	Grain yield at 12% moisture
------------------(lb/A)------------------		----(cm)----	-----(lb/A)----
N-Hib Calcium, 100 PF	81 cd	63 d	3693 d
Urea, 120 PF	82 abc	76 c	4019 cd
DCD, 120 PF	81 bc	76 c	4294 bc
SCU, 120 PF	81 cd	75 c	4722 ab
120 Urea, 90 PF + 30 PI	80 e	79 abc	4628 ab
150 Urea, 120 PF + 30 PI	82 ab	82 ab	4576 ab
180 Urea, 60 PF + 60 PI + 60 PD	79 e	78 bc	4427 abc
180 Urea, 120 PF + 30 PD + 30 PD + 10 days	80 de	82 ab	4389 abc
120 Urea, 30 PF + 30 at 10-day intervals	82 a	79 bc	4208 bc
120 Urea, 30 PF + 30 based on visual need	81 c	82 ab	4471 abc
150 Urea, 30 PF + 30 at 7-day intervals	82 a	84 a	4873 a
C.V., %	0.76	3.74	7.36

* Time of N: PF = preflood; PI = panicle initiation; PD = panicle differentiation.

** Means followed by the same letter are not significantly different ($P<0.05$) according to Duncan's multiple range test.

INFLUENCE OF ZINC APPLICATION AND WATER MANAGEMENT ON STRAIGHTHEAD SUSCEPTIBILITY OF LEMONT RICE

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INTRODUCTION

Straighthead is a physiological disorder of rice that has been associated with sandy soils, soils that have been treated with arsenical compounds, and anaerobic decomposition of fresh organic matter. A characteristic symptom of this disorder is referred to as "parrot beak." Florets become distorted and hooked on the end, and may be discolored with missing parts or reduced in size. Plants may also become darker green in color and often produce new shoots and roots from the lower nodes. Panicles remain upright at maturity, indicating sterility of the florets. When straighthead occurs, only small areas of a field may be affected with little or no apparent yield reduction occurring, or in severe situations, significant yield reductions and economic loss can occur.

There are still as yet unknown soil conditions that influence the occurrence of straighthead. Presently, there are only two control measures available to the farmer. Some rice varieties exhibit more resistance to straighthead than others, although given the proper conditions even varieties with tolerance to the disorder will straighthead. A cultural practice is also available to the farmer that will reduce the probability and significance of straighthead. If fields with a history of straighthead are drained during mid-tillering and the soil is completely aerated before panicle initiation, straighthead can be significantly reduced.

There is some indication in the literature that an application of zinc (Zn) will reduce the severity of straighthead. The objective of this study is to determine the influence of a Zn application coupled with two systems of water management on the severity of straighthead.

MATERIALS AND METHODS

The study was conducted on a Crowley silt loam soil. Approximately 60 lb/A P_2O_5 and K_2O, and 30 lb N/A were banded preplant into a mellow seedbed. Lemont rice was drill-seeded at a rate of 100 lb/A. Zinc and arsenic (As) solutions were applied to the soil surface. Chelated Zn was applied at a rate of 0 and 1 lb/A. Monosodium acid methanearsonate (MSMA) was used as the source for As, and was applied to deliver rates of 0, 2, 4, and 6 lb As/A. The test area was flushed 4 days after planting to incorporate the Zn and As treatments. Management typical of drill-seeded rice culture was practiced. A permanent flood was