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COMPREHENSIVE RESEARCH ON RICE
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PROJECT TITLE: Cooperative Extension Rice Variety Adaptation and Cultural Practice Research

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OBJECTIVES AND EXPERIMENTS CONDUCTED BY LOCATION TO ACCOMPLISH OBJECTIVES

Objective I

To evaluate cultivars and existing varieties under grower conditions, for the purpose of new variety development and release, the following tests were conducted throughout the state:

Very Early Maturity Group - Two uniform trials, were conducted at each of the following on-farm sites: the Brumley Ranch (San Joaquin County), the Lauppe Ranch (Natomas, Sutter County), and the Geer and Sons Ranch (District 108, Yolo County). Two additional tests were conducted by the plant breeders at the Rice Experiment Station (RES) in Butte County. The first test at each site included twenty entries (nine commercial varieties and eleven advanced breeding lines) in four replications. The second test also included twenty entries: two commercial varieties and eighteen preliminary breeding lines in two replications.

Early Maturity Group - Two uniform tests were conducted at each of the following on-farm sites: Skinner Ranch (Butte County), the Dennis Ranch (Colusa County), and the Quad 4 Ranch (District 10, Yuba County). Two additional trials were conducted at the RES. The first test at each site included twenty entries (nine commercial varieties and eleven advanced breeding lines) in four replications. The second test included twenty-three preliminary breeding lines in two replications. One additional uniform test of the cultivars and advanced lines (twenty entries, four replications) was conducted at a site in Glenn County known to be affected by blast in order to screen for blast resistance and severity.

Intermediate and Late Maturity Group - Two uniform tests were conducted at each of the following on-farm sites: the Wiley Ranch (Glenn County) and the Brugmann Ranch (Sutter County). Two additional tests were conducted by the plant breeders at the RES. The first test at each site included twelve entries (six commercial varieties and eight advanced breeding lines) in four replications; and the second test consisted of twenty preliminary breeding lines in two replications.

Objective II

To conduct research on improved cultural practices:

Rice Straw Management Project: Two multiyear rice straw experimental sites have been established near Maxwell, CA, and at the RES to study the agronomic effects of various straw management alternatives. The main plot treatments are winter flooding vs. no winter flooding. Subplot treatments within each main plot include burning, incorporation, rolling and removal by baling.

Japanese Varieties and Nitrogen (N): Four field trials were conducted in Butte County to evaluate various rates of N on the yield and quality of the two primary Japanese varieties grown in California, Akitakomachi and Koshihikari. In addition, quality and taste analysis tests were performed on samples from these tests.

Potassium (K) Disease Interaction Studies: An increasing number of growers are applying potassium in the belief that it will alleviate stemrot problems. The primary objective for these studies in 1997 was to determine if potassium fertilization provided any disease benefits in fields which were not potassium deficient.

Objective III

To provide professional technical and analytical assistance to field research projects of other principal investigators funded by the Rice Research Board; to maintain a UCD Agronomy Extension-based pool of equipment for conducting field research in rice. Equipment and assistance was provided to several projects as described later in this report.

SUMMARY OF 1997 RESEARCH OBJECTIVES:

Objective I - Rice Variety Evaluation

Nine uniform advanced breeding line trials and eight preliminary breeding line trials were conducted throughout the major rice producing areas of California. Six additional tests, two from each of the three maturity groups, were conducted by the rice breeders at the RES. Many of the experimental lines have been tested and screened in previous years and many lines were in advanced stages (2 or more years) of testing. The seed for public varieties and experimental cultivars was provided by the RES.

The following analyses provide single-location yield summaries for the advanced line tests and over-location agronomic performance summaries for each entry in each maturity category. For quick reference, grain yields of commercially available varieties tested in very early and early tests are summarized in Table 7. An Agronomy Progress Report, to be published later this year, will provide agronomic performance results for all entries in each experiment.

Very Early Tests (< 90 days to 50% heading at Biggs) - Eleven advanced breeding lines and nine commercial varieties and were compared in four very early tests. In addition, eighteen preliminary lines were compared to the standards L-204 and the Japanese variety, Akitakomachi at each location. Commercial varieties at each location included Calmochi-101, M-103, M-201, M-202, M-204, L-203, L-204, S-102 and S-201. Advanced lines at each location included eleven entries from the RES breeding program.

Grain yields in the advanced tests averaged 10,890 lb/acre at the -RES, 8,900 lb/acre at San Joaquin, 8,860 lb/acre at Sutter, and 11,200 lb/acre at Yolo (Table 1). Over the four locations, the highest yielding entry was advanced line 95-y-271, followed by M-202 (Table 1), which ranked first, second, and eighth in yield at the Yolo, Sutter, and San Joaquin sites, respectively. Entry 92-y-624, an advanced medium-grain, highly ranked in previous years, was the overall fourth highest entry and the second of the advanced lines, ranking second at the Sutter County site. Of the remaining very early commercial varieties ranking in the top ten, M-201, S-102, M-204, L-204, and Cal Mochi-101 ranked third, fifth, sixth, seventh and tenth respectively when summarized over location. Heading of the advanced lines ranged from 82 to 97 days after seeding (DAS), exceeded only by the early standard, S-201 which headed at 103 DAS (Table 2); heading in the preliminary lines ranged from 81 to 93 DAS. Lodging among the standard varieties and experimental cultivars was light to moderate; the Japanese variety, Akitakomachi was severely lodged.

Early Tests (90-97 days to 50% heading at Biggs) - Eleven advanced lines and nine commercial varieties were compared in five early tests. Twenty-three preliminary lines were compared to L-204 in separate tests at four of the five locations. Commercial varieties at each location were Calmochi-101, M-103, M-201, M-202, M-204, L-203, L-204, S-102 and S-201.

Yields in the advanced line tests averaged 10,460 lb/acre at the RES; 8,050 lb/acre at Butte (Durham); 8,110 lb/acre at Colusa; 7,540 lb/acre at Yuba and 9,190 lb/acre at the additional 'blast trial' in Glenn County (Table 3). The medium-grain cultivar 94-y-615, which was the average highest yielding advanced cultivar in 1996, yielded nearly 12,000 lb/acre at the RES in 1997 and was again the highest yielding entry over the five locations (Table 3) in 1997 . Other leading entries in the test were 92-y-624 (ranked third in 1996) and 96-y-203, a short, 'waxy' cultivar. Leading commercial varieties were S-201, M-204, M-201 and M-202, ranking fifth, sixth, seventh, and ninth over all tests. L-204, released in 1995, yielded 8,300 lb/acre and was ranked tenth. None of the preliminary lines exceeded the top yielding experimental line in the advanced tests, but 96-y-420 came close, yielding 11,520 lb/acre at Biggs and 9,750 lb acre at the Butte County site near Durham. Heading dates in the advanced test ranged from 78 DAS for the very early standard S-102 to 95 DAS for the early standard S-201, but average 87 DAS for all entries and locations (Table 4).

Intermediate-Late Tests (> 97 days to 50% heading at Biggs) - Eight advanced lines and six commercial varieties were compared in three intermediate-late tests. Twenty preliminary lines were also evaluated in separate tests at each location. Commercial varieties at each location included M-401, A-201, A-301, M-202, M-204, and L-202.

Average yields in the advanced line tests were 10,630 lb/acre at the Biggs RES, 7,320 lb/acre at Glenn, and 8,040 lb/acre at Sutter (Table 5). An advanced medium-grain, 95-y-60, was the highest yielding entry at the RES and at Glenn overall and the second highest yielding in Sutter. The premium quality medium grain variety, M-401 ranked second overall at an average 9,520 lb/acre and first at both the Sutter and Glenn sites; M-401 was closely followed by the early standard M-204 at an average yield of 9,310 lb/acre. A-301, an aromatic long grain, which ranked third in 1996, ranked twelfth in 1997, but at a respectable yield of 8,010 lb/acre. Average heading date across trials was 93 DAS (Table 6), with M-401 heading latest in all trials (100 to 108 DAS), indicating a majority of early-heading varieties in these trials.

Objective II - Cultural Practices

Rice Straw Management Project

A multi-year rice straw trial was established on 75 acres near Maxwell in the fall of 1993 to study the agronomic effects of various straw management alternatives. The experiment was designed as a split plot with the main plot treatments being winter flooding or no winter flooding. Straw subplot treatments within each main plot included burning, incorporation, rolling and baling.

Grain yields for 1994-97 are shown in Table 8. Straw and water treatments had a significant impact on yield some years, but their effect varied from year to year. Straw practices affected yield significantly in 1994 and 1996, but not in 1995 or 1997, while water practices were only significant in 1995. This variation was probably due to differences in the type and severity of crop production problems that occurred at the site each year.

In 1994, burning yielded significantly more than all other straw treatments and baling was better than the incorporated treatments (incorporate and roll). No differences between winter flooding and no winter flooding were observed. Production problems that likely impacted yield included salinity, hydrogen sulfide injury to rice and grass weed competition. The sulfide and salinity problems were negatively correlated to yield (R^2=0.22 and R^2=0.44, respectively). They were also variable in the trial and within plots and appeared to confound the data. Use of drains and increased water flow in subsequent years has minimized or eliminated sulfide and salinity problems. Also, poorer grass weed control in the incorporated and rolled treatments probably contributed to lower yields in these treatments..

In 1995, the winter water main plots were significantly different, but straw subplots were not. Winter flooding increased yield by 1,000 lb/acre over no flooding. The reason for this increase is not known. Even though there were no yield differences among the straw practices, straw effects on grass weed control and herbicide injury were observed. The grass problems in the incorporated and rolled plots and the herbicide injury in the non-incorporated (burned and baled) plots probably affected yield, but offset one another.

In 1996, straw practices were significantly different, but water practices were not. There was also a significant water x straw interaction. The incorporate, no flood treatment yielded significantly lower than all other treatments. The main reason for the lower yield was the poor grass control associated with this treatment. No differences in yield were observed among any of the other treatments. A pattern of reduced yield due to poor grass weed control appears to be emerging in the incorporated plots.

In 1997, neither water or straw practices had a significant effect on yield. Poorer grass control was observed in the incorporated plots, especially in the non-flooded incorporated plots, as in previous years. Yields in this treatment were lower though not significantly lower than any other straw treatment.

No consistent yield pattern has been observed between 1994 and 1997. However, greater barnyardgrass and watergrass weed competition in the incorporated plots, especially the non flooded incorporated plots, has been consistently observed. This increased weed competition has reduced yields in some years and may intensify over time.

Fertility Studies on Japanese Varieties of Rice - Akitakomachi and Koshihikari

California rice growers are increasingly interested in producing premium quality Japanese rice. Japanese rice varieties, however, do not respond favorably to traditional California nitrogen management strategies. The objectives of this research were to: 1.) determine the optimal rate and time of nitrogen application to maximize yields and grain quality, and; 2.) establish the relationship between the chlorophyll meter values and leaf tissue nitrogen levels for use as a management tool.

1996. Akitakomachi and Koshihikari were planted in replicated experiments in collaborating grower's fields using 21 different nitrogen treatments. 0, 20, 40, 60, 80, and 100 lb/acre of N as ammonium sulfate were applied either entirely preplant or as a basal/panicle initiation, basal/pollen meiosis, or basal/heading split application. Distinct stages of plant development were chosen for the split applications to maintain consistency. Pollen meiosis was chosen because it corresponded to a stage when Japanese farmers typically fertilize these varieties. Plant growth and development, yield components, and yield were measured. Grain samples were analyzed for protein, amylose, and fatty acids content and the taste scores determined. The chlorophyll meter was calibrated by taking measurements throughout the growing season and determining the percent N in the corresponding leaf samples.

1997. The treatments were similar to those used in 1996, except that the basal/meiosis split was replaced with a basal/early tillering split. Plant responses to both of these treatments were not noteworthy. Therefore to simplify comparison between years, the response to the basal/meiosis and basal/tillering splits are not presented. Plant growth measurements, grain analysis were repeated, and the calibration of the chlorophyll meter confirmed.

Akitakomachi. In 1996 and 1997, 80 lb/acre of N applied preplant produced the highest yields of 6,330 and 6,700 lb/acre, respectively (Table 9). The 100 lb/acre basal/PI split and basal treatments ranked second and third, respectively, in 1996. In contrast in 1997, 60 lb/acre of basal N produced the second highest yield (6,400 lb/acre) and the 100 lb/acre basal/heading split resulted in the third highest yield (6,150 lb/acre).

In terms of grain quality in 1996, however, rice grown at 60 lb/acre of N had the highest taste scores (Figure 1). Averaged across the various times of application, taste scores ranged from low of 79 to a high of 81, the 100 and 60 lb/acre treatments, respectively. All of the treatments resulted in taste scores above the lowest acceptable value of 75 required to meet Japanese standards. Grain analyses from the 1997 study are not yet complete.

Koshihikari. Overall yields were lower in 1997 as compared to 1996. A split application of 40 lb/acre of N applied as a 20 lb preplant and 20 lb at heading resulted in the highest yields in both 1996 and 1997 (Table 10). Noteworthy, the 1996 planting was the first year Koshihikari following several years of California medium grain rice. The higher yields at low N rates (e.g. 0, 20, and 40 lb/acre) reflect the impact of residual N on Koshihikari productivity. High rates of N actually reduced yields when compared to the control in 1996 (Table 10). Five of the top 6 yields were observed at 40 lb/acre of N or less. The effects of residual N diminished in 1997 as indicated by the higher yields at the 80 and 100 lb/acre rates, yield ranks 3 and 2, respectively.

In a fashion similar to Akitakomachi, taste scores for Koshihikari in 1996 were highest at the lower N rates (Figure 2). However as presented in Table 2, the higher N rates did not translate into higher yields attributable presumably due to the residual N from previous years. Among the grain quality parameters tested (e.g. protein, amylose, fatty acids) for Akitakomachi and Koshihikari, only the protein content of the grain was correlated with taste scores (data not shown). Grain quality results from 1997 are not yet available.

Chlorophyll Meter. Leaf tissue N levels predicted by the chlorophyll meter were virtually the same across the range of observed meter values for both Akitakomachi and Koshihikari (Table 11). A strong linear relationship was observed between meter readings and leaf tissue N at panicle initiation, pollen meiosis, and heading in 1996 and 1997.

Potassium x Disease Interaction Studies

Results from similar studies in 1996 found that stemrot severity could increase when rice plants were potassium deficient and correcting the deficiency reduced disease severity. Aggregate sheathspot was similarly affected, but only slightly, and disease incidence was not affected at all. Therefore, the primary objective for 1997 was to determine if potassium fertilization provided any disease benefits in fields which were not potassium deficient. In addition, we hoped to refine our knowledge of potassium fertilization of rice in California. We established three trials in 1997:

1. K deficient soil: A replicated, small plot experiment that compared various rates and timings of K fertilizer over three preplant nitrogen rates, in a potassium deficient soil.
2. K sufficient soil: A replicated small plot K fertilizer rate and timing trial over one preplant N rate, in a potassium sufficient soil.
3. K+/ - paired plots: A series of paired comparisons (200 lb KCl/acre vs. no KCl) in ten fields, representing a range of soils; all were M-202 except for one M-401 field.

The trial in the K deficient soil did not provide much useful information. Despite very low soil K (average of 29.5 ppm, ammonium acetate extraction), we measured no significant affect of K fertilizer rate or timing on grain yield, harvest moisture, lodging, or plant height. Leaf K at 40, 55 and 70 DAP increased with K rates but all samples were above the critical value, even in the unfertilized K treatments, indicating adequate K nutrition. Disease levels were low in the trial area and we observed no significant interaction with K fertilizer, although stemrot severity did increase with increased N rate. The most likely cause of the poor response to applied potassium is the generally low nitrogen level. Even at the highest treatment rate, 150 lb N/acre, leaf levels of total N were sub-optimal at all three sample times. Previous results show that potassium deficiency is more severe as nitrogen rates increase. At the low N nutrition in this trial, K supply was evidently adequate so that effects associated with deficiency did not develop. Low nitrogen status may have been associated with low efficiency of broadcast ammonium sulfate compared to banded.

The K-only trial was established in a non-deficient soil (preplant K 247 ppm) with a history of stemrot. The field was heavily fertilized with nitrogen and yield was high, averaging over 10,000 lb/acre. We measured no differences in response to potassium for yield, height, lodging, grain moisture or stemrot severity. The K fertilizer provided no protection against stemrot disease in this K-sufficient soil.

The K+/- plots yielded similar results as the K trial in the non-deficient soil. All ten soils were presumably sufficient in soil K, averaging 189 ppm over a range of 82 - 246 ppm. This is higher than the current recommended critical value of 60 ppm. A rate of 200 lb KCl/acre did not affect yield, leaf level of K or N at any of three sample dates, nor stemrot and aggregate sheathspot incidence or severity compared to the unfertilized control.

From this work we conclude that fertilizer potassium does not provide protection against stemrot in soils which have adequate levels of soil potassium.

Objective 3 - Assistance to Other Projects

The rice equipment pool, including a precision fertilizer applicator, SWECO 324 plot combine, moisture meters, backpack CO_2 sprayers, and other equipment were used with labor and technical assistance for more than twenty field experiments in 1996. The precision fertilizer applicator was used to establish two nitrogen/topdress trials and several potassium trials. The SWECO 324 plot combine was used to harvest seventeen variety experiments, all of the fertility experiments, specific plots within the straw management trials and miscellaneous trials throughout the Valley. The backpack sprayers were used to apply herbicides in county-based weed control trials. Backpack sprayers were also used to provide levee weed control at experimental sites during the growing season.

In addition to equipment assistance to other projects, labor from this project was used to plant, collect samples, and monitor growth in several field and greenhouse experiments.

PUBLICATIONS OR REPORTS:

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Scardaci, S.C., R.K. Webster, J.E. Hill, J.F. Williams, R.G. Mutters, D.M. Brandon. 1997. Rice Blast: A New Disease in California. University of California, Davis, Department of Agronomy and Range Science, Agronomy Fact Sheet Series, No. 1997-1.

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Tseng, S.T., C.W. Johnson, K.S. McKenzie, J.J. Oster, J.E. Hill, D.M. Brandon. 1997. Registration of 'L-204' Rice. Crop Science, 37. p. 1390-1391.

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Williams, J.F., S.R. Smith, and K.M. Jahnes. 1997. Interaction of Potassium Fertilization and Stem Rot. Abstracts, Rice Field Day, 1997.

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CONCISE GENERAL SUMMARY OF CURRENT YEAR'S RESULTS:

Seventeen rice variety evaluation trials were conducted on rice grower's farms—15 in the Sacramento Valley and two in the San Joaquin Valley. Approximately half these tests evaluated preliminary cultivars and half were dedicated to testing advanced lines. Additional tests were conducted on the Rice Experiment Station (RES), Biggs, CA. The wide range of planting dates, environments, disease levels, and cultural practices provide a stiff test which cultivars must pass before considering their release as varieties. Yields ranged from about 8,700 lb/acre in the early and the intermediate tests to nearly 10,000 lb/acre in the very early tests, with some advanced lines reaching near or over 12,000 lb/acre in individual tests. As in previous years, the commercial standards ranked high in yield against the advanced and preliminary entries, demonstrating the difficulty in making further yield advances. However, testing advanced and preliminary lines under a variety of conditions remains a highly important component in releasing varieties well suited to changing cultural practices, markets and pest conditions that will maintain the high yield standards expected from California rice growers.

This project also contributed to the long term studies on rice straw management and winterflooding at both the Maxwell and RES sites. Results from the Maxwell site indicate that winterflooded and some straw disposal treatments differ from others significantly in given years, but over all years the most consistent effect has been a build up of grass weeds where weed seed has been protected in the soil by fall incorporation. At the RES, one of the most important agronomic effects has been the development of potassium deficiency where straw has been removed. The details of this work will be reported under the RRB project on *Alternative Rice Residue Management Practices*. Studies in Butte County investigated nitrogen management practices to maximize yield and grain quality of the premium quality Japanese varieties Akitakomachi and Koshihikari and to evaluate the chlorophyll meter as a method of determining nitrogen management. Taste scores were higher at the lower nitrogen rates for both varieties. The chlorophyll meter showed a strong relationship to leaf tissue nitrogen indicating that it may be possible to use this as a management tool for determining nitrogen needs. Additional studies focused on the effect of potassium applied to non-deficient soils as a possible means to reduce stemrot disease. This work showed that potassium provided no protection against stemrot in soils where potassium was adequate. This project continued to assist other researchers supported by the RRB through the loan of equipment, labor and expertise.

Table 1. 1997 Four location very early rice lines and varieties yield (lb/acre at 14% moisture) summary table.

ADVANCED LINES AND VARIETIES

Variety	Grain Type	Average		Butte Biggs RES		San Joaquin Brumley Rch		Sutter Lauppe Rch		Yolo Geer Ranch	
15 95-y-271	M	10630	(1)	11810	(4)	9730	(4)	8690	(14)	12300	(2)
10 M-202	M	10540	(2)	10620	(13)	9370	(8)	9720	(2)	12450	(1)
9 M-201	M	10530	(3)	12200	(2)	8840	(12)	9290	(3)	11770	(5)
12 92-y-624	M	10500	(4)	11810	(3)	9030	(10)	10010	(1)	11140	(12)
3 S-102	S	10490	(5)	11490	(8)	10130	(1)	9270	(4)	11090	(13)
11 M-204	M	10310	(6)	11630	(5)	9000	(11)	8860	(11)	11750	(6)
17 L-204	L	10230	(7)	11570	(6)	8680	(13)	8780	(12)	11910	(3)
5 96-y-142	S	10170	(8)	10900	(11)	9250	(9)	9190	(5)	11340	(11)
13 95-y-214	M	10110	(9)	10540	(14)	9590	(6)	8760	(13)	11530	(8)
1 CM-101	Swx	10040	(10)	9800	(17)	9870	(2)	9060	(7)	11430	(10)
18 94-y-39	L	10020	(11)	11420	(9)	8560	(14)	8530	(17)	11580	(7)
16 L-203	L	10010	(12)	11530	(7)	8010	(17)	8660	(15)	11850	(4)
20 96-y-521	L	9990	(13)	11180	(10)	8290	(16)	9050	(8)	11430	(9)
2 S-201	S	9780	(14)	12200	(1)	7530	(19)	8860	(10)	10510	(16)
14 95-y-265	M	9750	(15)	10090	(16)	9820	(3)	8600	(16)	10480	(17)
6 96-y-153	S	9430	(16)	10100	(15)	8530	(15)	8920	(9)	10180	(19)
4 96-y-4	S	9400	(17)	9560	(18)	9480	(7)	7860	(19)	10690	(14)
8 M-103	M	9240	(18)	9130	(20)	9630	(5)	8510	(18)	9700	(20)
19 96-y-40	L	9130	(19)	10860	(12)	7650	(18)	7420	(20)	10580	(15)
7 96-y-55	S	8960	(20)	9450	(19)	7030	(20)	9080	(6)	10270	(18)
MEAN		9960		10890		8900		8860		11200	
CV		5.3		5.9		5.6		4.3		5.1	
LSD (.05)		370		910		700		540		810	

PRELIMINARY LINES AND VARIETIES

Variety	Grain Type	Average		Butte Biggs RES		San Joaquin Brumley Rch		Sutter Lauppe Rch		Yolo Geer Ranch	
23 96-y-201	SWX	11200	(1)	11710	(3)	9720	(4)	10480	(1)	12890	(1)
26 96-y-196	SWX	11040	(2)	10920	(10)	10570	(1)	10260	(2)	12420	(2)
27 96-y-207	M	10620	(3)	10910	(11)	9810	(2)	9380	(7)	12370	(3)
24 96-y-24	S	10370	(4)	10900	(12)	9220	(7)	9990	(3)	11390	(11)
40 97-y-40	L	10290	(5)	12490	(1)	7600	(17)	8840	(13)	12240	(4)
32 96-y-243	M	10240	(6)	9750	(17)	9740	(3)	9510	(6)	11970	(6)
39 96-y-495	L	10170	(7)	11160	(7)	8160	(14)	9560	(5)	11800	(7)
33 L-204	L	10130	(8)	11590	(4)	8300	(13)	8570	(14)	12050	(5)
30 96-y-268	M	10110	(9)	10540	(13)	9470	(6)	9000	(9)	11450	(10)
31 96-y-378	M	9970	(10)	11230	(6)	8440	(12)	8850	(12)	11350	(12)
38 96-y-457	L	9880	(11)	10070	(15)	8940	(8)	8950	(11)	11540	(8)
34 96-y-503	L	9840	(12)	11160	(8)	8770	(9)	8550	(15)	10880	(15)
37 96-y-447	L	9640	(13)	11280	(5)	7700	(16)	8050	(19)	11540	(9)
36 96-y-507	L	9620	(14)	11800	(2)	6770	(19)	8980	(10)	10920	(14)
35 96-y-505	L	9580	(15)	11140	(9)	7850	(15)	9040	(8)	10290	(18)
22 96-y-164	S	9450	(16)	10430	(14)	8540	(11)	8470	(16)	10340	(17)
28 96-y-213	M	9430	(17)	9760	(16)	9630	(5)	8440	(17)	9890	(19)
29 96-y-245	M	9330	(18)	9590	(19)	8670	(10)	8240	(18)	10800	(16)
25 96-y-25	S	9270	(19)	9610	(18)	6590	(20)	9710	(4)	11170	(13)
21 AKITA	S	7370	(20)	8180	(20)	7280	(18)	7570	(20)	6430	(20)
MEAN		9880		10710		8590		9020		11190	
CV		5.2		5.2		5.7		4.3		5.3	
LSD (.05)		510		1160		1020		820		1230	

S = short; M = medium; L = long; WX = waxy; Swx = Sweet waxy.
Numbers in parentheses indicate relative rank in column.

Table 2. 1997 Four location very early rice lines and varieties summary table.

ADVANCED LINES AND VARIETIES

Variety	Grain Type	Grain Yield at 14% Moisture	Grain Moisture at Harvest	Seedling Vigor	Days to 50% Heading	Lodging	Plant Height
		lbs/acre	(%)	(1-5)		(1-99)	(cm)
15 95-y-271	M	10630 (1)	19.6 (5)	3.8 (12)	91 (14)	6 (8)	88 (9)
10 M-202	M	10540 (2)	21.1 (3)	4.2 (4)	94 (15)	13 (10)	95 (19)
9 M-201	M	10530 (3)	22.1 (1)	4.2 (3)	95 (18)	3 (5)	92 (17)
12 92-y-624	M	10500 (4)	20.2 (4)	4 (10)	95 (17)	56 (20)	95 (19)
3 S-102	S	10490 (5)	15.1 (20)	4.2 (4)	82 (1)	9 (9)	90 (15)
11 M-204	M	10310 (6)	19.5 (7)	3.8 (12)	94 (16)	5 (7)	89 (14)
17 L-204	L	10230 (7)	16.3 (16)	4.1 (6)	87 (11)	2 (4)	83 (6)
5 96-y-142	S	10170 (8)	18.2 (10)	3.9 (11)	87 (10)	15 (11)	83 (4)
13 95-y-214	M	10110 (9)	18.6 (8)	4.1 (8)	84 (6)	27 (15)	87 (8)
1 CM-101	Swx	10040 (10)	16.5 (14)	4.1 (7)	83 (4)	42 (18)	88 (10)
18 94-y-39	L	10020 (11)	15.4 (19)	3.3 (20)	84 (7)	1 (2)	82 (3)
16 L-203	L	10010 (12)	17.4 (13)	3.3 (19)	89 (13)	1 (1)	78 (1)
20 96-y-521	L	9990 (13)	15.9 (17)	3.5 (17)	86 (8)	4 (6)	88 (11)
2 S-201	S	9780 (14)	21.2 (2)	4.4 (1)	103 (20)	25 (14)	92 (18)
14 95-y-265	M	9750 (15)	17.6 (11)	3.6 (15)	86 (9)	24 (13)	91 (16)
6 96-y-153	S	9430 (16)	17.6 (12)	4 (9)	89 (12)	46 (19)	85 (7)
4 96-y-4	S	9400 (17)	16.3 (15)	3.4 (18)	83 (4)	20 (12)	82 (2)
8 M-103	M	9240 (18)	18.2 (9)	3.8 (14)	83 (3)	41 (17)	88 (12)
19 96-y-40	L	9130 (19)	15.8 (18)	3.5 (16)	82 (2)	1 (3)	83 (5)
7 96-y-55	S	8960 (20)	19.5 (6)	4.3 (2)	97 (19)	35 (16)	89 (13)
MEAN		9960	18.1	3.9	89	19	87
CV		5.3	5.4	12.1	1.2	75.9	3.5
LSD (.05)		370	0.7	0.3	1	10	2

PRELIMINARY LINES AND VARIETIES

Variety	Grain Type	Grain Yield at 14% Moisture	Grain Moisture at Harvest	Seedling Vigor	Days to 50% Heading	Lodging	Plant Height
		lb/acre (14%)	(%)	(1-5)		(1-99)	(cm)
23 96-y-201	SWX	11200 (1)	17.8 (6)	3.8 (10)	91 (19)	39 (16)	90 (16)
26 96-y-196	SWX	11040 (2)	17.8 (4)	3.4 (15)	86 (8)	19 (14)	86 (6)
27 96-y-207	M	10620 (3)	16.4 (10)	3.9 (8)	85 (7)	5 (9)	86 (6)
24 96-y-24	S	10370 (4)	14.7 (18)	3.3 (18)	87 (11)	29 (15)	84 (3)
40 97-y-40	L	10290 (5)	15.4 (13)	3.6 (14)	88 (15)	1 (1)	81 (1)
32 96-y-243	M	10240 (6)	16.3 (11)	4.3 (4)	83 (2)	11 (11)	88 (11)
39 96-y-495	L	10170 (7)	14 (20)	4.5 (2)	81 (1)	3 (5)	88 (12)
33 L-204	L	10130 (8)	15.8 (12)	4.1 (5)	88 (12)	1 (3)	81 (2)
30 96-y-268	M	10110 (9)	17.8 (5)	4.4 (3)	84 (3)	4 (6)	87 (10)
31 96-y-378	M	9970 (10)	19.2 (2)	3.9 (8)	93 (20)	5 (7)	89 (15)
38 96-y-457	L	9880 (11)	14.8 (17)	4.1 (7)	88 (12)	2 (4)	90 (18)
34 96-y-503	L	9840 (12)	14.8 (15)	3.4 (16)	87 (10)	5 (8)	88 (12)
37 96-y-447	L	9640 (13)	15.4 (14)	3.6 (12)	89 (17)	1 (1)	91 (19)
36 96-y-507	L	9620 (14)	14.6 (19)	3.6 (13)	86 (9)	6 (10)	85 (5)
35 96-y-505	L	9580 (15)	14.8 (16)	3.8 (10)	85 (5)	19 (13)	85 (4)
22 96-y-164	S	9450 (16)	16.7 (9)	4.5 (1)	88 (12)	48 (18)	87 (8)
28 96-y-213	M	9430 (17)	17.6 (7)	3.2 (20)	85 (6)	56 (19)	90 (17)
29 96-y-245	M	9330 (18)	18.3 (3)	3.2 (19)	88 (16)	13 (12)	87 (9)
25 96-y-25	S	9270 (19)	17.2 (8)	4.1 (5)	91 (18)	44 (17)	88 (14)
21 AKITA	S	7370 (20)	19.2 (1)	3.4 (17)	85 (4)	96 (20)	97 (20)
MEAN		9880	16.4	3.8	87	20	87
CV		5.2	5	13	2.3	53.7	3.8
LSD (.05)		510	0.8	0.5	2	11	3

S = short; M = medium; L = long; WX = waxy; Swx = Sweet waxy.
Subjective rating of 1-5 where 1 = poor and 5 = excellent seedling emergence.
Subjective rating of 1-99 where 1 = none and 99 = completely lodged.
Numbers in parentheses indicate relative rank in column.

Table 3. 1997 Five location advanced and four location preliminary early rice lines and varieties yield (lb/acre at 14% moisture) summary table.

ADVANCED LINES AND VARIETIES - FIVE LOCATIONS

Variety	Grain Type	Average	Butte Biggs RES	Yuba Quad 4 Rnch	Colusa Dennis Rnch	Butte S Skinner Rch	Glenn EB Extra Blast
63 94-y-615	M	9910 (1)	11940 (1)	9200 (2)	9440 (1)	8760 (5)	10200 (2)
62 92-y-624	M	9550 (2)	11030 (5)	9450 (1)	9120 (5)	8150 (12)	9980 (4)
57 96-y-203	SWX	9450 (3)	11200 (2)	8160 (5)	8850 (6)	8830 (2)	10230 (1)
64 95-y-356	M	9250 (4)	10830 (9)	7720 (10)	9200 (3)	8750 (6)	9730 (6)
53 S-201	S	9230 (5)	10490 (14)	9000 (3)	9410 (2)	7420 (16)	9810 (5)
61 M-204	M	9140 (6)	10580 (11)	8230 (4)	8840 (7)	8480 (8)	9550 (8)
59 M-201	M	9100 (7)	11160 (4)	7270 (13)	8700 (9)	8170 (11)	10200 (3)
54 96-y-341	S	9040 (8)	11170 (3)	8010 (7)	8830 (8)	7680 (15)	9530 (9)
60 M-202	M	8960 (9)	10510 (13)	7730 (9)	9130 (4)	8240 (9)	9170 (12)
66 L-204	L	8880 (10)	10700 (10)	7410 (11)	8080 (10)	8790 (4)	9420 (11)
65 L-203	L	8780 (11)	10940 (6)	6900 (15)	7530 (14)	8980 (1)	9560 (7)
68 95-y-629	L	8660 (12)	10190 (15)	7780 (8)	7340 (16)	8820 (3)	9160 (13)
70 96-y-480	L	8590 (13)	10920 (7)	6240 (19)	7780 (11)	8560 (7)	9470 (10)
52 S-102	S	8410 (14)	10520 (12)	7370 (12)	7540 (13)	7770 (14)	8860 (14)
67 94-y-40	L	8390 (15)	10840 (8)	6450 (18)	7730 (12)	8200 (10)	8720 (15)
51 CM-101	SWX	7980 (16)	9350 (18)	7050 (14)	7510 (15)	7900 (13)	8110 (18)
55 96-y-55	S	7960 (17)	9690 (16)	8110 (6)	7270 (17)	6460 (20)	8270 (17)
58 M-103	M	7570 (18)	9100 (19)	6680 (16)	6960 (18)	6830 (19)	8290 (16)
56 96-y-5	S	7370 (19)	9400 (17)	6540 (17)	6160 (20)	6960 (18)	7790 (19)
69 96-y-90	L	7200 (20)	8660 (20)	5520 (20)	6700 (19)	7350 (17)	7770 (20)
MEAN		8670	10460	7540	8110	8050	9190
CV		7.5	7.4	5.5	10.6	7.7	5.1
LSD (.05)		400	1090	580	1220	880	660

PRELIMINARY LINES AND VARIETIES - FOUR LOCATIONS

Variety	Grain Type	Average	Butte Biggs RES	Yuba Quad 4 Rnch	Colusa Dennis Ranc	Butte SK Skinner Rnc
82 96-y-420	M	9520 (1)	11520 (4)	8030 (3)	8800 (7)	9750 (1)
80 96-y-386	M	9440 (2)	11610 (1)	8560 (1)	9430 (2)	8150 (17)
84 96-y-403	M	9240 (3)	11300 (5)	7640 (8)	9280 (4)	8760 (7)
79 96-y-253	M	9160 (4)	11580 (3)	8440 (2)	8350 (12)	8270 (16)
78 96-y-249	M	9120 (5)	10620 (12)	7850 (4)	9360 (3)	8640 (11)
74 96-y-177	M	9080 (6)	10440 (15)	7230 (10)	10000 (1)	8660 (10)
85 L-204	L	9050 (7)	10960 (11)	7200 (11)	8780 (8)	9260 (2)
73 96-y-355	S	9010 (8)	10990 (10)	7310 (9)	9030 (6)	8710 (9)
72 96-y-323	MBS	8890 (9)	10490 (14)	7680 (6)	9110 (5)	8290 (15)
71 95-y-316	S	8870 (10)	11580 (2)	7640 (7)	7510 (17)	8750 (8)
88 96-y-507	L	8790 (11)	11130 (8)	6490 (17)	8530 (9)	9000 (5)
81 96-y-398	M	8760 (12)	11150 (7)	7760 (5)	7790 (16)	8330 (14)
83 96-y-385	M	8750 (13)	10410 (17)	6850 (14)	8520 (10)	9200 (3)
75 96-y-277	M	8740 (14)	11130 (9)	6940 (13)	8470 (11)	8430 (13)
77 96-y-231	M	8430 (15)	10600 (13)	6510 (16)	7800 (15)	8800 (6)
90 96-y-543	L	8390 (16)	11230 (6)	6700 (15)	6610 (20)	9030 (4)
76 96-y-578	M	8220 (17)	10430 (16)	6950 (12)	7370 (18)	8140 (18)
86 96-y-503	L	8200 (18)	10360 (18)	6320 (19)	8010 (13)	8120 (19)
87 96-y-505	L	8110 (19)	10350 (19)	6380 (18)	7260 (19)	8460 (12)
89 96-y-87	L	7340 (20)	8280 (20)	5680 (20)	7960 (14)	7440 (20)
MEAN		9170	10810	7210	8400	8610
CV		5.2	3.7	4.5	7.3	7
LSD (.05)		420	570	680	1280	n.s.

S = short; M = medium; L = long; WX = waxy; Swx = Sweet waxy.
Numbers in parentheses indicate relative rank in column.

Table 4. 1997 Five location advanced and four location preliminary lines and varieties summary table.

ADVANCED LINES AND VARIETIES - FIVE LOCATIONS

Variety	Grai Type	Grain Yield at 14% Moisture lb/acre (14%)	Grain Moisture at Harvest (%)	Seedling Vigor (1-5)	Days to 50% Heading	Lodging (1-99)	Plant Height (cm)
63 94-y-615	M	9910 (1)	18.3 (4)	3.8 (9)	91 (19)	21 (9)	94 (9)
62 92-y-624	M	9550 (2)	18.9 (2)	4 (3)	90 (17)	59 (15)	99 20)
57 96-y-203	Swx	9450 (3)	18.2 (5)	3.7 (10)	86 (9)	62 (17)	97 17)
64 95-y-356	M	9250 (4)	16.9 (10)	3.5 (14)	88 (11)	2 (1)	92 (5)
53 S-201	S	9230 (5)	19.5 (1)	4.4 (1)	95 (20)	44 (11)	99 19)
61 M-204	M	9140 (6)	17.8 (7)	3.4 (16)	89 (13)	33 (10)	94 10)
59 M-201	M	9100 (7)	18.7 (3)	3.8 (7)	90 (16)	6 (3)	94 11)
54 96-y-341	S	9040 (8)	16.4 (11)	3.9 (5)	87 (10)	16 (6)	95 14)
60 M-202	M	8960 (9)	18.2 (6)	4 (4)	88 (12)	55 (14)	98 18)
66 L-204	L	8880 (10)	15.5 (14)	3.6 (12)	85 (6)	4 (2)	87 (2)
65 L-203	L	8780 (11)	15.3 (17)	3.1 (19)	85 (8)	11 (4)	84 (1)
68 95-y-629	L	8660 (12)	15.3 (16)	3 (20)	90 (15)	44 (12)	88 (3)
70 96-y-480	L	8590 (13)	14.6 (20)	3.2 (18)	85 (7)	18 (7)	92 (6)
52 S-102	S	8410 (14)	15.5 (13)	4.1 (2)	78 (1)	61 (16)	94 12)
67 94-y-40	L	8390 (15)	15.1 (19)	3.2 (17)	84 (5)	20 (8)	90 (4)
51 CM-101	Swx	7980 (16)	15.8 (12)	3.9 (6)	80 (3)	70 (19)	93 (7)
55 96-y-55	S	7960 (17)	17 (9)	3.8 (8)	91 (18)	45 (13)	95 15)
58 M-103	M	7570 (18)	17.3 (8)	3.7 (11)	79 (2)	67 (18)	93 (7)
56 96-y-5	S	7370 (19)	15.5 (15)	3.6 (13)	83 (4)	79 (20)	95 13)
69 96-y-90	L	7200 (20)	15.2 (18)	3.5 (15)	90 (14)	11 (5)	96 16)
MEAN		8670	16.7	3.7	87	36	93
CV		7.5	5.8	14.7	1.6	39.4	3.6
LSD (.05)		400	0.6	0.3	1	9	2

PRELIMINARY LINES AND VARIETIES - FOUR LOCATIONS

Variety	Grai Type	Grain Yield at 14% Moisture lbs/acre	Grain Moisture at Harvest (%)	Seedling Vigor (1-5)	Days to 50% Heading	Lodging (1-99)	Plant Height (cm)
82 96-y-420	M	9590 (1)	17.3 (4)	4 (8)	89 (17)	10 (7)	89 (3)
80 96-y-386	M	9380 (2)	16.8 (9)	3.9 (11)	87 (13)	32 (15)	92 11)
84 96-y-403	M	9260 (3)	17.8 (3)	4.1 (4)	89 (16)	4 (3)	90 (6)
74 96-y-177	M	9200 (4)	16.5 (11)	4.6 (1)	85 (10)	50 (19)	95 17)
79 96-y-253	M	9160 (5)	16.4 (12)	4.1 (6)	85 (10)	19 (10)	97 19)
78 96-y-249	M	9090 (6)	17 (7)	4.1 (7)	85 (7)	4 (4)	95 18)
85 L-204	L	9080 (7)	15 (17)	4 (9)	85 (7)	4 (2)	86 (1)
73 96-y-355	S	8910 (8)	16.8 (8)	4.1 (2)	83 (4)	48 (18)	92 10)
71 95-y-316	S	8890 (9)	17.3 (5)	3.6 (14)	90 (19)	30 (13)	92 12)
72 96-y-323	MBS	8860 (10)	16.1 (14)	3.9 (10)	84 (5)	52 (20)	95 16)
88 96-y-507	L	8840 (11)	14.8 (18)	3.5 (16)	85 (9)	27 (12)	90 (5)
81 96-y-398	M	8840 (12)	16.5 (10)	4.1 (4)	88 (14)	3 (1)	98 20)
83 96-y-385	M	8740 (13)	17.1 (6)	3.8 (12)	88 (15)	4 (5)	89 (4)
75 96-y-277	M	8730 (14)	17.9 (2)	4.1 (2)	89 (18)	12 (8)	91 (9)
77 96-y-231	M	8520 (15)	16.4 (13)	3.2 (19)	82 (1)	9 (6)	95 15)
90 96-y-543	L	8330 (16)	15.1 (16)	2.9 (20)	85 (12)	26 (11)	91 (8)
76 96-y-578	M	8300 (17)	18.7 (1)	3.6 (14)	91 (20)	32 (14)	94 13)
86 96-y-503	L	8250 (18)	14.5 (19)	3.4 (17)	83 (3)	36 (16)	90 (7)
87 96-y-505	L	8200 (19)	14.4 (20)	3.7 (13)	84 (6)	42 (17)	87 (2)
89 96-y-87	L	7490 (20)	15.4 (15)	3.3 (18)	82 (2)	13 (9)	94 14)
MEAN		8780	16.4	3.8	86	23	92
CV		5.5	3.8	13.4	1.6	54.4	3.7
LSD (.05)		480	0.6	0.5	1	12	3

S = short; M = medium; L = long; WX = waxy, Swx = Sweet waxy.
Subjective rating of 1-5 where 1 = poor and 5 = excellent seedling emergence.
Subjective rating of 1-99 where 1 = none and 99 = completely lodged.
Numbers in parentheses indicate relative rank in column.

Table 5. 1997 Three location intermediate/late rice lines and varieties yield (lb/acre at 14% moisture) summary table.

ADVANCED LINES AND VARIETIES

Variety	Grain Type	Average		Butte Biggs RES		Sutter Brugman		Glenn Wiley Ranch	
108 95-y-60	M	9650	(1)	12220	(1)	8790	(2)	7950	(6)
101 M-401	MPQ	9520	(2)	11120	(5)	8860	(1)	8580	(1)
105 M-204	M	9310	(3)	11250	(4)	8380	(7)	8300	(2)
112 94-y-66	L	9180	(4)	11870	(2)	7700	(10)	7980	(5)
104 94-y-11	M	9170	(5)	10560	(10)	8790	(3)	8150	(3)
107 95-y-40	M	9030	(6)	10620	(9)	8470	(5)	8020	(4)
113 96-y-12	L	8940	(7)	11690	(3)	7710	(9)	7430	(9)
111 A-301	L	8620	(8)	10700	(8)	7490	(11)	7660	(7)
106 M-202	M	8610	(9)	9890	(11)	8390	(6)	7550	(8)
102 96-y-55	S	8320	(10)	9210	(12)	8510	(4)	7230	(10)
109 L-202	L	8050	(11)	11090	(6)	7380	(12)	5670	(14)
110 A-201	L	8010	(12)	11090	(7)	7220	(13)	5730	(13)
103 97-y-10	S	7800	(13)	8900	(13)	8050	(8)	6430	(11)
114 96-y-90	LBa	7090	(14)	8610	(14)	6810	(14)	5850	(12)
MEAN		8660		10630		8040		7320	
CV		6.1		5.4		7.8		4.6	
LSD (.05)		430		820		900		480	

PRELIMINARY LINES AND VARIETIES

Variety	Grain Type	Average		Butte Biggs RES		Sutter Brugman		Glenn Wyle Ranch	
127 96-y-64	M	9870	(1)	11970	(2)	9310	(3)	8320	(2)
124 96-y-60	M	9820	(2)	11760	(4)	9770	(1)	7940	(4)
126 96-y-63	M	9730	(3)	12290	(1)	9130	(6)	7780	(7)
122 96-y-38	M	9690	(4)	11320	(8)	9640	(2)	8100	(3)
133 96-y-66	L	9670	(5)	11350	(7)	8540	(13)	9120	(1)
123 96-y-40	M	9460	(6)	11970	(3)	8550	(12)	7850	(5)
131 96-y-50	L	9260	(7)	11100	(11)	9230	(4)	7460	(9)
134 96-y-67	L	9170	(8)	11560	(5)	8470	(14)	7490	(8)
115 96-y-57	M	9130	(9)	11300	(9)	8850	(10)	7240	(11)
121 96-y-20	SWX	9070	(10)	10960	(12)	9150	(5)	7090	(12)
125 96-y-61	M	9060	(11)	11220	(10)	8980	(8)	7000	(14)
129 96-y-43	M	8650	(12)	10550	(13)	8670	(11)	6740	(17)
128 96-y-36	M	8620	(13)	10400	(14)	9080	(7)	6380	(18)
118 97-y-11	M	8560	(14)	8940	(19)	8940	(9)	7810	(6)
117 97-y-11	M	8230	(15)	9180	(17)	8460	(15)	7060	(13)
132 96-y-65	L	8200	(16)	11370	(6)	7900	(17)	5330	(19)
120 97-y-12	S	8150	(17)	8980	(18)	8170	(16)	7300	(10)
119 97-y-11	S	8030	(18)	9460	(16)	7780	(18)	6840	(16)
116 97-y-11	M	8020	(19)	9490	(15)	7640	(19)	6940	(15)
130 96-y-64	L	6440	(20)	7460	(20)	7270	(20)	4590	(20)
MEAN		8840		10630		8680		7220	
CV		7.1		4.3		5.8		11.8	
LSD (.05)		730		950		1050		1790	

S = short; M = medium; L = long; Lba = Long basmati; WX = waxy; SWX = Sweet waxy, MPQ = medium premium quality
Numbers in parentheses indicate relative rank in column.

Table 6. 1997 Three location intermediate/late rice lines and varieties summary tables.

ADVANCED LINES AND VARIETIES

Variety	Grai Type	Grain Yield at 14% Moisture lbs/acre	Grain Moisture at Harvest (%)	Seedling Vigor (1-5)	Days to 50% Heading	Lodging (1-99)	Plant Height (cm)
108 95-y-60	M	9650 (1)	13.5 (3)	3.7 (9)	95 (11)	2 (3)	87 (9)
101 M-401	MPQ	9520 (2)	16 (1)	3.9 (7)	104 (14)	25 (13)	101 14)
105 M-204	M	9310 (3)	13.2 (6)	3.5 (10)	92 (9)	2 (6)	90 11)
112 94-y-66	L	9180 (4)	12.5 (11)	3.3 (13)	92 (8)	2 (5)	81 (3)
104 94-y-11	M	9170 (5)	13.8 (2)	3.9 (6)	98 (12)	5 (10)	95 12)
107 95-y-40	M	9030 (6)	13 (9)	4.3 (4)	88 (1)	2 (7)	88 10)
113 96-y-12	L	8940 (7)	12.9 (10)	3.4 (11)	90 (3)	2 (3)	77 (1)
111 A-301	L	8620 (8)	13.4 (5)	2.9 (14)	98 (13)	1 (1)	81 (4)
106 M-202	M	8610 (9)	13.1 (8)	3.8 (8)	91 (5)	7 (11)	96 13)
102 96-y-55	S	8320 (10)	12.3 (14)	4.4 (2)	93 (10)	24 (12)	86 (7)
109 L-202	L	8050 (11)	13.4 (4)	3.4 (12)	89 (2)	1 (2)	80 (2)
110 A-201	L	8010 (12)	13.2 (7)	4.4 (2)	91 (6)	2 (7)	85 (5)
103 97-y-10	S	7800 (13)	12.4 (13)	4.6 (1)	91 (6)	25 (14)	86 (6)
114 96-y-90	LBa	7090 (14)	12.4 (12)	4 (5)	91 (4)	3 (9)	86 (8)
MEAN		8660	13.2	3.8	93	7	87
CV		6.1	5.5	9.9	3.2	90.4	4.3
LSD (.05)		430	0.6	0.3	2	5	3

PRELIMINARY LINES AND VARIETIES

Variety	Grai Type	Grain Yield at 14% Moisture lbs/acre	Grain Moisture at Harvest (%)	Seedling Vigor (1-5)	Days to 50% Heading	Lodging (1-99)	Plant Height (cm)
127 96-y-64	M	9870 (1)	13.5 (3)	3.8 (9)	94 (17)	3 (8)	87 (7)
124 96-y-60	M	9820 (2)	12.9 (11)	3.8 (7)	96 (20)	5 (10)	92 18)
126 96-y-63	M	9730 (3)	13.5 (2)	3.4 (17)	94 (15)	3 (9)	87 (8)
122 96-y-38	M	9690 (4)	13.1 (7)	4.2 (3)	91 (10)	3 (5)	90 10)
133 96-y-66	L	9670 (5)	11.7 (20)	4 (6)	89 (5)	3 (4)	80 (3)
123 96-y-40	M	9460 (6)	12.5 (15)	3.3 (18)	91 (12)	11 (12)	90 10)
131 96-y-50	L	9260 (7)	13.2 (5)	3.6 (11)	87 (1)	11 (13)	91 16)
134 96-y-67	L	9170 (8)	12.4 (16)	3.2 (20)	89 (6)	1 (1)	78 (1)
115 96-y-57	M	9130 (9)	13 (9)	3.7 (10)	95 (19)	3 (5)	90 10)
121 96-y-20	SWX	9070 (10)	12.1 (19)	3.5 (16)	90 (7)	26 (14)	88 (9)
125 96-y-61	M	9060 (11)	13.1 (6)	3.3 (19)	93 (14)	2 (2)	91 15)
129 96-y-43	M	8650 (12)	12.8 (12)	3.5 (15)	92 (13)	2 (3)	85 (4)
128 96-y-36	M	8620 (13)	13 (10)	4.2 (3)	88 (2)	26 (15)	90 13)
118 97-y-11	M	8560 (14)	12.1 (18)	4.1 (5)	89 (4)	68 (20)	95 19)
117 97-y-11	M	8230 (15)	12.7 (13)	3.6 (11)	91 (10)	40 (16)	96 20)
132 96-y-65	L	8200 (16)	13.4 (4)	3.6 (11)	94 (16)	3 (5)	78 (2)
120 97-y-12	S	8150 (17)	12.2 (17)	4.2 (2)	94 (17)	65 (19)	87 (6)
119 97-y-11	S	8030 (18)	14.4 (1)	4.5 (1)	90 (7)	64 (18)	92 17)
116 97-y-11	M	8020 (19)	13.1 (8)	3.6 (14)	91 (9)	52 (17)	90 13)
130 96-y-64	L	6440 (20)	12.6 (14)	3.8 (8)	88 (3)	7 (11)	86 (5)
MEAN		8840	12.9	3.7	91	20	88
CV		7.1	5.7	11.6	3	77.2	4.4
LSD (.05)		730	0.9	0.5	3	18	4

S = short; M = medium; L = long; WX = waxy; Lba = Long basmati.

Subjective rating of 1-5 where 1 = poor and 5 = excellent seedling emergence.

Subjective rating of 1-99 where 1 = none and 99 = completely lodged.

Numbers in parentheses indicate relative rank in column.

Table 7. Grain yield (lb/acre at 14% moisture) of publicly developed rice varieties used as standards and cross-test means. Note that individual tests may not be managed to maximize yields of varieties not in the same maturity group.

Test	Location	Seeding Date	VARIETIES									
			CM-101	M-103	M-201	M-202	M-204	L-203	L-204	S-102	S-201	*Location Mean*
Very Early	Biggs, RES	Apr 28 & May 22*	9800	9130	12200	10620	11630	11530	11570	11490	12200	*11130*
	San Joaquin	Apr 25	9870	9630	8840	9370	9000	8010	8680	10130	7530	*9007*
	Sutter	May 12	9060	8510	9290	9720	8860	8660	8780	9270	8860	*9001*
	Yolo	May 7	11430	9700	11770	12450	11750	11850	11910	11090	10510	*11384*
	Ver Early 1997 Mean:		***10040***	***9243***	***10525***	***10540***	***10310***	***10013***	***10235***	***10495***	***9775***	**10131**
Early	Biggs, RES	Apr 30 & May 21*	9350	9100	11160	10510	10580	10940	10700	10520	10490	10372
	Yuba	Apr 24	7050	6680	7270	7730	8230	6900	7410	7370	9000	7516
	Colusa	May 20	7510	6960	8700	9130	8840	7530	8080	7540	9410	8189
	Butte	May 2	7900	6830	8170	8240	8480	8980	8790	7770	7420	8064
	Glenn Extra Blast	Apr 29	8110	8290	10200	9170	9550	9560	9420	8860	9810	9219
	Early 1997 Mean:		***7984***	***7572***	***9100***	***8956***	***9136***	***8782***	***8880***	***8412***	***9226***	***8672***
	Cross Trial, Nine Location M		***8898***	***8314***	***9733***	***9660***	***9658***	***9329***	***9482***	***9338***	***9470***	
			VARIETIES									
			A-201	A-301	-	M-202	M-204	M-401	L-202			
Late	Butte, RES	May 22	11090	10700	-	9890	11250	11120	11090	-	-	10857
	Sutter	Apr 24	7220	7490	-	8390	8380	8860	7390	-	-	7955
	Glenn	Apr 22	5730	7660	-	7550	8300	8580	5670	-	-	7248
	Late 1997 Mean:		***8013***	***8617***		***8610***	***9310***	***9520***	***8050***			***8687***
	Cross Trial, Twelve Location		-	-	-	***9398***	***9571***	-	-	-	-	

* Reps 1 and 2 were planted on earlier date, reps 3 and 4 at later date.

Table 8. Rice grain yield by straw/water management treatments, Maxwell site, 1994-1997.

Water/Straw Treatments		Yield lbs/acre @ 14% moisture			
Main Plot	Subplot	1994	1995	1996	1997
Flood	Burn	8780	8810	9370	10400
	Incorporate	8340	9570	9240	10180
	Roll	7410	9200	9220	10470
	Bale	8670	8750	9170	10410
	Mean	8300	9080	9250	10370
No Flood	Burn	8990	8310	9120	10590
	Incorporate	7300	7980	8330	9960
	Roll	7440	8260	9160	10450
	Bale	7660	7760	9100	10320
	Mean	7850	8080	8930	10330
ANOVA					
Water		NS	*	NS	NS
Straw		**	NS	*	NS
Water * Straw		NS	NS	*	NS
CV%		7.0	6.5	3.5	3.6
$LSD_{.05}$ (subplots within each main plot)		843	NS	472	NS

Table 9. Yield response of Akitakomachi to different rates and times of nitrogen application, 1996 & 1997. Treatment 20-20-0 corresponds to 20 lb/acre of preplant N, 20 lb/acre applied at PI, and 0 lb/acre applied at heading. A single number indicates that all N was applied preplant.

Treatment	1997	Rank	1996	Rank
0	5230	14	3750	14
20	5340	13	5170	13
40	5700	10	5660	8
20-20-0	5740	8	5220	11
20-0-20	5990	5	5190	12
60	6400	2	5630	9
40-20-0	5630	11	5870	5
40-0-20	5530	12	5700	7
80	**6700**	**1**	**6330**	**1**
40-40-0	5700	9	5990	4
40-0-40	6070	4	5480	10
100	5970	6	6000	3
50-50-0	5800	7	6300	2
50-0-50	6150	3	5840	6
LSD (0.05)	460		350	

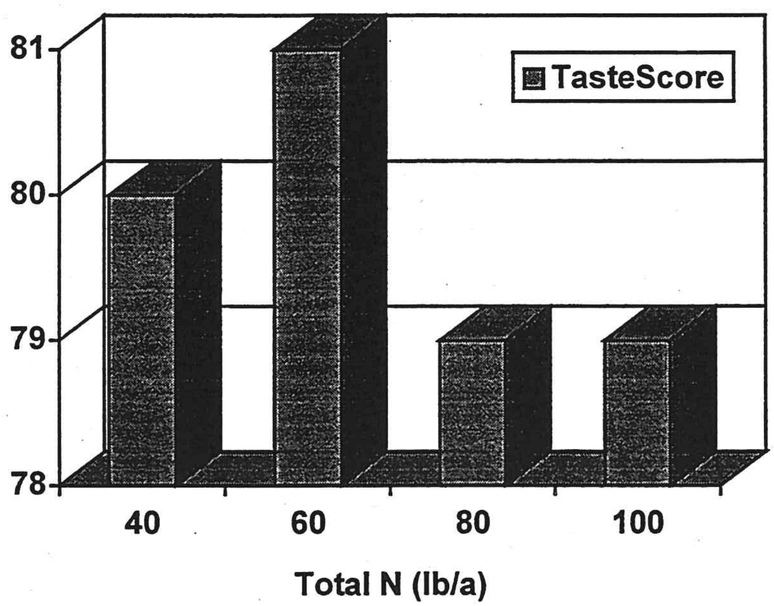

Figure 1. 1996 Akitakomachi taste scores associated with different rates of nitrogen.

Table 10. Yield response of Koshihikari to different rates and times of nitrogen application, 1996 & 1997. Treatment 20-20-0 corresponds to 20 lb/acre of preplant N, 20 lb/acre applied at PI, and 0 lb/ acre applied at heading. A single number indicates that all N was applied preplant.

Treatment	1997	Rank	1996	Rank
0	5000	12	6400	4
20	5400	9	6390	5
40	5310	10	6120	6
20-20-0	5690	5	6430	3
20-0-20	**6010**	**1**	**6770**	**1**
60	4780	13	5990	9,10
40-20-0	5230	7	5770	11
40-0-20	5240	11	6760	2
80	5620	6	5030	14
40-40-0	5480	8	5750	12
40-0-40	5750	3	5990	9,10
100	5720	4	5310	13
50-50-0	4770	14	6080	8
50-0-50	5790	2	6100	7
LSD (0.05)	430		390	

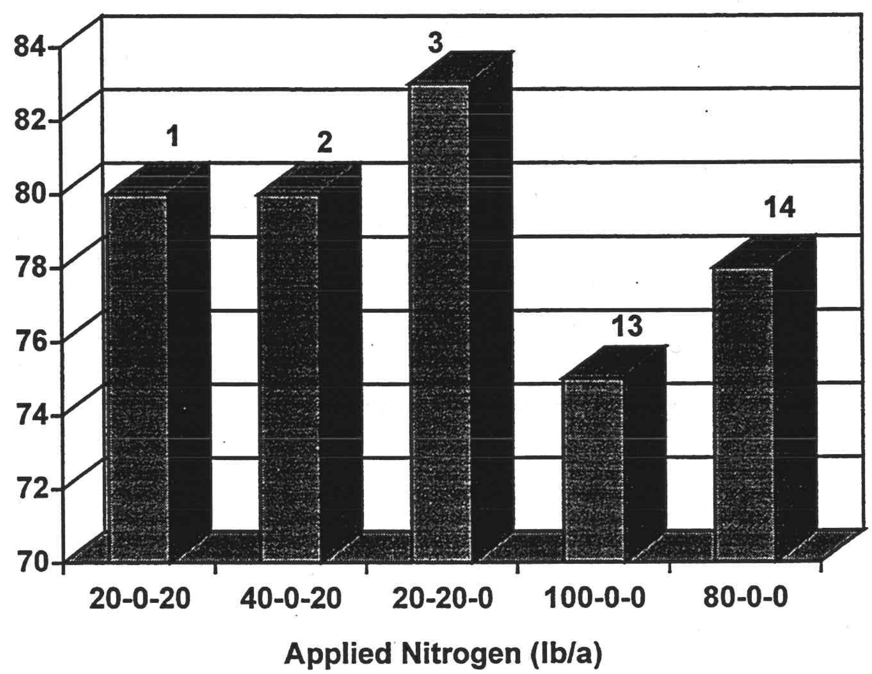

Figure 2. 1996 Koshihikari taste scores associated with different rates of nitrogen. Numbers above bars represent 1996 yield rank (refer to Table 2).

Table 11. Leaf N (%) estimated with the chlorophyll meter at panicle initiation.

	Meter Value											
	26	27	28	29	30	31	32	33	34	35	36	37
Akita	1.9	2.0	2.1	2.2	2.3	2.4	2.5	2.6	2.7	2.8	2.9	3.0
Koshi	1.9	2.0	2.1	2.2	2.3	2.4	2.5	2.6	2.7	2.8	2.9	3.0

Values rounded to one decimal place. Leaf N at meter value of 26: Akita=1.86%; Koshi=1.91%.