ANNUAL REPORT
COMPREHENSIVE RESEARCH ON RICE
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PROJECT TITLE: Crop Management and Environmental Effects on Rice Milling Quality and Yield. (RP-13)

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$ 20,090

OBJECTIVES AND EXPERIMENTS:

1. Investigate the crop-environmental interactions affecting yield and quality at a range of soil and grain moisture levels during grain maturation.

2. Establish practical in-field criteria for determining grain maturation to optimize yield, quality, and grower return.

3. Evaluate milling quality stability of prominent California public varieties.

A plot at Rice Research Station was divided into three basins each with its own water supply and drain. Basins were separated by double drain ditches. Each basin subdivided into a series of 2m x 3m sections and each dry seeded with M202, M205, or M206 variety rice. Each variety was at seeded at a rate of 150 pounds per acre. The three variety treatments were replicated to allow 3 three replications to be harvested at each of five harvest dates. Cultural practices were identical for all treatments, except for drain date. The east basin was drained 7 days after 50% heading (DAH) on August 23, approximately two weeks earlier than normal. The middle basin was drained 14 DAH on August 31 and the west basin was drained 21 DAH on Sept 7. One square meter areas of each treatment were harvested on September 27, October 1, 4, 15, 18, 22, and 26. Each treatment was hand harvested between 11:00 and 13:00 hours and threshed with an Almaco plot thresher. Rice moisture content for each harvested treatment (HMC) was determined with a single kernel moisture meter (Kett PQ510, Japan). Samples were room-air dried and a 500g subsample was husked (Yamamoto FC-2K, Japan) and milled (Yamamoto VP-32T, Japan) and

whole kernel percentage was measured using a machine grader (Foss Tectator Graincheck, Sweden).

Duplicate plots of M202, M205 and M206 rice were planted next to the yield trials located near Colusa and Natomas. Plots were harvested at several dates to obtain a range of HMCs. Samples were threshed, dried and evaluated with same procedure described for the RES experiment.

RESULTS:

Results from the Rice Experiment Station experiment confirmed the results of last season; M206 can be harvested at low moisture content with little loss in headrice yield (HRY), Figure 1. Drain date influenced HRY and draining at 21 DAH allowed M206 to be harvested at MCs less than 15% wb with no detectable loss in HRY. Draining two weeks earlier, at 7 DAH caused the M206 to lose significant HRY at low HMC. Draining at 14 DAH appeared to cause some HRY loss but not as much as the 7 DAH drain date. Variety M205 showed similar effects of drain date and HMC although middle drain date, 14 DAH, appeared to cause more HRY loss than with M206, Figure 2. Variety M202 showed a loss in HRY as HMC decreased below 20 to 22% MC at all three drain dates, although the loss was less for the last drain date, 21 DAH, Figure 3.

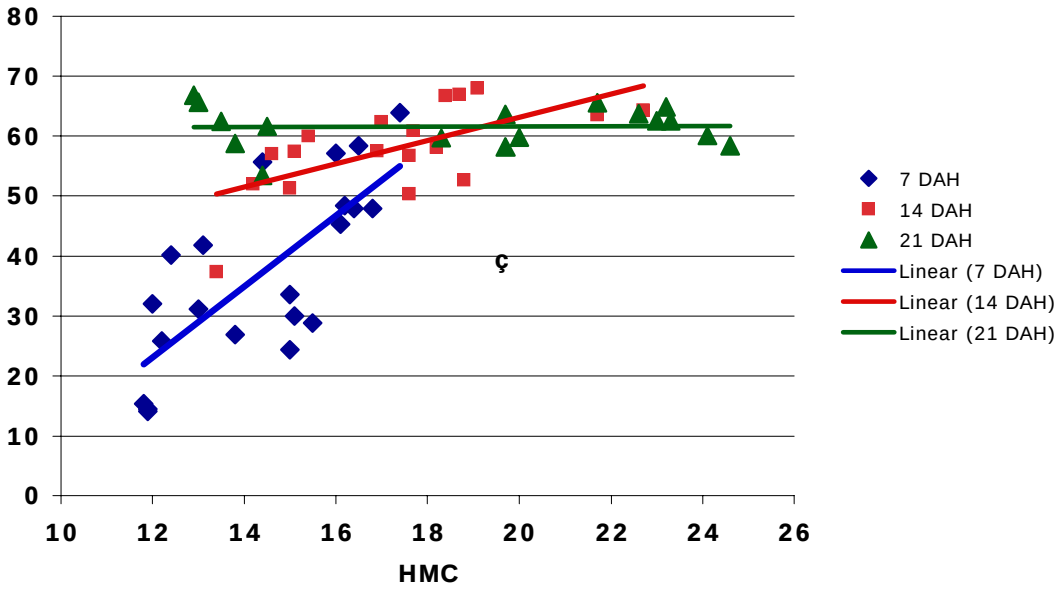

Figure 1. Effect of drain date and rice moisture content at harvest on headrice yield of M206 rice. Experiment was conducted at the Rice Experiment Station in Biggs, CA.

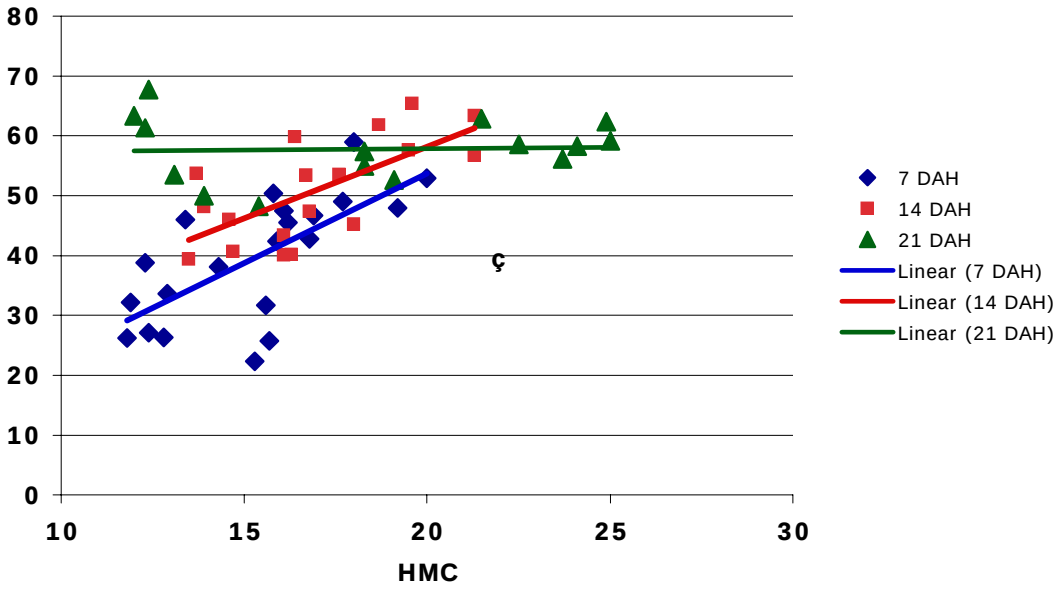

Figure 2. Effect of drain date and rice moisture content at harvest on headrice yield of M205 rice. Experiment was conducted at the Rice Experiment Station in Biggs, CA.

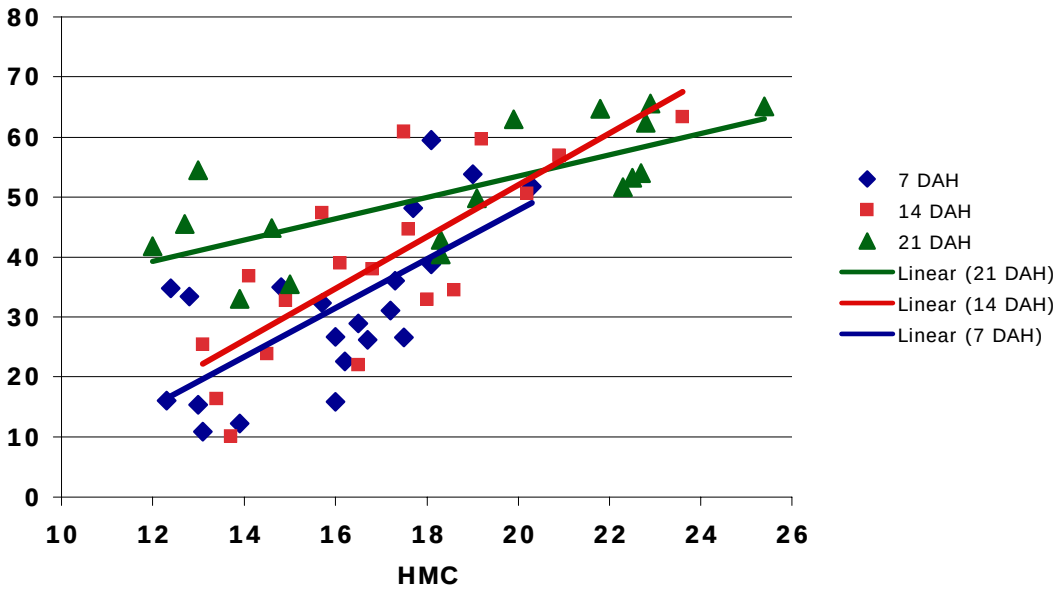

Figure 3. Effect of drain date and rice moisture content at harvest on headrice yield of M202 rice. Experiment conducted at the Rice Experiment Station in Biggs, CA.

The data in Figures 1 through 3 include combined results for most of the harvest dates for the RES plots. The HRY stability for the newer varieties is more clearly described with a plot of HRY versus harvest date, Figure 4. Varieties M205 and M206 had nearly constant HRY for 25 days, from Sept 27 to Oct 22. The HRY of M205 dropped to 51% and M206 dropped to 58% on the last harvest date, Oct 26, but by that time their HMC was less than 15%. On the last harvest date the HRY of M202 dropped to 38%.

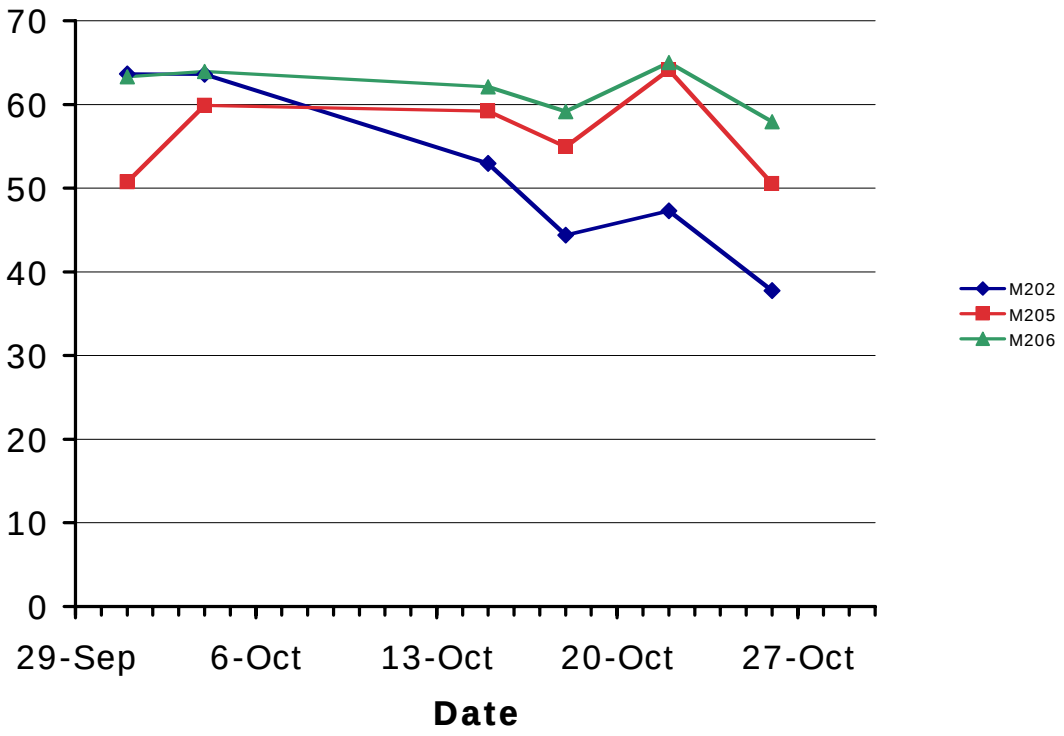

Figure 4. Average head rice quality from Sept 27 to Oct 26 for rice drained 21 days after heading

The drain timing for the RES plots was based on the days after 50% heading (DAH) rather than appearance of the panicles near the time of draining. Heading date is a more consistently definable and easily observable condition than color or shape of the panicle. Draining based on DAH appeared to correlate well with rice quality and may prove to be an effective predictor of drain date rather than relying on panicle appearance evaluated near the time of draining.

Experiments next to the variety trials near Colusa and Natomas confirmed that M206 had better HRY at lower HMC compared to M202, Table 1. M205 showed better HRY than M202 but not as much as M206 and the amount was not statistically significant at the Natomas location. These areas have similar soils but different weather conditions than RES and indicate the HRY stability of M206 is likely to be unaffected by typical growing conditions in the Sacramento Valley.

Table 1. Harvest moisture content and head rice yield for M202, M205 and M206 grown at variety plots near Clousa and Natomas.

		Colusa		Natomas		
		26-Sep	3-Oct	5-Oct	15-Oct	22-Oct
Moisture content	M202	22.5	17.4	26.9	22.3	16.5
(% wb)	M205	25.6	19.2	24.6	21.5	15.8
	M206	20.7	16.9	23.4	22.7	17.2
Head Rice Yield	M202	67.8	56.4	67.6	59.4	53.2
(%)	M205	66.7	62.8	64.2	55.8	55.3
	M206	68.0	64.3	65.0	60.9	58.8
HRY difference	205-202	0.2	6.4*	-3.4	-3.6	2.1
	206-202	0.2	7.9*	-2.6	1.5	5.6*

* indicates statistical difference alpha=0.05

The earliest drain date, 7 DAH, caused about 10 cwt per acre loss in yield compared with the 14 and 21 DAH drain dates, Table 2. Draining about 7 days earlier than normal appears to cause little loss in yield for any of the three varieties. Based on this result and the HRY data, it appears that fields planted with M206 may be drained about a week earlier than normal with no loss in yield and minimal effect on quality. This is only a tentative observation and it needs to be tested in subsequent seasons and over a wider range of growing conditions. If true, M206 may allow earlier draining than M202 and consequently use less water.

Table 2. Season average yield data for drain date basins at the Rice Experiment Station

Drain date	Yield (cwt/acre)			
	M202	M205	M206	Avg
7 DAH	70	67	76	71
14 DAH	81	82	86	83
21 DAH	76	77	89	81

SUMMARY OF 2007 RESEARCH:

Varieties M206 and to a lesser extent M205 maintain high head rice yield at low harvest moisture content levels compared with the M202 variety. All three varieties produced maximum yields when drained 14 days after heading, approximately a week earlier than normal. If validated for additional seasons and over a wider range of soil and weather conditions, these two findings could potentially revolutionize the management of rice harvest and drying. Particularly so should this unique characteristic be fully integrated into the selection criteria for future medium grain varieties. The ability to harvest M206 near 15% moisture content and still maintain high HRY, will allow growers to harvest at low moisture contents in order to reduce drying costs and increase their return per acre. Each percentage point decrease in moisture content reduces drying cost by about 2 cents per hundredweight (a conservative estimate given the volatility energy prices). Harvesting at lower moisture content will decrease the seasonal demand for column drying capacity and eliminate the need to restrict daily harvest amounts because of limited drying capacity. It will also reduce the consumption of natural gas for column drying and decrease the carbon dioxide emissions associated with rice production. Harvesting at

low moisture content will decrease the potential for off-odor development associated with temporary storage of high moisture content rough rice in trucks and receiving bins at the dryer; a trait sometimes associated with California rice in the minds of foreign marketers. The quality and yield stability of M206 and similar new varieties will allow draining fields a week earlier reducing irrigation water use and allow the rice to reach acceptable harvest moisture earlier in its growth cycle.

PUBLICATIONS OR REPORTS:
none

CONCISE GENERAL SUMMARY OF CURRENT YEAR'S RESULTS:

Tests at the Rice Experiment Station and at yield trials near Colusa and Natomas demonstrated for the second year that M206 rice maintains high headrice quality over a wide range of harvest moisture contents, even to moisture contents near 15%. This year's results also indicated it has high head rice quality and high yield when drained about one week earlier than normal. Variety M205 has better stability in head rice quality than M202 but not quite as good as M206. The stability of headrice quality for M206 will allow the industry to harvest at lower moisture content and reduce the need for column drying. In our experiments drain date was based on days after 50% heading. This appears to be a useful index to predict drain date rather than relying on color and shape of panicles near the time of draining.