Rice Briefs

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UC CE University of California Agriculture and Natural Resources | Cooperative Extension Colusa County

Summary of 2015 University of California Rice Variety Trials

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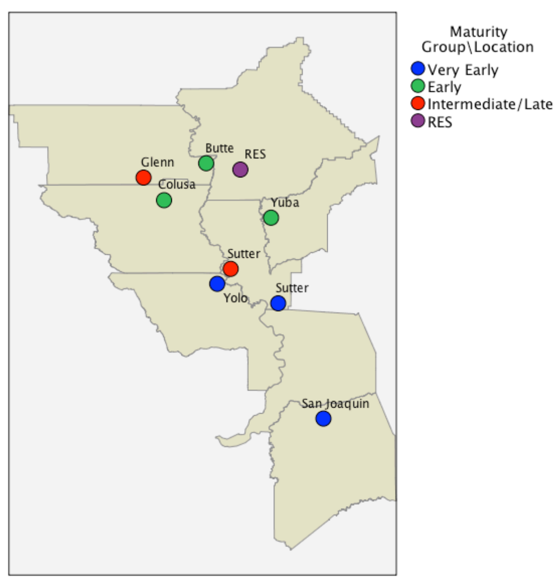
Every year, the University of California Cooperative Extension, in cooperation with the Rice Experiment Station (RES), conducts rice variety trials in several locations of the Sacramento and San Joaquin Valleys. Three broad variety categories are included in the trials:

- Preliminary breeding lines: those that have been selected by RES breeders to be evaluated on a statewide basis because of promising characteristics observed at the RES. They are tested in two-replication trials.
- Advanced breeding lines: these lines are more promising; typically they have been tested first as preliminary. They are tested in four-replication trials. The best of the best may undergo seed increase and be considered for release as new rice varieties after several years of testing.
- Commercial varieties: varieties released by the RES and planted in commercial fields.

The entries and varieties included in the trials can be grouped in three maturity groups:

1. Very early maturity group (<90 days to 50% heading)
2. Early maturity group (90-97 days to 50% heading)
3. Intermediate/late maturity group (>97 days to 50% heading)



The trials are conducted at the RES and in grower fields. On-farm trials are planted in the most appropriate location for the maturity group of the entries, taking into consideration weather but also the field variety of the location to avoid early or late harvesting. More than one maturity group is included in the trials so as to compare the performance of preliminary and advanced lines to "standards" such as M-202 or M-206.

Each entry is grown in 200 ft^2 plots.
Cooperating growers manage the trials as part of the field. Plots are harvested using a research plot combine, and yields are converted to lbs/acre at 14% moisture. The complete report (2015 Agronomy Progress Report) is published on the UC Rice On-line website (http://rice.ucanr.edu/).

Table 8. Grain Yield (lb/acre @14% moisture) Summary of Very Early Rice Varieties by Location and Year (2011-2015)

Location	Year	**M04**	M202	M206	Calmochi 101	S102	L206
	2011*	**-**	-	-	-	-	-
Biggs (RES)	2012	**10260**	10050	10420	8500	9370	10020
	2013	**9710**	8380	8610	8580	9120	9970
	2014	**8150**	7330	9200	6540	7640	8580
	2015	**8580**	7830	9350	7940	9520	8910
Location Mean		**9175**	**8398**	**9395**	**7890**	**8913**	**9370**
	2011*	**-**	-	-	-	-	-
Sutter	2012	**8990**	8810	9320	7500	8470	9570
	2013	**9510**	9990	9710	8340	9300	9700
	2014	**9510**	9060	9710	7780	8770	9440
	2015	**9520**	9460	9900	7990	9190	9820
Location Mean		**9383**	**9330**	**9660**	**7903**	**8933**	**9633**
	2011	**10020**	9590	10230	9320	9050	9490
Yolo	2012	**9610**	8930	9900	7450	8400	9060
	2013	**9420**	9260	9790	7830	8380	9000
	2014	**9610**	9450	9770	7580	8980	8760
	2015	**8150**	7070	7490	5560	6940	7740
Location Mean		**9362**	**8860**	**9436**	**7548**	**8350**	**8810**
	2011	**8800**	9090	9330	7850	7760	8340
San Joaquin	2012	**8460**	7490	8990	7880	8180	7570
	2013	**8140**	8140	8410	7680	7960	8180
	2014	**9680**	8650	9390	8440	8480	8660
	2015	**9650**	8590	9970	8750	9240	8400
Location Mean		**8946**	**8392**	**9218**	**8120**	**8324**	**8230**
Loc/Years Mean		**9209**	8732	9416	7862	8597	8956
Yield % M104		**100.0**	**94.8**	**102.2**	**85.4**	**93.4**	**97.2**
Number of Tests		**18**	18	18	18	18	18

* Test locations not included in 2011 due to very high yield cvs.

Table 14. Grain Yield (lb/acre @14% moisture) Summary of Early Rice Varieties by Location and Year (2011-2015)

Location	Year	Calhikari 201	S102	**M202**	M105	M205	M206	Calmati 202	L206
Biggs (RES)	2011	9210	10230	**9660**	9490	10610	10050	5410	10020
	2012	8680	9500	**9770**	10250	10530	9980	7990	10510
	2013	8490	8640	**7640**	7820	9230	8160	5700	8420
	2014	6220	7320	**7010**	8570	9140	9240	6310	8640
	2015	8580	10050	**8570**	8610	8720	9620	6790	9360
Location Mean		8236	9148	**8530**	8948	9646	9410	6440	9390
Butte	2011	8060	8280	**8180**	9270	8860	8520	8020	9330
	2012	8080	8220	**8650**	9490	9600	9240	7910	9380
	2013	7840	8650	**7870**	9640	8960	9020	6450	9390
	2014	8310	8570	**8360**	9070	9140	9610	7210	9730
	2015	7180	8810	**7550**	9350	7780	9370	6370	9810
Location Mean		7894	8506	**8122**	9364	8868	9152	7192	9528
Colusa	2011	6040	7420	**9350**	7580	9760	9960	5210	9660
	2012	7430	7460	**8630**	8620	9130	9680	5340	9400
	2013	7840	7220	**9140**	9750	8930	9660	5970	10250
	2014	7740	8080	**8720**	9100	9370	9280	6150	9380
	2015	8940	9200	**9820**	10500	10050	9850	6660	9940
Location Mean		7598	7876	**9132**	9110	9448	9686	5866	9726
Yuba	2011	7800	8740	**9300**	9800	10000	10190	6030	10160
	2012	6080	7970	**9220**	8510	8840	9240	5570	9100
	2013	8040	9280	**8950**	9330	9650	9750	5750	9590
	2014	7290	7420	**8010**	8590	9120	8950	5460	9260
	2015	8490	8740	**9860**	9970	9650	9940	6950	9840
Location Mean		7540	8430	**9068**	9240	9452	9614	5952	9590
Loc/Years Mean		7817	8490	**8713**	9166	9354	9466	6363	9559
Yield % M202		**89.7**	**97.4**	**100**	**105.2**	**107.4**	**108.6**	**73.0**	**109.7**
Number of Tests		20	20	**20**	20	20	20	20	20

Table 19. Grain Yield (lb/acre @14% moisture) Summary of Intermediate/ Late Rice Varieties by Location and Year (2011-2015)*

Location	Year	M205	M402	**M202**	L206
Biggs (RES)	2011	10270	9200	**9160**	9990
	2012	11210	10260	**11090**	11180
	2013	9730	9830	**8700**	9460
	2014	10550	10040	**8870**	10340
	2015	9120	8450	**8150**	9520
Location Mean		10176	9556	**9194**	10098
Glenn	2011	9550	9820	**9030**	8900
	2012	8220	8260	**7660**	7680
	2013	8400	8970	**8270**	8870
	2014	8910	8910	**8510**	8870
	2015	9420	8710	**8560**	9910
Location Mean		8900	8934	**8406**	8846
Sutter	2011	9310	8000	**9010**	9780
	2012	9630	9040	**9690**	9890
	2013	8540	6900	**7890**	8720
	2014	8680	7020	**9030**	9660
	2015	-	-	**-**	-
Location Mean		9040	7740	**8905**	9513
Loc/Years Mean		9372	8743	**8835**	9486
Yield % M202		**106.1**	**99.0**	**100**	**108.5**
Number of Tests		14	14	**14**	14

* Sutter not included in 2015 due to very high cv's and low yields.

When is the optimal time to plant rice in the Sacramento Valley?

Bruce Linquist and Matthew Espe, UC Davis

Factors affecting planting date

In the Sacramento Valley, most rice is planted in May with 50% of the acreage typically being planted by May 10. However, timing varies from year to year. Growers typically plant rice in the Sacramento Valley as early as possible and this depends on three primary factors:

1. *Sufficiently dry weather to prepare a seedbed*: Following the winter flood period rice fields are drained usually in early February and allowed to dry. When sufficiently dry enough to allow machinery on the field, the field is "opened up" with a plow which helps speed up the drying process. Fields are "typically" dry enough to begin seedbed preparation (plowing, disking, leveling, fertilizer applications) in early to mid-April. Under such cases planting can begin in late April and early May. A dry early spring can make these operations proceed a bit faster while rain in March, April and May can significantly delay field operations.
2. *Warm temperatures*: Temperatures need to be sufficiently warm to allow the rice seed to germinate and the seedling to grow. Optimal temperatures for seedling emergence and growth are above 77^{o}F. Such temperatures typically occur late April in most parts of the Sacramento Valley.
3. *Availability of water:* Unless there is access to a well, planting cannot proceed until there is irrigation water available from the irrigation district.

While planting on a certain day may be optimal, growers usually have a number of fields which they cannot have ready all on the same day. Rather it takes time to get fields ready for planting and equipment is moved from one field to the next in order to prepare a seedbed as fast as possible. Certainly having more equipment and labor help speed up land preparation but this is not always an option for growers. Also, just because a field is ready for planting does not ensure there will be enough water to flood the field. Flooding a field for the first time in a season requires a large head of water and irrigation districts are limited in the amount of water that they can provide at any given time based on the canal system.

Effect of planting time on harvest

Planting time affects the harvest date. Harvest typically occurs in September and October and this is affected by planting time and variety. Delayed planting, cool years which delay crop development, and planting late duration varieties too late can result in harvest during late October and November which coincides with the onset of cool weather and rain. Cool weather and rain further delay harvest for three reasons (1) it takes rice longer to mature, (2) rice grain does not dry down fast, (3) it is harder to get harvest equipment into the field. In addition, late harvests can have negative effects on grain quality (both physical and increased molds) and increase drying costs due to having to harvest grain at higher moisture contents.

Effect of planting time on rice yields

Does time of planting affect rice yields? We compiled and analyzed data from all UC Cooperative Extension variety trials from 1999 to 2014. During this period rice was planted between April 20 and June 9. Yields across planting dates were highly variable due to many factors that can affect planting on any given date; however, there was a significant effect of planting time on yield with every day delay in planting reducing yield by 0.23% (Fig. 1). This equated to 21.1 lb/ac; thus a delay of 30 days would reduce yield by over 630 lb/ac. In order to provide another assessment of planting date on yield we calibrated the ORYZA2000 (V3) rice model for California rice systems. Using weather data (Durham CIMIS station) from near the Rice Experiment Station (RES) we simulated rice yield potential for the RES for planting dates from April 29 to June 18 for every year from 1999 to 2014. The model indicates that for each day delay in planting during this period that yields decline by 0.26% (Fig. 1). This value is very similar to the observed data from the RES.

From a physiological standpoint this yield reduction with delayed planting makes sense. The yield potential of California rice is high due to high solar radiation and long days. The most solar radiation occurs when days are longest (June 21 being the longest day of the year). It is important for plants to capture as much solar radiation (light) as possible in order to achieve high yields. Depending on temperature, canopy closure occurs about 5 to 6 weeks after planting. If the canopy has not closed, then some of the light is not captured by plant leaves. Planting early ensures that canopy closure occurs early and maximizes use of solar radiation when it is highest. Planting in early June, ensures that much of the light during the longest days of the year will not be captured.

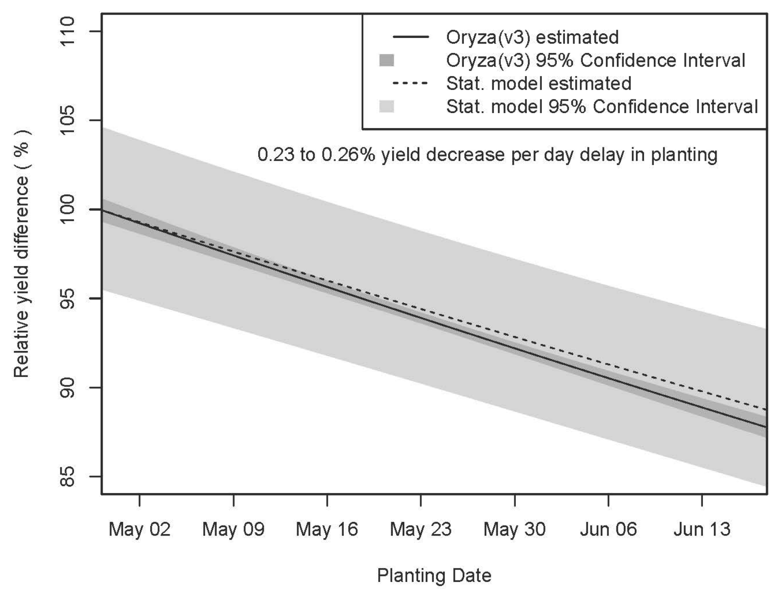


Figure 1. The effect of different planting dates from Apr. 29th to June 18th on the yield of rice variety M-206 grown at the Rice Experiment Station (Biggs, CA) as estimated by two different techniques. One estimate was made from simulating potential yields using the Oryza(v3) dynamic crop model calibrated and validated for rice variety M-206 (solid line). The other estimate was made from statistical analysis (dashed line) of yield data from released medium-grain rice varieties grown in the Statewide Rice Variety Trials from 1999 to 2014 using a random-effects statistical model (n = 3230). Both estimates were normalized to relative yield. The crop model estimated a yield decrease of 0.262% per day delay in planting (95% confidence interval: 0.244 to 0.282%, dark grey area), while the statistical model estimated a 0.232% decrease per day delay (95% confidence interval: 0.190 to 0.289, light grey area).

Preparing for armyworms

Luis Espino, UCCE

Last year was an eventful one for armyworms. The armyworm outbreak affected many growers, mostly in Butte and Glenn counties, and resulted in severe yield loses in many cases. A survey I conducted during our rice grower meetings this past winter showed that 82% of attendants experienced yield losses in these two counties, and for 9% of the attendants yield losses were 20% or higher. Our currently registered insecticides for armyworm control were not very effective, reducing armyworm populations only half the time.

Armyworms occur in rice every year. However, most of the time, they do not cause yield reductions. Rice has a great capacity to recover from foliar injury, withstanding up to 25% defoliation without an effect on yield. Panicle injury is less forgiving, and that is why the threshold is only 10% of injured panicles before a treatment is recommended.

It is impossible to know if we are going to experience another armyworm outbreak this year. I hope that the freezing temperatures we experienced early in the winter and recent rain storms will help in reducing overwintering populations. Nevertheless, growers should remain vigilant and increase their scouting during the usual periods of armyworm activity. To help with this, I plan on having pheromone traps at several locations across the valley to monitor moth activity. Research conducted a few years ago showed that the pheromones work well to detect when moths are flying and laying eggs. Then, using temperature models, I can estimate when we should be looking for larvae in the field.

Last year, Intrepid insecticide received a Section 18 registration to be used against armyworms in several counties. Intrepid may be available again this year if we experience another severe outbreak. To receive alerts regarding armyworm activity in the field and updates on Intrepid, subscribe to the UC Rice Blog (http://ucanr.edu/blogs/riceblog/).