ANNUAL REPORT
COMPREHENSIVE RESEARCH ON RICE
January 1, 1999 - December 31, 1999

PROJECT TITLE: Cooperative Extension Rice Variety Adaptation and Cultural Practice Research

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LEVEL OF 1998 FUNDING: $94,790

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 eighteen entries (nine commercial varieties and nine advanced breeding lines) in four replications. The second test included twenty-four entries: one commercial variety and twenty-three preliminary breeding lines in two replications.

Early Maturity Group - Two uniform tests were conducted at each of the following on-farm sites: the McKnight 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 preliminary breeding lines in two replications.

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 Penning Ranch (Yuba County). Two additional tests were conducted by the plant breeders at the RES. The first test at each site included fourteen entries (six commercial varieties and eight advanced breeding lines) in four replications; and the second test consisted of nineteen preliminary breeding lines, and one commercial variety, in two replications.

Additional yield tests – At six locations in 1999, three transgenic rice lines, with engineered tolerance for Liberty herbicide (Liberty-Link system), were evaluated for yield by comparison to M202. One half of the transgenic lines were sprayed with Liberty, a broad-spectrum non-selective herbicide. Transgenic seed was removed from the field at harvest.

At two early trial locations and two intermediate/late locations, commercial cultivars were studied for straw yield and processing characteristics. The varieties evaluated included Calmochi-101, L-204, L-205, M-202, M204, S-102 at the early trial locations and M-401 and M-402 at the two intermediate/late locations. Total biomass at harvest was determined by cutting with the combine at ground level and collecting straw from the rear of the combine. Straw sub-samples were taken to analyze for physical and chemical properties related to straw handling and utilization.

Objective II

To conduct research on improved cultural practices:

Variety by nitrogen study: The Rice Experiment Station recently released four new varieties with another due for release in 2000. This research was conducted to provide growers with initial guidelines for nitrogen management of these new varieties. The experiment was conducted at the Rice Experiment Station, Biggs, CA.

Eight varieties were grown at 6 different nitrogen rates (0, 40, 80, 120, 160 and 200 lb N/acre) in a split-plot design with four replications of the main plot treatment. Nitrogen treatment and variety were the main and subplot treatments, respectively. Varieties tested included 4 new releases (M402, L205, Calmati, and Calhikari), 1 advanced line (Y-615), and 3 standard varieties (M202, L204, and S102). Y-615 will be released as M205 in 2000.

Color chart for estimating leaf nitrogen: A prototype color chart for visually estimating leaf tissue nitrogen in California rice varieties was developed and calibrated. The leaf color of a short, medium, and long grain variety grown under different levels of nitrogen was quantified using a

colorimeter. The results were used to fabricate a series of acrylic color panels corresponding to a range of tissue nitrogen concentrations. Final construction of color panels will begin in spring of 2000.

Potassium Study: The objectives of this study were to: 1) to re-evaluate the effect of K fertilization response of rice yield and its interaction with N; 2) to determine how adequate level of available K affects the occurrence of rice diseases; and 3) to reassess the accuracy of the soil K test on predicting plants available K.

In 1999, as part of the first field season activities of a three year field study, a field at Mathews Farm near Marysville, CA that would likely show a potassium (K) deficiency was selected. From half of the selected area, the rice straw was removed whereas for the other half of the field, the rice straw was incorporated in the fall of 1998. The same location will be used for the next three years and straw will be removed or incorporated for the duration of the experiment.

Objective III

To continue investigations on the management of Japanese premium quality rice:

Proper nitrogen management in the Japanese varieties Akitakomachi and Koshihikari is key to producing superior quality rice. Plant productivity and quality response of these varieties to an array of rate and times of nitrogen applications were studied at locations in Butte County during the past 3 years. To test the applicability of previous years' results to the Sacramento Valley at large, a multi-county test of the top producing nitrogen treatments was conducted in 1999.

Experiments were conducted at 6 locations, 3 each for Japanese varieties Akitakomachi (Akita) and Koshihikari (Koshi). Akita was grown at 6 and Koshi 8 different nitrogen treatments. Nitrogen was applied entirely preplant or as preplant/topdress applications. Treatments were chosen based on previous results (see 1998 Annual Comprehensive Rice Research Report). Akita experiments were conducted near Richvale, Pleasant Grove and Colusa. Koshi experiments were conducted near Richvale, Yuba City, and Willows.

Objective IV

To provide professional technical assistance to other UC research project leaders and to maintain an Extension-based equipment pool for planting, fertilizing, treating, and harvesting field experiments.

Objective V

To support the dissemination of rice research information to California producers and the public through the publication and distribution of fact sheets and other material.

SUMMARY OF 1999 RESEARCH OBJECTIVES

Objective I - Rice Variety Evaluation

Eight 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) - Nine advanced breeding lines and nine commercial varieties were compared in four very early tests. In addition, twenty-three preliminary lines were compared to the Japanese variety, Akitakomachi at each location. Commercial varieties at each location included Calhikari-201, Calmati-201, Calmochi-101, M-103, M-202, M-204, L-204, L-205, and S-102. Advanced lines at each location included nine entries from the RES breeding program.

Grain yields in the advanced tests averaged 10,160 lb/acre at the Biggs-RES, 8,980 lb/acre at Sutter, 7,950 lb/acre at Yolo, and 4,520 at San Joaquin.(Table 1). Yields from the San Joaquin location were excluded from the over locations analysis due to very low overall yield and high variability. Over the three locations, the highest yielding entry was S-102 followed by the advanced line 96Y196, a waxy, short-grain and M-103. Of the remaining commercial varieties ranking in the top ten, Calmochi-101, L-204, M-202 and L-205 ranked fourth, sixth, ninth and tenth respectively. Two of the preliminary lines, 97Y187 and 97Y182, ranked higher than any entry in the advanced test. Heading was slower than in past years, with an average of 94 days after seeding (DAS) in the advanced lines (Table 2) compared to an average of 84 DAS in 1998 and 89 DAS in 1997.

Early Tests (90-97 days to 50% heading at Biggs) - Eleven advanced lines and nine commercial varieties were compared in four early tests. Twenty preliminary lines were also evaluated in separate tests at each location. Commercial varieties at each location were Calmati-201, Calmochi-101, M-103, M-202, M-204, L-204, L-205, S-102 and S-201.

Yields in the advanced line tests averaged 9,920 lb/acre at the RES; 5,590 lb/acre at Butte (McKnight Ranch); 8,510 lb/acre at Colusa, and 6,820 lb/acre at Yuba (Table 3). The short, 'waxy' cultivar, 96Y203, was the highest yielding entry averaged over the four locations in 1999. Other top entries in the test were S-102, Calmochi-101, M-103, and M-202. Other commercial

varieties were M-204, L-204 and L-205, ranking seventh, ninth, and thirteenth over all tests. M-202 yielded 8,950 lb/acre and was ranked fifth. None of the preliminary lines exceeded the top yielding experimental line in the advanced tests, but several yielded slightly more than the commercial standard M-202 in the advanced tests. Time to 50% heading in the advanced test averaged 99 DAS for all entries and locations(Table 4). The commercial standard M-202 required a relatively long period of 97 DAS to reach 50% heading versus a multi-year average of 90 days.

Intermediate-Late Tests (> 97 days to 50% heading at Biggs) - Eight advanced lines and six commercial varieties were compared in three intermediate-late tests. Nineteen preliminary lines were also evaluated in separate tests at each location. Commercial varieties at each location included A-201, Calmati-201, M-202, M-204, M-401, and M-402.

Average yields in the advanced line tests were 8,720 lb/acre at the RES, 7,300 lb/acre at Glenn, and 7,330 lb/acre at Sutter (Table 5). The advanced medium-grain line, 97Y413, was the highest yielding entry overall. The highest yielding commercial variety was M-204, followed by M-402 and M-202. The premium quality medium grain variety M-401, which ranked second overall in 1997, and eleventh overall in 1998, ranked eleventh in 1999. The overall yield of the preliminary line 98Y644, a medium-grain, was higher than any entry in the advanced tests. Average time to heading across all varieties and locations was 101 DAS (Table 6) with M-401 again taking much longer to head (117 DAS) than any other entry and longer than the multi-year average, for M-401, of 111 days.

Objective II - Cultural Practices

Variety by nitrogen study: The Rice Experiment Station recently released four new varieties with another due for release in 2000. This research was conducted to provide growers with initial guidelines for nitrogen management of these new varieties. The data is from one year at one location. The information should be evaluated in the context of the individual farming operation and cropping year.

Field Trial. The experiment was conducted at the Rice Experiment Station, Biggs, CA. Eight varieties were grown at 6 different nitrogen rates (0, 40, 80, 120, 160 and 200 lb N/acre) in a split-plot design with four replications of the main plot treatment. Nitrogen treatment and variety were the main and subplot treatments, respectively. Varieties tested included 4 new releases (M402, L205, Calmati, and Calhikari), 1 advanced line (Y-615), and 3 standard varieties (M202, L204, and S102). Y-615 will be released as M205 in 2000.

Ammonium sulfate (21-0-0-24) was banded 2-3 inches deep in bands 8 inches apart with a Clampco precision fertilizer drill. Individual plot size was 10 by 20 feet. The field was flooded within a few days of fertilizer application. Presoaked seed was broadcast onto flooded plots at a rate of 150 lb/acre on May 24, 1999. The field was managed with conventional cultural practices.

Data Collection. Performance characteristics measured for each variety included days to 50% heading, disease ratings for aggregate sheath spot and stem rot (J. Oster, RES), height, lodging, grain moisture at harvest, grain yield at 14% moisture, and straw biomass. Days to 50% heading were determined when 50% of the heads in a given plot were free of the boot. Plant height was taken at harvest measured from the soil surface to the tip of the panicle. Lodging was a visual score of 0 (no lodging) to 100 (all plants lodged). Time of lodging was not recorded. Disease ratings were scored 0 (no disease) to 5 (severe). Grain was harvested from a 7.5 X 20 feet (0.0034 acre) area from each plot with a SWECO 324 plot combine. Final yield was adjusted to 14%. Straw biomass was measured by catching the straw as it left the harvester in a large sack attached to a load cell and mounted on the combine.

Data Analysis. Regression analysis was used to predict maximum yields by calculating the first derivative of the yield response function and determining the N rate at the predicted maximum yield. An LSD(0.05) analysis was used for mean separation and test for significance.

Results: M202 yield maximized (9380 lb/a) at 135 lb N/a (Figure 1). In contrast the other two medium grain varieties tested, Y-615 and M402, both showed a maximum yield responses of 9350 and 8900 lb/a, respectively, at 120 lb N/a.

Among the long grain varieties tested, L204 yielded the highest, 8390 lb/a, at 125 lb N/a. maximum yields 7680 lb/a for L205 occurred at a N rate of 140 lb/a (Figure 2). Calmati was the lowest yielding long grain (6170 lb/a). Blanking in Calmati was one factor that contributed to the low yield.

Yield of S102 was the highest of all varieties tested (10,200 lb/a). Maximum yield would be expected at 135 lb N/a(Figure 3). The new Japanese type premium short grain, Calhikari, yielded the highest (8650 lb/a) at a N rate of 110 lb/a.

Performance characteristics for the test varieties at their optimal N rates are shown in Table 8. Plant height ranged from 34 to 39 inches across varieties. Calmati did not lodge in this experiment. In contrast, M202, S102, and Calhikari exhibited a 50% or greater lodge rate at optimal yield N rates. Straw weight was roughly comparable to grain weight with the exception of Calmati where grain yield accounted for only 41% of the total above ground biomass. Average days to 50% heading ranged from 87 (M202 and Calhikari) to 94 for M402. On average, days to 50% heading increased by 8 when N increased from 0 to 200 lb/a (data not shown).

In general, stem rot increased with increasing amounts of N for all varieties (Figure 4). Conversely, the incidence of aggregate sheath spot declined with increasing amounts of applied N. Stem rot levels in M202 and Calhikari were the most responsive to changes in N; M402 was the least.

Color chart for estimating leaf nitrogen: A prototype color chart for visually estimating leaf tissue nitrogen in California rice varieties was developed and calibrated. The leaf color of a short, medium, and long grain variety grown under different levels of nitrogen was quantified using a colorimeter. The results were used to fabricate a series of acrylic color panels

corresponding to a range of tissue nitrogen concentrations. Final construction of color panels will begin in spring of 2000.

Potassium Study: This project was partially funded by the California Department of Food and Agriculture Fertilizer Research and Education Program. It is reported here because fertilizer application and harvesting was supported by RM-2. The work was conducted by Chris Van Kessel, William Horwath and Jack Williams.

California legislation (AB 1378) leading to a phase down of rice straw burning is changing the way farmers manage rice straw. Although soil incorporation is the most commonly used option for straw management, removal is expected to increase. The average concentration of K in rice straw is around 1.4 % but its range can be as low as 0.6 % or as high as 1.8 %. The amount of straw removed by baling for off-site use can exceed 100 lbs./acre, in addition to the K removed by grain. When straw is removed on a continued basis, this management practice would show a pronounced effect on the available K levels in the soil. Some preliminary data gathered from the long term straw rotation studies at the Rice Experiment Station showed that the extractable K levels in the soil in the top 15 cm declined significantly to less than 60 ppm when straw was baled for 3 years. The current fertility guideline for rice is that 30-60 ppm of extractable K should be present at time of seeding; otherwise K fertilization is recommended.

The objectives of this study are 1) to re-evaluate the effect of K fertilization response of rice yield and its interaction with N; 2) to determine how adequate level of available K affects the occurrence of rice diseases; and 3) to reassess the accuracy of the soil K test on predicting plants available K.

As part of the first field season activities of a three year field study, a field at Matthews Farm near Marysville, CA, that would likely show a potassium (K) deficiency, was selected. From half of the selected area, the rice straw was removed whereas for the other half of the field, the rice straw was incorporated in the fall of 1998. The same location will be used for the next three years and straw will be removed or incorporated for the duration of the experiment. In the spring of 1999, 10 soil samples were collected from the site where straw was removed or where straw was incorporated. After one year of straw removal, a significant difference in soil available K concentration: 59 mg K/kg soil when the straw was removed versus 88 mg K/kg soil when the straw incorporated plot was detected.

In the spring of 1999, an N by K rate trial was established on both straw management treatments. A split plot factorial design replicated 4 times with 5 rates of N (0, 44.5, 89, 133.5, 178 lbs/Acre) as ammonium sulfate and 6 rates of K (0, 22, 44, 67, 89, 111 lbs/ac) as potassium chloride for each straw management treatment (total of 240 plots) was used. Plant tissue samples were collected before panicle initiation and are currently been analyzed for N and K content.

There was a strong N fertilizer response and grain yield increased from 6015 lbs/ac. under zero N fertilization to 9150 lbs/ac under high rate of N application. The yield under zero N fertilization was 350 lbs/ac higher when residue was incorporated, suggesting a small N carry over from the residue. There was also an increase of about 1000 lbs/ac in straw yield when residue was

incorporated. As grain yield was not affected by straw incorporation or removal, the increase in total biomass was solely due to the increase in straw production.

Potassium fertilization had no effect on total grain yield (across all N rates: 8271 versus 8198 lbs/ac), despite the difference in extractable K levels in the spring following straw incorporation. The amount of extractable K of 59 mg/kg soil when the straw was removed would have been considered as inadequate and K fertilization would have been recommended. Therefore, under the growing conditions of 1999, the soil test in the spring did not accurately predict K availability and more K may have been available for crop uptake than the soil test for K predicted.

Aggregate sheathspot disease declined from a high of 3.35 under zero N application to a low of 2.80 under higher levels of N rate. Rate of K application did not show any effect of Aggregate sheathspot. Because there was absence of a K response on yield, the levels of K in the soil were sufficient and this may have precluded any effect of K on aggregate sheathspot.

Objective III - Continued Investigations on the Management of Japanese Premium Quality Rice

Proper nitrogen management in the Japanese varieties Akitakomachi and Koshihikari is key to producing superior quality rice. Plant productivity and quality response of these varieties to an array of rate and times of nitrogen applications were studied at locations in Butte County during the past 3 years. To test the applicability of previous years' results to the Sacramento Valley at large, a multi-county test of the top producing nitrogen treatments was conducted in 1999.

Field Trial. Experiments were conducted at 6 locations, 3 each for Japanese varieties Akitakomachi (Akita) and Koshihikari (Koshi). Akita was grown at 6 and Koshi 8 different nitrogen treatments (Tables 9,10). Nitrogen was applied entirely preplant or as preplant/topdress applications. Treatments were chosen based on previous results (see 1998 Annual Comprehensive Rice Research Report). Akita experiments were conducted near Richvale, Pleasant Grove and Colusa. Koshi experiments were conducted near Richvale, Yuba City, and Willows.

Preplant treatments consisted of ammonium sulfate (21-0-0-24) banded 2-3 inches deep in bands 8 inches apart with a Clampco precision fertilizer drill. Topdressing treatments were broadcast over the individual plots. Three numbers designate treatments. The numbers represent lb/a applied at preplant, PI, and heading. For example, 0-40-20 designates 0 preplant nitrogen, 40 lb at PI and 20 lb at heading. Individual plot size was 10 by 20 feet. The field was flooded within a few days of fertilizer application. Presoaked seed was flown on and the fields were managed using conventional cultural practices. The Koshi experiment near Yuba City was compromised due to an over-flight of N fertilizer. Yield data from that trial are not presented.

Data Collection. Performance characteristics measured for each variety included days to 50% heading, height, lodging, grain moisture at harvest, and grain yield at 14% moisture. Grain was harvested from a 7.5 X 20 feet (0.0034 acre) area from each plot and final yield was adjusted to

14% moisture. Tissue samples for nitrogen analysis were taken at panicle initiation (PI) and PI plus seven days.

Data Analysis. Data was analyzed with a 2-way analysis of variance and an LSD (0.05) mean separation to test for significance. Regression analysis was used to predict yields as a function of the tissue N levels at PI.

Results. No significant differences in Akita yields between treatments were observed at any location (Table 9). However, significant across location differences were detected where the 40-40-0 produced the highest yields. The larger number of data points for each treatment when the data was pooled strengthened the analysis. The 60 lb N/a preplant treatment and the 50-50-0 preplant/PI split also performed well. Regression analysis indicated that the highest yield in Akita occur when tissue nitrogen is approximately 2.7% at PI (Figure 5).

No significant differences in yield between treatments were apparent in Koshi at either location (Table 10). Similar to Akita, differences were observed in Koshi yield response when the data was pooled across location. The 50-25-25 treatment produced the highest yields. Leaf nitrogen content at PI was not a good predictor of yield in Koshi.

Objective IV - 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 1999. The precision fertilizer applicator was used to establish five nitrogen trials and potassium trials. The SWECO 324 plot combine was used to harvest nineteen variety experiments, fertility experiments, all sub-plots within the straw management trials, and all sub-plots within the herbicide resistance management trial. UC equipment and personnel assisted with establishment of levee infrastructure for weed control plots at Biggs, RES. 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.

Objective V - Publication and Distribution of Rice Research Information
The following reports were designed, formatted and printed with support from this project:

Annual Report Comprehensive Rice Research 1998
University of California and USDA, 180 pp.

Rice Field Day Program, 1999
California Cooperative Rice Research Foundation, RES, 47pp.

L-204 Rice: Description and Management Guidelines
Agronomy Fact Sheet Series, No. 1999-2
UC Davis, Department of Agronomy & Range Science

L-205 Rice: Description and Management Guidelines
Agronomy Fact Sheet Series, No. 1999-3
UC Davis, Department of Agronomy & Range Science

PUBLICATIONS OR REPORTS:

Mutters, R.G., and J.W. Eckert. 1999. Fertility studies on Japanese varieties of rice. Rice Field Day Abstracts 1999, CCRRF. p.28

Mutters, R.G., and J.W. Eckert. 1999. Fertility Studies on Japanese Varieties of Rice: Akitakomachi and Koshihikari. Proceedings of the 2nd. Temperate Rice Conference. June 13-17, 1999, Sacramento, CA

Tseng, S.T., C.W. Johnson, K.S. McKenzie, D.M. Brandon, J.E. Hill, W.M. Canevari, R.G. Mutters, S.C. Scardaci, J.F. Williams. 1999. L-204 Rice: Description and Management Guidelines. Agronomy Fact Sheet Series, No. 1999-2, UC, Davis, Department of Agronomy and Range Science,

Tseng, S.T., C.W. Johnson, K.S. McKenzie, D.M. Brandon, J.E. Hill, W.M. Canevari, R.G. Mutters, S.C. Scardaci, J.F. Williams. 1999. L-205 Rice: Description and Management Guidelines. Agronomy Fact Sheet Series, No. 1999-3, UC, Davis, Department of Agronomy and Range Science,

Williams, J.F. 1999. California Situation and Outlook. Rice Outlook Conference, December 6-7, 1999, San Antonio, Texas.

CONCISE GENERAL SUMMARY OF CURRENT YEAR'S RESULTS:

Sixteen on-farm rice variety evaluation trials were conducted throughout the rice growing region of California, exposing standard, advanced and preliminary varieties to a range of environments, cultural practices and disease levels. Six similar tests were conducted at the RES in Biggs, CA. Average yields across varieties and locations ranged from about 7,700 lb/acre in the early and intermediate variety tests to about 9,030 lb/acre in the very early tests. Unusually cool mid-season temperatures lengthened time to 50% heading and caused cold-induced sterility which decreased yields in varieties exposed to cool weather during late July and early August. Under these weather conditions, which selected for tolerance to cold-induced pollen sterility, several advanced and preliminary lines appeared to yield well relative to the commercial standards demonstrating the importance of yearly statewide testing under a variety of conditions in order to select varieties with stable yield potential. As in previous years, the commercial standards

ranked high in yield against the advanced and preliminary entries, demonstrating that further yield advances are difficult to attain. However, testing advanced and preliminary lines under a variety of conditions remains a critical aspect of releasing varieties adapted to changing cultural practices, markets and pests.

Plant productivity and grain quality response of the Japanese varieties Akitakomachi and Koshihikari were studied under an array of nitrogen rate and timing applications in a multi-county test. Top producing nitrogen treatments were selected from three previous years of work in Butte county. This study validated and broadened the conclusions drawn from previous work and provides growers with timely information on management of Akitakomachi and Koshihikari; two varieties which require non-conventional nitrogen management and are planted on an increasing acreage due to market demand. The Rice Experiment Station recently released four new varieties(M-402, L-205, Calmati-201 and Calhikari-201). A study was conducted at the RES to provide growers with initial guidelines for nitrogen management of these new varieties. The results suggest rates of applied nitrogen which maximize yield under conventional management techniques and will therefore be useful to growers in optimizing the genetic potential of these new varieties.

Table 1. 1999 Very early rice lines and varieties grain yield (lb/acre @14% moisture) at four locations.

ADVANCED LINES AND VARIETIES

Variety	Grain Type	Three location Average	Biggs Biggs RES	Yolo Geer Ranch	Sutter Lauppe Ranch	San Joaquin Brumley Ranch
S102	S	10530 (1)	11140 (3)	10290 (1)	10150 (1)	8260 (3)
96Y196	W	10230 (2)	10800 (4)	10060 (2)	9810 (3)	8370 (2)
M103	M	9990 (3)	10330 (9)	9960 (3)	9670 (5)	7980 (4)
CM101	WX	9940 (4)	10200 (11)	9960 (4)	9670 (4)	8860 (1)
96Y457	L	9790 (5)	11210 (2)	9000 (7)	9150 (10)	2610 (11)
L204	L	9660 (6)	10310 (10)	9250 (5)	9410 (7)	2460 (13)
95Y214	M	9610 (7)	10550 (7)	9020 (6)	9260 (8)	5620 (5)
97Y257	M	9550 (8)	11320 (1)	7890 (10)	9440 (6)	4300 (7)
M202	M	9290 (9)	10480 (8)	7420 (14)	9990 (2)	
L205	L	9180 (10)	10610 (6)	7750 (12)	9170 (9)	2490 (12)
98Y174	MPQ	9090 (11)	9820 (14)	8370 (8)	9070 (12)	4280 (8)
97Y476	L	8970 (12)	10700 (5)	7750 (13)	8460 (17)	1960 (15)
97Y143	SPQ	8830 (13)	9790 (15)	7910 (9)	8780 (14)	2000 (14)
98-468	SPQ	8580 (14)	8760 (17)	7850 (11)	9140 (11)	3390 (9)
M204	M	8470 (15)	10100 (13)	6730 (15)	8560 (16)	4420 (6)
94Y615	M	8140 (16)	10130 (12)	5720 (16)	8570 (15)	3330 (10)
CH201	SPQ	8030 (17)	9460 (16)	5710 (17)	8920 (13)	1910 (16)
CT201	BA	4640 (18)	7090 (18)	2410 (18)	4420 (18)	
MEAN		9030	10160	7950	8980	4520
CV		6.6	8.1	6.1	4.3	13.6
LSD (.05)		480	1160	680	550	880

PRELIMINARY LINES AND VARIETIES

Variety	Grain Type	Three location Average	Biggs Biggs RES	Yolo Geer Ranch	Sutter Lauppe Ranch	San Joaquin Brumley Ranch
97Y187	S	11160 (1)	11590 (1)	11160 (1)	10730 (2)	8270 (3)
97Y182	S	10920 (2)	11070 (3)	10540 (2)	11160 (1)	8690 (1)
97Y255	M	10190 (3)	10620 (9)	9340 (6)	10600 (3)	5090 (10)
98Y189	S	10110 (4)	11240 (2)	8660 (12)	10440 (4)	4650 (13)
98Y199	W	10090 (5)	10820 (7)	10040 (3)	9420 (13)	7320 (5)
97Y192	W	10070 (6)	10260 (19)	9740 (4)	10200 (5)	8430 (2)
97Y469	L	10020 (7)	10370 (15)	9530 (5)	10160 (6)	5100 (9)
98Y214	M	9840 (8)	10700 (8)	8850 (11)	9960 (8)	5080 (12)
98Y240	M	9800 (9)	10290 (17)	9300 (8)	9810 (11)	5480 (6)
9733046	L	9770 (10)	10940 (5)	8540 (13)	9820 (10)	
98Y213	M	9760 (11)	10070 (20)	9330 (7)	9870 (9)	7400 (4)
98Y265	M	9630 (12)	10530 (11)	8920 (9)	9440 (12)	5080 (11)
98Y212	M	9540 (13)	10530 (10)	8130 (16)	9980 (7)	2810 (21)
98Y208	M	9500 (14)	10270 (18)	8900 (10)	9340 (14)	5200 (7)
98Y372	M	9440 (15)	11050 (4)	8510 (14)	8770 (16)	5110 (8)
9731978	L	9270 (16)	10840 (6)	8310 (15)	8660 (17)	3180 (19)
98Y400	M	8800 (17)	10490 (13)	6750 (21)	9150 (15)	3180 (18)
97Y549	L	8790 (18)	10490 (14)	7380 (19)	8510 (20)	
98-171	MPQ	8700 (19)	9910 (21)	7660 (18)	8520 (19)	3970 (15)
98Y452	L	8690 (20)	10510 (12)	7720 (17)	7850 (22)	4040 (14)
97Y517	L	8580 (21)	10370 (16)	6780 (20)	8580 (18)	3450 (17)
98Y500	L	7430 (22)	9440 (22)	4780 (24)	8070 (21)	3080 (20)
98Y454	L	6740 (23)	9390 (23)	5120 (22)	5690 (24)	
AKITA	SPQ	6290 (24)	6390 (24)	4870 (23)	7620 (23)	3590 (16)
MEAN		9300	10340	8290	9260	5150
CV		4.8	4.4	6	4.2	15.6
LSD (.05)		510	940	1020	800	1670

S = short; M = medium; L = long; WX = waxy; B = basmati; A = aromatic; PQ = premium quality
Numbers in parentheses indicate rank in column.

Table 2. 1999 Very early rice lines and varieties three location summary.

ADVANCED LINES AND VARIETIES

Variety	Grain 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)
S102	S	10530 (1)	16.0 (18)	4.0 (17)	88 (2)	11 (11)	91 (17)
96Y196	W	10230 (2)	18.9 (10)	4.0 (14)	88 (1)	15 (14)	85 (6)
M103	M	9990 (3)	18.4 (11)	4.2 (9)	90 (4)	18 (17)	90 (16)
CM101	WX	9940 (4)	17.6 (13)	4.0 (15)	90 (6)	17 (16)	89 (12)
96Y457	L	9790 (5)	17.1 (14)	4.1 (12)	95 (11)	3 (7)	88 (11)
L204	L	9660 (6)	16.9 (15)	4.4 (5)	94 (9)	1 (2)	82 (2)
95Y214	M	9610 (7)	19.0 (9)	4.5 (2)	89 (3)	15 (13)	89 (14)
97Y257	M	9550 (8)	20.5 (5)	4.4 (4)	96 (13)	3 (8)	87 (9)
M202	M	9290 (9)	22.0 (3)	4.4 (6)	97 (14)	6 (9)	93 (18)
L205	L	9180 (10)	16.3 (17)	4.2 (10)	95 (12)	2 (4)	84 (5)
98Y174	MPQ	9090 (11)	19.9 (6)	4.4 (3)	92 (7)	16 (15)	89 (13)
97Y476	L	8970 (12)	16.6 (16)	4.0 (15)	93 (8)	1 (3)	80 (1)
97Y143	SPQ	8830 (13)	17.8 (12)	4.0 (13)	90 (5)	14 (12)	83 (3)
98-468	SPQ	8580 (14)	20.6 (4)	4.3 (7)	94 (10)	33 (18)	89 (15)
M204	M	8470 (15)	23.3 (2)	4.6 (1)	99 (16)	2 (4)	87 (10)
94Y615	M	8140 (16)	24.9 (1)	4.2 (8)	101 (17)	3 (6)	86 (7)
CH201	SPQ	8030 (17)	19.3 (8)	4.1 (11)	97 (15)	8 (10)	86 (8)
CT201	BA	4640 (18)	19.7 (7)	3.8 (18)	102 (18)	1 (1)	84 (4)
MEAN		9030	19.1	4.2	94	9	87
CV		6.6	7.2	7.6	1.9	115.9	4.3
LSD (.05)		480	1.1	0.3	1	9	3

PRELIMINARY LINES AND VARIETIES

Variety	Grain 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)
97Y187	S	11160 (1)	19.8 (4)	4.3 (10)	89 (3)	4 (13)	92 (20)
97Y182	S	10920 (2)	18.7 (8)	4.1 (14)	92 (13)	6 (19)	91 (19)
97Y255	M	10190 (3)	19.7 (5)	4.4 (9)	95 (20)	5 (17)	94 (23)
98Y189	S	10110 (4)	18.4 (11)	4.3 (12)	92 (15)	5 (15)	90 (18)
98Y199	W	10090 (5)	22.2 (1)	4.1 (17)	91 (11)	4 (13)	87 (12)
97Y192	W	10070 (6)	17.9 (15)	4.0 (21)	89 (2)	25 (23)	85 (8)
97Y469	L	10020 (7)	16.2 (22)	4.7 (2)	94 (17)	2 (9)	93 (22)
98Y214	M	9840 (8)	18.7 (7)	4.3 (11)	90 (7)	3 (11)	88 (16)
98Y240	M	9800 (9)	18.0 (14)	4.5 (5)	92 (14)	2 (8)	92 (21)
9733046	L	9770 (10)	16.4 (20)	4.1 (16)	94 (19)	3 (10)	88 (17)
98Y213	M	9760 (11)	17.7 (18)	4.7 (1)	85 (1)	5 (18)	87 (13)
98Y265	M	9630 (12)	18.7 (6)	4.5 (3)	91 (10)	5 (16)	85 (6)
98Y212	M	9540 (13)	18.1 (13)	4.4 (6)	91 (11)	7 (20)	83 (4)
98Y208	M	9500 (14)	18.1 (12)	4.4 (6)	89 (4)	3 (11)	87 (14)
98Y372	M	9440 (15)	20.8 (2)	4.5 (4)	98 (23)	2 (6)	86 (10)
9731978	L	9270 (16)	15.4 (23)	4.1 (17)	90 (8)	1 (2)	75 (1)
98Y400	M	8800 (17)	18.6 (9)	4.4 (6)	94 (17)	2 (6)	86 (9)
97Y549	L	8790 (18)	16.2 (21)	3.8 (22)	93 (16)	1 (2)	77 (3)
98-171	MPQ	8700 (19)	18.6 (10)	4.2 (13)	89 (6)	7 (21)	86 (10)
98Y452	L	8690 (20)	14.9 (24)	4.0 (20)	89 (4)	1 (1)	77 (2)
97Y517	L	8580 (21)	17.2 (19)	4.1 (15)	98 (24)	1 (5)	87 (15)
98Y500	L	7430 (22)	17.8 (16)	3.5 (24)	96 (22)	1 (2)	85 (7)
98Y454	L	6740 (23)	17.8 (17)	4.1 (17)	95 (20)	14 (22)	83 (5)
AKITA	SPQ	6290 (24)	19.9 (3)	3.6 (23)	91 (9)	95 (24)	100 (24)
MEAN		9300	18.2	4.2	92	8	87
CV		4.8	4.9	6.8	1.6	85	3.4
LSD (.05)		510	1	0.3	2	8	3

S = short; M = medium; L = long; WX = waxy; B = basmati; A = aromatic; PQ = premium quality
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 rank in column.

Table 3. 1999 Early rice lines and varieties grain yield (lb/acre @14% moisture) at four locations.

ADVANCED LINES AND VARIETIES

Variety	Grain Type	Average	Biggs Biggs RES	Butte Mcknight Ranch	Colusa Canal Ranch	Yuba Quad-4 Ranch
96Y203	W	9720 (1)	11260 (1)	6710 (6)	11310 (1)	9590 (1)
S102	S	9610 (2)	10460 (6)	8630 (1)	10260 (3)	9100 (2)
CM101	WX	9130 (3)	9850 (11)	8380 (2)	9870 (6)	8410 (3)
M103	M	9010 (4)	10120 (8)	7720 (3)	9940 (5)	8260 (5)
M202	M	8950 (5)	10540 (5)	6780 (5)	10550 (2)	7920 (6)
95Y214	M	8930 (6)	10220 (7)	7200 (4)	10010 (4)	8290 (4)
M204	M	8520 (7)	11130 (3)	6070 (9)	9780 (7)	7100 (9)
97Y393	M	8460 (8)	10960 (4)	6100 (8)	9070 (10)	7710 (7)
L204	L	7930 (9)	9830 (13)	6230 (7)	9180 (9)	6470 (12)
96Y341	S	7880 (10)	10080 (9)	6060 (10)	8290 (12)	7090 (10)
94Y615	M	7830 (11)	11200 (2)	4740 (13)	8260 (13)	7130 (8)
96Y480	L	7630 (12)	9840 (12)	4290 (14)	9440 (8)	6940 (11)
L205	L	7280 (13)	9850 (10)	4860 (11)	8160 (15)	6240 (15)
98Y582	MPQ	7110 (14)	9820 (14)	4780 (12)	7830 (16)	6000 (17)
98-115	SPQ	7050 (15)	9270 (17)	3910 (16)	8760 (11)	6240 (14)
CH201	SPQ	6980 (16)	9460 (16)	3930 (15)	8220 (14)	6310 (13)
97Y315	S	6410 (17)	9540 (15)	3650 (17)	6340 (18)	6120 (16)
98Y88	L	6180 (18)	9120 (19)	3420 (18)	6820 (17)	5350 (18)
97Y40	L	5280 (19)	9150 (18)	2820 (19)	5500 (19)	3680 (19)
CT201	BA		6620 (20)		2680 (20)	2420 (20)
MEAN		7740	9920	5590	8510	6820
CV		7.6	6.2	12.1	8.0	4.8
LSD (.05)		410	870	960	960	460

PRELIMINARY LINES AND VARIETIES

Variety	Grain Type	Average	Biggs Biggs RES	Butte Mcknight Ranch	Colusa Canal Ranch	Yuba Quad-4 Ranch
98Y242	M	9360 (1)	10910 (2)	7660 (4)	10460 (3)	8420 (2)
98Y389	M	9090 (2)	10110 (13)	7790 (3)	10250 (7)	8210 (3)
97Y197	W	8930 (3)	10540 (8)	6810 (7)	10720 (1)	7670 (6)
98Y558	LW	8880 (4)	10780 (3)	8220 (2)	9290 (14)	7240 (13)
98Y249	M	8770 (5)	10730 (6)	5970 (10)	9600 (13)	8790 (1)
98Y417	M	8670 (6)	10280 (11)	6210 (9)	10640 (2)	7560 (8)
98Y256	M	8650 (7)	10360 (10)	6560 (8)	10180 (9)	7520 (9)
97Y346	BS	8290 (8)	10760 (4)	7530 (5)	10050 (11)	4830 (18)
96Y323	BS	8270 (9)	10740 (5)	9370 (1)	6350 (20)	6630 (14)
9734336	L	8040 (10)	9930 (14)	7320 (6)	7630 (16)	7290 (12)
98Y396	M	8000 (11)	9510 (17)	5510 (13)	9230 (15)	7770 (5)
98Y272	M	7970 (12)	8710 (19)	5560 (11)	10210 (8)	7400 (10)
98Y421	M	7910 (13)	10980 (1)	2900 (17)	10450 (4)	7310 (11)
98Y613	M	7630 (14)	10460 (9)	5390 (14)	6690 (18)	7970 (4)
98Y509	LR	7570 (15)	10150 (12)	4820 (15)	9770 (12)	5550 (16)
9734316	L	7290 (16)	9540 (16)	4740 (16)	7260 (17)	7610 (7)
98Y535	L	7050 (17)	9890 (15)	2640 (18)	10090 (10)	5580 (15)
98Y618	M	6980 (18)	10590 (7)	5540 (12)	6530 (19)	5250 (17)
97Y509	LR	6680 (19)	9350 (18)	2310 (19)	10270 (6)	4800 (19)
99Y074	MPQ	5860 (20)	7230 (20)	1890 (20)	10270 (5)	4050 (20)
MEAN		8000	10080	5740	9300	6870
CV		15.7	7.6	12.9	19	20.9
LSD (.05)		1250	1610	1550	ns	ns

S = short; M = medium; L = long; WX = waxy; B = basmati; A = aromatic; PQ = premium quality
Numbers in parentheses indicate rank in column.

Table 4. 1999 Early rice lines and varieties four location summary.

ADVANCED LINES AND VARIETIES

Variety	Grain 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)
96Y203	W	9720 (1)	20.4 (6)	4.4 (1)	100 (10)	55 (20)	94 (19)
S102	S	9610 (2)	15.0 (19)	4.0 (10)	90 (1)	36 (14)	93 (13)
CM101	WX	9130 (3)	15.4 (18)	4.1 (6)	92 (4)	49 (19)	94 (17)
M103	M	9010 (4)	16.8 (14)	4.1 (9)	91 (3)	44 (18)	93 (15)
M202	M	8950 (5)	19.3 (8)	4.0 (11)	97 (5)	40 (16)	95 (20)
95Y214	M	8930 (6)	16.8 (15)	4.2 (3)	90 (2)	43 (17)	94 (17)
M204	M	8520 (7)	20.9 (3)	4.1 (7)	102 (14)	10 (11)	91 (10)
97Y393	M	8460 (8)	21.0 (2)	3.9 (14)	103 (16)	10 (12)	94 (16)
L204	L	7930 (9)	16.0 (16)	3.9 (13)	98 (7)	1 (1)	82 (3)
96Y341	S	7880 (10)	17.6 (11)	4.2 (2)	100 (11)	5 (9)	88 (8)
94Y615	M	7830 (11)	20.7 (5)	4.1 (5)	105 (19)	4 (7)	91 (11)
96Y480	L	7630 (12)	17.3 (12)	3.9 (12)	98 (6)	1 (5)	87 (6)
L205	L	7280 (13)	15.9 (17)	3.7 (16)	99 (8)	4 (8)	87 (7)
98Y582	MPQ	7110 (14)	21.3 (1)	3.8 (15)	104 (17)	6 (10)	93 (14)
98-115	SPQ	7050 (15)	20.0 (7)	4.1 (8)	104 (17)	39 (15)	86 (5)
CH201	SPQ	6980 (16)	17.7 (10)	4.1 (4)	99 (9)	18 (13)	89 (9)
97Y315	S	6410 (17)	20.8 (4)	3.7 (17)	103 (15)	1 (5)	92 (12)
98Y88	L	6180 (18)	16.9 (13)	3.6 (19)	101 (13)	1 (1)	79 (1)
97Y40	L	5280 (19)	18.2 (9)	3.6 (18)	101 (12)	1 (1)	80 (2)
CT201	BA			3.5 (20)	106 (20)	1 (1)	84 (4)
MEAN		7740	18.3	3.9	99	18	89
CV		7.6	5.1	10.2	1.7	61.5	4.1
LSD (.05)		410	0.6	0.3	1	11	3

PRELIMINARY LINES AND VARIETIES

Variety	Grain 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)
98Y242	M	9360 (1)	19.3 (7)	3.9 (8)	97 (1)	16 (12)	93 (18)
98Y389	M	9090 (2)	17.9 (16)	4.2 (4)	97 (3)	20 (18)	92 (16)
97Y197	W	8930 (3)	19.4 (6)	3.9 (9)	100 (10)	21 (19)	92 (16)
98Y558	LW	8880 (4)	17.2 (17)	3.8 (12)	102 (18)	3 (3)	88 (7)
98Y249	M	8770 (5)	18.6 (12)	3.7 (15)	101 (14)	11 (9)	90 (12)
98Y417	M	8670 (6)	19.5 (5)	3.9 (10)	101 (17)	25 (20)	89 (9)
98Y256	M	8650 (7)	18.5 (13)	4.1 (5)	98 (5)	8 (6)	87 (4)
97Y346	BS	8290 (8)	19.8 (3)	4.3 (2)	103 (19)	20 (17)	92 (15)
96Y323	BS	8270 (9)	18.4 (14)	3.7 (17)	100 (7)	5 (4)	90 (13)
9734336	L	8040 (10)	16.7 (20)	3.6 (20)	97 (2)	2 (2)	90 (11)
98Y396	M	8000 (11)	19.6 (4)	4.2 (3)	100 (11)	10 (8)	94 (19)
98Y272	M	7970 (12)	19.1 (9)	3.9 (7)	100 (9)	16 (11)	86 (3)
98Y421	M	7910 (13)	20.0 (2)	3.8 (13)	101 (14)	15 (10)	91 (14)
98Y613	M	7630 (14)	18.9 (11)	4.0 (6)	100 (13)	5 (5)	89 (10)
98Y509	L	7570 (15)	17.0 (18)	3.8 (13)	99 (6)	19 (16)	89 (8)
9734316	L	7290 (16)	16.8 (19)	3.6 (19)	100 (7)	1 (1)	88 (6)
98Y535	L	7050 (17)	18.1 (15)	3.6 (18)	101 (16)	9 (7)	84 (2)
98Y618	M	6980 (18)	19.2 (8)	3.9 (11)	100 (11)	19 (15)	87 (5)
97Y509	L	6680 (19)	19.1 (10)	3.7 (15)	98 (4)	18 (13)	82 (1)
99Y074	MPQ	5860 (20)	20.4 (1)	4.5 (1)	104 (20)	19 (14)	94 (20)
MEAN		8000	18.7	3.9	100	13	89
CV		15.7	6.4	8.6	3.2	146.4	5.7
LSD (.05)		1250	1.2	0.3	3	ns	5

S = short; M = medium; L = long; WX = waxy; B = basmati; A = aromatic; PQ = premium quality
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 rank in column.

Table 5. 1999 Intermediate/late rice lines and varieties grain yield (lb/acre @14% moisture) at three locations.

ADVANCED LINES AND VARIETIES

Variety	Grain Type	Average	Biggs Biggs RES	Glenn Wiley Ranch	Sutter Penning Ranch
97Y413	M	9340 (1)	11200 (1)	8200 (3)	8620 (2)
M204	M	8480 (2)	10150 (3)	7290 (9)	8010 (4)
M402	MPQ	8440 (3)	9270 (6)	8230 (2)	7820 (5)
M202	M	8440 (4)	9170 (7)	7420 (8)	8720 (1)
97Y599	M	8290 (5)	10240 (2)	7590 (4)	7050 (10)
97Y543	L	8260 (6)	9800 (5)	7550 (6)	7420 (8)
96Y578	MPQ	8200 (7)	8930 (9)	7420 (7)	8240 (3)
94Y663	L	8100 (8)	9870 (4)	7120 (10)	7300 (9)
98Y119	SPQ	7510 (9)	7280 (11)	7560 (5)	7700 (6)
96Y671	L	7510 (10)	9150 (8)	6570 (12)	6830 (11)
M401	MPQ	7350 (11)	5880 (13)	8510 (1)	7650 (7)
A201	LA	7260 (12)	8630 (10)	6410 (13)	6750 (12)
CT201	BA	5960 (13)	6770 (12)	5450 (14)	5650 (13)
99Y074	MPQ	5830 (14)	5720 (14)	6870 (11)	4890 (14)
MEAN		7780	8720	7300	7330
CV		6.4	8.2	4.8	4.5
LSD (.05)		400	1020	500	470

PRELIMINARY LINES AND VARIETIES

Variety	Grain Type	Average	Biggs Biggs RES	Glenn Wiley Ranch	Sutter Penning Ranch
98Y644	M	9370 (1)	10930 (1)	8840 (2)	8330 (3)
98Y511	L	9200 (2)	10700 (2)	8500 (7)	8380 (2)
98Y434	M	9180 (3)	10700 (3)	9080 (1)	7770 (5)
98Y425	M	9080 (4)	9960 (6)	8800 (3)	8470 (1)
98Y366	M	8680 (5)	10080 (5)	8690 (4)	7270 (11)
98Y634	M	8530 (6)	10280 (4)	8600 (6)	6700 (18)
98Y525	L	8460 (7)	9390 (12)	8680 (5)	7300 (10)
98Y250	M	8360 (8)	9670 (8)	8210 (10)	7210 (12)
98Y582	MPQ	8340 (9)	9450 (10)	7960 (13)	7630 (6)
98Y526	L	8340 (10)	9390 (13)	8140 (12)	7490 (7)
98Y367	M	8290 (11)	9630 (9)	8220 (9)	7030 (14)
98Y365	M	8270 (12)	9680 (7)	7680 (16)	7460 (8)
98Y662	L	8240 (13)	9420 (11)	8370 (8)	6940 (16)
97Y576	S	8230 (14)	8740 (16)	8140 (11)	7820 (4)
98Y655	L	8080 (15)	9180 (14)	7890 (14)	7160 (13)
98-110	SPQ	7570 (16)	7530 (18)	7750 (15)	7440 (9)
98Y654	L	7460 (17)	9080 (15)	6450 (20)	6850 (17)
98-470	SPQ	7280 (18)	8340 (17)	7500 (18)	6010 (19)
CH201	SPQ	7180 (19)	6930 (20)	7590 (17)	7030 (15)
99Y116	MPQ	6440 (20)	7520 (19)	6710 (19)	5090 (20)
MEAN		8230	9330	8090	7270
CV		7	4.3	9.2	7.2
LSD (.05)		660	840	ns	1100

S = short; M = medium; L = long; WX = waxy; B = basmati; A = aromatic; PQ = premium quality
Numbers in parentheses indicate rank in column.

Table 6. 1999 Intermediate/late rice lines and varieties three location summary.

ADVANCED LINES AND VARIETIES

Variety	Grain 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)
97Y413	M	9340 (1)	15.2 (6)	4.5 (5)	96 (2)	5 (11)	87 (10)
M204	M	8480 (2)	15.2 (8)	4.3 (8)	97 (5)	4 (10)	86 (9)
M402	MPQ	8440 (3)	18.8 (2)	4.4 (7)	112 (13)	2 (7)	92 (13)
M202	M	8440 (4)	14.9 (10)	4.6 (4)	95 (1)	11 (13)	90 (12)
97Y599	M	8290 (5)	16.1 (4)	4.3 (9)	97 (3)	2 (9)	84 (7)
97Y543	L	8260 (6)	14.6 (13)	4.2 (11)	98 (6)	2 (8)	83 (4)
96Y578	MPQ	8200 (7)	15.2 (7)	4.2 (10)	97 (4)	7 (12)	85 (8)
94Y663	L	8100 (8)	14.5 (14)	4.0 (13)	98 (7)	2 (6)	80 (2)
98Y119	SPQ	7510 (9)	16.6 (3)	4.2 (12)	106 (12)	25 (14)	84 (5)
96Y671	L	7510 (10)	15.1 (9)	4.0 (14)	99 (8)	1 (1)	74 (1)
M401	MPQ	7350 (11)	21.4 (1)	4.6 (3)	117 (14)	1 (3)	95 (14)
A201	LA	7260 (12)	14.8 (11)	4.8 (2)	100 (9)	1 (3)	84 (5)
CT201	BA	5960 (13)	14.7 (12)	4.5 (6)	101 (10)	1 (1)	83 (3)
99Y074	MPQ	5830 (14)	15.5 (5)	5.0 (1)	104 (11)	1 (5)	89 (11)
MEAN		7780	15.9	4.4	101	5	85
CV		6.4	4.7	6.5	1.7	62.3	3.4
LSD (.05)		400	0.6	0.2	1	2	2

PRELIMINARY LINES AND VARIETIES

Variety	Grain 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)
98Y644	M	9370 (1)	15.7 (3)	4.5 (8)	99 (11)	5 (13)	94 (19)
98Y511	L	9200 (2)	14.2 (17)	4.0 (18)	98 (6)	10 (18)	83 (6)
98Y434	M	9180 (3)	15.2 (7)	4.4 (12)	98 (7)	2 (4)	88 (15)
98Y425	M	9080 (4)	15.0 (11)	4.5 (8)	97 (2)	3 (7)	86 (11)
98Y366	M	8680 (5)	15.3 (5)	4.6 (5)	97 (5)	3 (5)	86 (10)
198Y634	M	8530 (6)	15.4 (4)	4.4 (12)	99 (10)	3 (8)	84 (8)
98Y525	L	8460 (7)	13.9 (20)	4.5 (8)	99 (8)	7 (15)	84 (7)
98Y250	M	8360 (8)	14.7 (14)	4.5 (8)	96 (1)	5 (11)	86 (14)
98Y582	MPQ	8340 (9)	15.7 (2)	4.5 (7)	100 (15)	5 (11)	86 (13)
98Y526	L	8340 (10)	14.0 (18)	4.1 (16)	99 (13)	4 (9)	82 (4)
98Y367	M	8290 (11)	15.2 (8)	4.6 (4)	100 (14)	8 (17)	90 (18)
98Y365	M	8270 (12)	15.2 (10)	4.4 (14)	99 (9)	4 (10)	88 (16)
98Y662	L	8240 (13)	14.5 (15)	4.7 (3)	102 (17)	1 (1)	78 (3)
97Y576	S	8230 (14)	15.2 (9)	5.0 (1)	100 (16)	13 (19)	95 (20)
98Y655	L	8080 (15)	14.7 (13)	4.1 (17)	99 (12)	1 (3)	82 (5)
98-110	SPQ	7570 (16)	16.8 (1)	4.2 (15)	107 (20)	36 (20)	86 (11)
98Y654	L	7460 (17)	15.3 (6)	3.9 (20)	102 (17)	1 (1)	77 (2)
98-470	SPQ	7280 (18)	14.8 (12)	4.0 (19)	97 (2)	6 (14)	75 (1)
CH201	SPQ	7180 (19)	14.3 (16)	4.7 (2)	97 (2)	7 (16)	84 (9)
99Y116	MPQ	6440 (20)	14.0 (19)	4.6 (5)	102 (19)	3 (6)	89 (17)
MEAN		8230	14.9	4.4	99	6	85
CV		7	4.2	6.0	1.4	69.7	4.2
LSD (.05)		660	0.7	0.3	2	5	4

S = short; M = medium; L = long; WX = waxy; B = basmati; A = aromatic; PQ = premium quality
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 rank in column.

Table 7. Grain Yield (lb/acre) Comparison of Commercial Rice Varieties with Common Entries in the Very Early and Early Tests (1999)

Test/ Location	Planting Date	CM-101	CH-201	CT-201	M-103	M-202	M-204	L-204	L-205	S-102
Very Early										
Butte(RES)		10200	9460	7090	10330	10480	10100	10310	10610	11140
Yolo	5/4/99	9960	5710	2410	9960	7420	6730	9250	7750	10290
Sutter	5/14/99	9670	8920	4420	9670	9990	8560	9410	9170	10150
Three Location Mean		**9943**	**8030**	**4640**	**9987**	**9297**	**8463**	**9657**	**9177**	**10527**
Early										
Butte(RES)		9850	9460	6620	10120	10540	11130	9830	9850	10460
Butte	5/13/99	8380	3930		7720	6780	6070	6230	4860	8630
Colusa	5/14/99	9870	8220	2680	9940	10550	9780	9180	8160	10260
Yuba	5/4/99	8410	6310	2420	8260	7920	7100	6470	6240	9100
Four Location Mean		**9128**	**6980**	**3907**	**9010**	**8948**	**8520**	**7928**	**7278**	**9613**
Seven Location Mean		**9477**	**7430**	**4273**	**9429**	**9097**	**8496**	**8669**	**8091**	**10004**

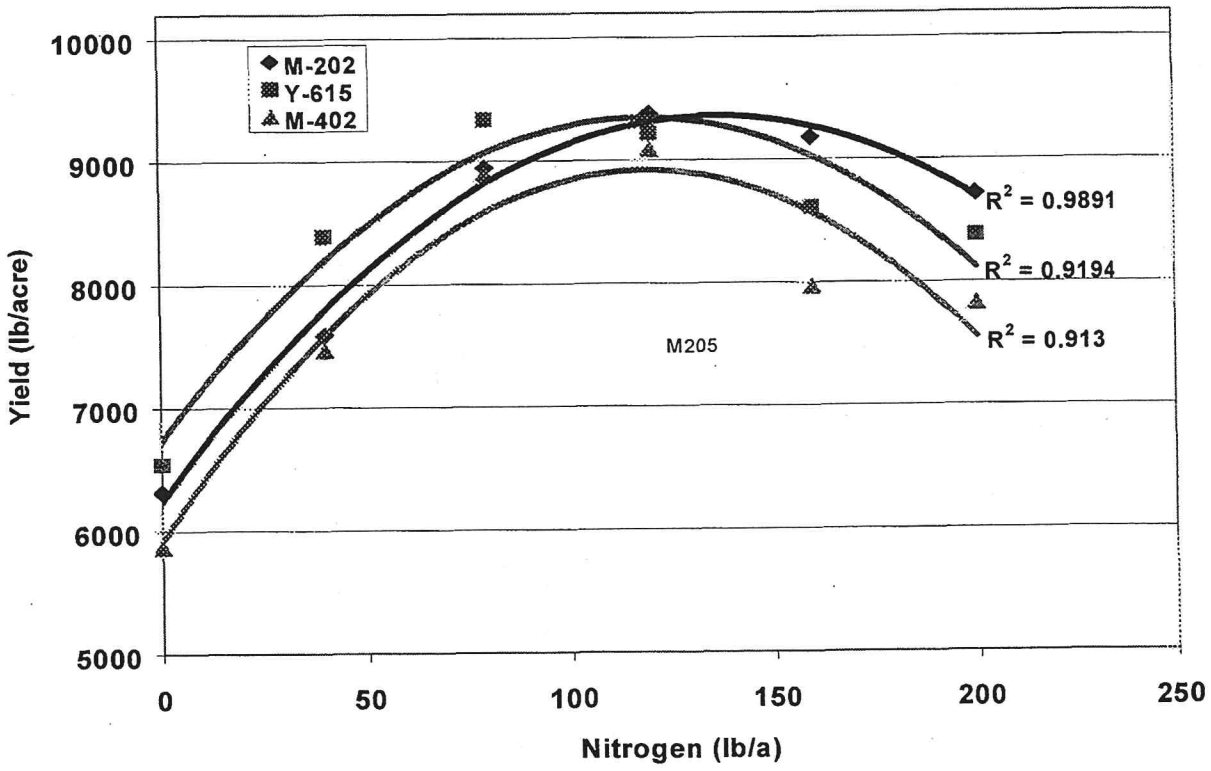

Figure 1. Response of 3 California medium grain varieties to various rates of nitrogen.

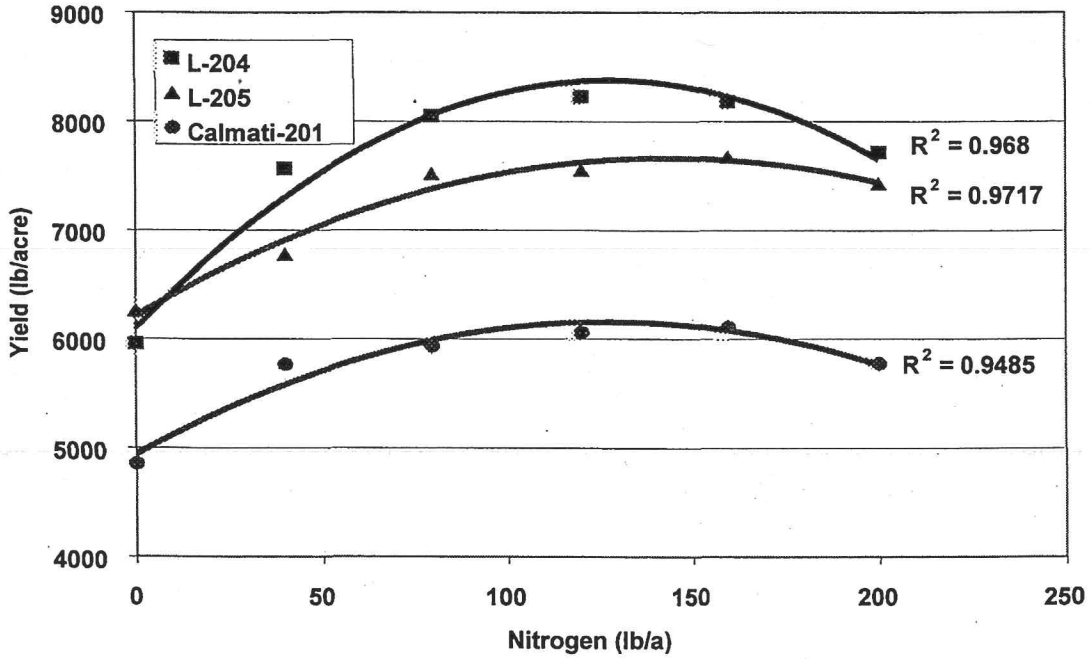

Figure 2. Response of 3 California long grain varieties to various rates of nitrogen.

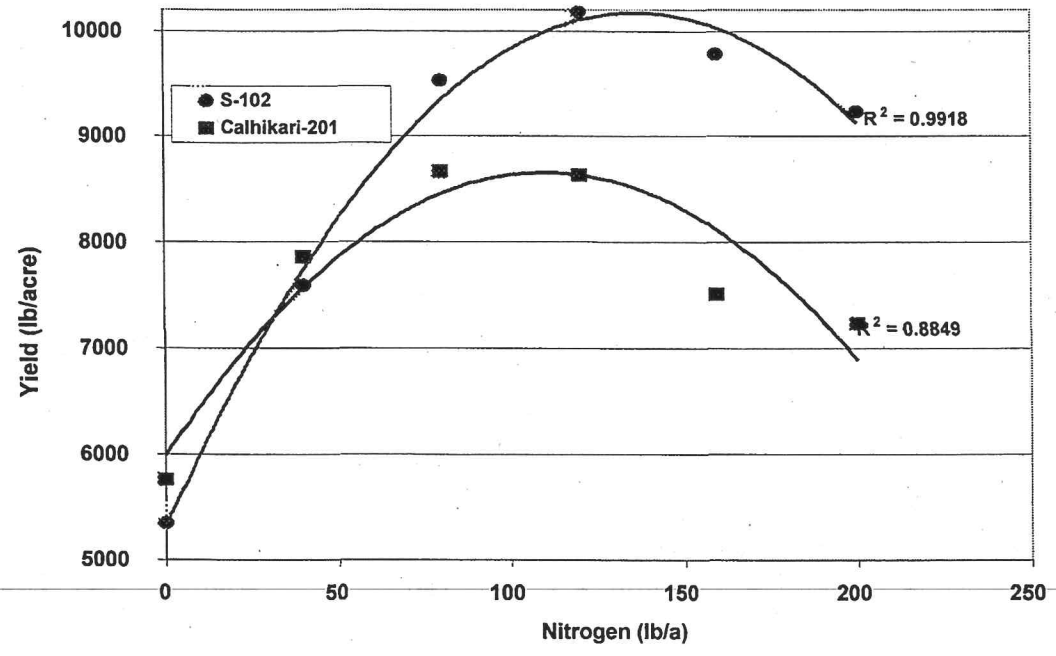

Figure 3. Response of 2 California short grain varieties to various rates of nitrogen.

Variety	Yield	Optimal N	Height	Lodging (%)	Straw	Harvest index	50% Head
	lb/acre	lb/acre	inches	%	lb/acre		Days
M 202	9380	135	37	50	9570	49	87
Y 615	9350	120	37	40	8700	52	89
M 402	8900	120	39	30	9570	48	94
L 204	8390	125	34	10	8120	51	88
L 205	7680	140	35	10	8700	47	89
S 102	10200	135	39	50	7830	57	82
Calmati	6170	125	37	0	8700	41	91
Calhikari	8650	110	37	55	8700	50	87

Table 8. Average performance characteristics for 8 selected California varieties of rice.

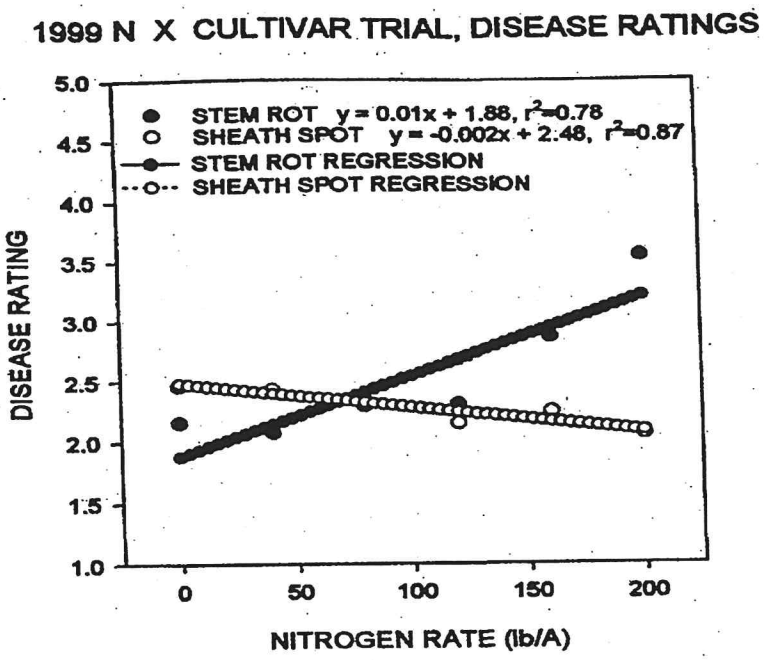

Figure 4. Aggregated disease ratings of selected California varieties of rice grown at different levels of nitrogen. Data courtesy of J. Oster, RES.

Treatment	Pleasant Grove	Colusa	Richvale	Average
	lb/a	lb/a	lb/a	lb/a
0	4916	4270	4892	4693
60-0-0	5511	6045	5623	5727
80-0-0	5307	5442	5358	5369
40-40-0	5806	6268	5943	6006
100-0-0	4901	4956	4742	4860
50-50-0	5941	5890	5297	5709
LSD (0.05)	ns	ns	ns	439

Table 9. Yield response of Akitakomachi to various nitrogen treatments at 3 different locations. Treatment numbers (e.g. 60-0-0) represent lb N/a applied at preplant-panicle initiation-heading.

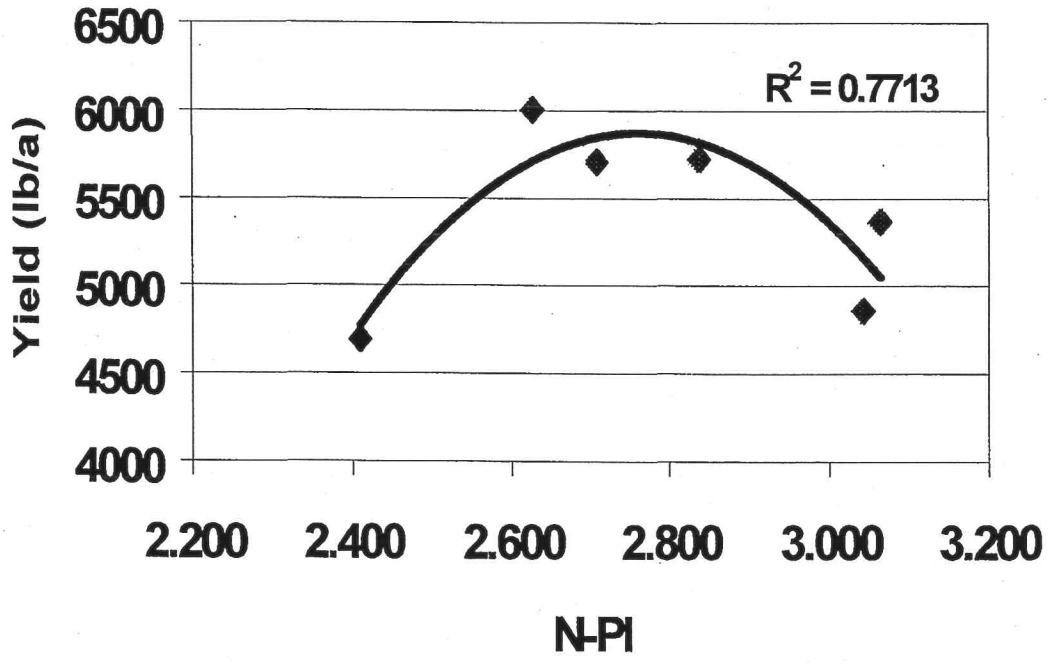

Figure 5. Yield of Akitakomachi as a function of leaf nitrogen content (%) at panicle initiation (PI).

Treatment	Richvale	Willows	Average
	lb/a	lb/a	lb/a
0	5091	4988	5040
20-0-0	5840	5454	5647
20-0-20	5996	5342	5669
40-0-20	5704	6059	5882
40-0-40	5750	5886	5818
50-25-25	6122	6448	6285
40-20-0	5991	6155	6073
40-40-0	5339	6343	5841
LSD (0.05)	ns	ns	309

Table 10. Yield response of Koshihikari to various nitrogen treatments at 2 different locations. Treatment numbers (e.g. 60-0-0) represent lb N/a applied at preplant-panicle initiation-heading.