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Rice Briefs

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Agriculture and Natural Resources | Cooperative Extension Colusa County

Water Management to Mitigate Blanking

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The approach of late summer and the possibility for lower nighttime temperatures is the time when panicle blanking can occur. Spikelet sterility, sometimes referred to as 'blanking' occurs when the developing pollen grains are exposed to nighttime temperatures at or below 55° F for several hours. Pollen is sensitive to low temperatures about 7 to 10 days after panicle initiation. The pollen is at the temperature sensitive stage when the collar of the flag leaf and collar of the previous leaf are aligned (Figure 1). While there are varietal differences in blanking susceptibility in normal years, blanking is around 12 percent. Blanking can be detected in the field about 10 days after flowering. The occurrence of translucent hulls when the panicle is held up to the sun identifies unfilled grain.

Figure 1. The low temperature sensitive stage of pollen development occurs when the collar of the flag leaf and the collar of the previous leaf align (center plant in photo).

Proper water management can help to mitigate the occurrence of blanking. About three weeks before heading, the base of the panicle is about 4 inches above the ground. Start raising your water shortly after panicle initiation up to a depth of about 6 inches. Hold that water depth for about 10 ten days or until all of the panicles have developed beyond the temperature sensitive stage of development, 7 to 10 days before heading. The water insulates the panicle from low air temperature. The minimum nighttime water temperature in the canopy will be about 3-5 degrees F warmer than the minimum nighttime air temperature. In a 1980 paper UC Davis researchers found that shallow water (3-4 inches) resulted in 22.2 percent blanking among eight varieties, whereas deeper water (6-8 inches) resulted in 17.8 percent blanking among the same eight varieties (http://ucce.ucdavis.edu/files/repositoryfiles/ca3411p5-62835.pdf).

Given the drought concerns this year, we suggest that growers allow the flood water to subside naturally rather draining the fields. In practice, this means that water flow into the field can be stopped well in advance of the drain date. How far in advance will depend on the amount of water already in the field as well as soil and field properties such as percolation. Therefore, raising the water before heading does not necessarily use more water provided the water is turned off earlier at the end of the season.

Keep in mind that different varieties and fertility practices can influence the time required to reach the susceptible development stage for blanking. Also variety and fertility management can affect the degree of blanking. Varieties that tend to have lower levels of blanking have true genetic tolerance to cooler temperatures, and they generally are shorter in stature and mature early. High nitrogen rates may increase blanking by increasing vegetative growth and delaying heading. The increased vegetative growth draws away sugars that the plant would otherwise use to fill the grain. Unfortunately, blanking is not like thinning fruit trees – it does not result in larger kernels where kernels form. A 1972 UC Davis study showed that panicles do not compensate for high blanking by producing larger grains (http://ucce.ucdavis.edu/files/repositoryfiles/ca2604p3-63941.pdf). In fact, the study showed that grains from high-blanking panicles had weights that were 3% lower than grain from panicles where blanking was low.

Rice Yield Components

Luis Espino, UCCE Colusa, Glenn & Yolo Counties

In the past few weeks I received several calls asking a version of the following question: how are stand, tillering and panicle size related to yield? A way to understand how these things interact is by discussing rice yield components and the factors that affect them. Yield components refer to the structures of the rice plant that directly translate into yield. These are: the number of panicles per given area, the number of spikelets (potential) grains per panicle, the percent of filled grains per panicle, and the weight of each grain.

The number of panicles per unit area (we usually talk about panicles/ft^2) is determined by the number of established seedlings and tillers produced per seedling. In general, 60 to 70 panicles/ft^2 are needed to achieve good yields. How you get to this optimum number can vary. In a good stand (15 to 20 plants/ft^2), plants will produce one to three tillers. In contrast, when the stand is poor (5 to 7 plants/ft^2) plants may produce up to 12 tillers. The tillering capacity of rice plants help compensate for poor stands, but there is a price to be paid. When a lot of tillers per plant are produced, panicle maturity will be uneven, compromising grain quality at harvest. When stands are very dense, tillers may not even develop or may die before they can produce a panicle due to shading. Consequently only the main culm will produce a panicle. Other factors that can reduce tillering are nitrogen deficiency, weed competition and others pests and diseases.

The number of grains per panicle is determined by variety and stand density. Most California varieties commonly produce 70 - 100 grains per panicle; the higher the plant density the lower the number of grains per panicle. The number of grains per panicle is set during panicle differentiation, about a week after the green ring stage. Thin stands will promote the production of more grains per panicle (and more tillers), but since there is a genetic limit to the number of grains per panicle, plants in fields with very thin stands might not be able to produce enough grains per panicle to compensate for low panicle densities.

The percentage of filled grains per panicle can be affected by several factors. Empty grains, or blanks, can be the result of cold temperature during pollen formation (see the article "Water Management to Mitigate Blanking" in this newsletter). Later, temperatures above 104° F during flowering can dry the germinating pollen tube and cause blanking. Other factors that can reduce the percentage of filled grains are excess N, panicle blast and armyworms feeding on developing grains. Grain weight is relatively constant. It cannot be increased to compensate for poor tillering or small panicles. However, grain weight can be negatively affected by draining the field too soon before harvest.

So how do these components relate to yield? Remember in large part, crop management affects only the first three variables.

YIELD = (Panicles/area) X (no. of spikelets/panicle) X (% filled grains/panicle) X (kernel weight)

Rice Strawlage

Glenn Nader, Peter Robinson, Roger Ingram, Morgan Doran and Josh Davy, UCCE

Strawlage is the process of putting up high moisture straw rice (45 to 65%) without allowing the forage to dry which reduces digestibility. Previous research documented a significant loss of forage quality by rice straw during field drying. At the time of harvest, the energy values for rice straw were near that of low quality alfalfa, but at the end of the 48 hour drying period energy values declined dramatically similar to a very low quality forage. The reasons for these dramatic changes are not understood at this time. At the time of harvest (grain moisture of 18%) most rice forage is about 55% moisture, which is an acceptable moisture level for strawlage. Individual bale plastic wrapping is too costly to implement. In contrast, more recent field test demonstrated that the much cheaper method of tarping a large stack of bales is an acceptable means of putting up high moisture rice straw forage. Specifically, a 100 x 40 foot tarp is used to cover 54 - 4x8x3 foot large bales. The bottom bales are set on a 25 x 100 tarp to decrease loss of the forage that touches the ground (Figure 1).

Figure 1. Tarping large bales of rice straw preserves high moisture content and digestibility.

Put the stacks in well drained areas that allow for winter access and no water accumulation on the bottom bales. Keeping the tarps on windy areas in the winter can be a challenge. When possible put them in a wind sheltered area near trees or building.

Mold can be a problem with the high moisture forage baling. Last year, it appeared that fields treated with Quadris had less mold in the strawlage. Alternatively, there are two proven methods of controlling mold: 1) Application of 8.4 pounds per ton of CropSaver (a chemically buffered and neutralized *proprionic acid*) in the baler pick area, or; 2) Apply urea and UN 32. Urea is spread on top of the bottom tarp and also on the bales using a can with holes in the bottom. As bales are brought in they are sprayed with UN 32 on the outside. The addition of urea improved the forage nutritional content, as well as controlled mold growth.

Ranchers are concerned about the potential for fires. In three years of conducting research we have not had any fires. Keep in mind that at 50 percent moisture content there is a significant amount of moisture that needs to be driven off before combustion occurs. Secondly, covering the stack with plastic also limits the amount of oxygen that is available to support a fire.

Nutritional Findings: Rice straw varies greatly in its forage value with crude protein from 2 - 7 % and ADF from 46 - 56 %. When treated with UN-32 or CropSaver®, dry matter and digestible fiber were more stable that untreated strawlage. The energy content of the strawlage decreased with time in the stack, but the values are well above the 0.35 Mcal/lb DM which is common for dry baled straw at 8 to 13% moisture. High gas production can persist for about 27 days or until the free sugars in the strawlage have been consumed by microbes. Nitrates levels were higher in the Urea/UN-32 treated strawlage, but values are well below levels that are of concern for ruminant animal feeds.

Management that can impact the forage value: Research has shown that the higher the nitrogen fertilization of rice, the higher the crude protein content of straw. This is **not** intended to recommend that growers increase nitrogen applications to improve forage quality. It should only be used as a strategy to choose the field with higher fertility levels for potential livestock forage production.

The higher the rice grain moisture is at harvest the higher the straw digestibility will be. As the rice plant dries down during grain ripening, the rice straw will have less digestible nutrients. This is why cold water checks and rice harvested at higher grain moisture produce straw with higher nutritional quality.

Rice Straw Removal Costs: In addition to the cost of baling rice straw (i.e. to bale and stack) there are also soil fertility costs associated with straw removal as compared to incorporation. Straw removal takes away potassium and nitrogen, as well as sulfur. Conversely the majority of nutrients are retained in the field when the straw is incorporated. Burning rice straw volatizes most of the nitrogen and sulfur causing most to be lost into the atmosphere, whereas most of the potassium remains in the ash. The nutrient impacts from different straw management processes need to be considered as part of the costs. For more information, consult UC ANR Publication 8425, "Rice Producers' Guide to Marketing Straw", available free at http://anrcatalog.ucdavis.edu/.

Planning Harvest

Cass Mutters, UCCE Butte County

If the current temperature trend continues then plant maturity may be accelerated as compared to the last couple of years. The National Weather Service predicts warmer than normal August temperatures in the Sacramento Valley (http://www.cpc.ncep.noaa.gov/products/predictions/30day/). In the 2014 Statewide Variety Trials, panicle initiation was ahead of the expected plant development schedule by about 7 days.

Remember that the rate of drying for M-202, M-205 and M-206 varies between years. For example, in a 'warm' year (e.g. 2009) the rate of moisture loss from the maturing kernel was double that of a 'cool' year (e.g. 2010). In this case, the average rate of moisture loss across varieties was 0.8 percentage points per day as compared to 0.4 in the cooler year (Table 1).

Table 1. Daily moisture loss in percentage points from M-202, M-205, and M-206 2009 & 2010.

Variety	2010	2009
M-202	0.4	0.9
M-205	0.4	0.6
M-206	0.3	0.9
Average	0.37	0.80

Keeping close track of grain moisture is particularly important in warm harvest seasons. M-105, M-205, and M-206 can be harvested at quite low moisture contents without compromising milling quality. However, there are limits to this resilience. Rice at a moisture content of less than 17-18% will crack if rehydrated by prolonged dew or rain. The harvest season over the last few years have been unusually dry with very few hours of dew. Consequently it was possible to harvest high quality rice at very low moisture contents. An El Nino weather pattern is developing the Pacific Ocean. This may result in early rains and/or more dew events, thus increasing the chance of kernel fissuring due to rehydration in low moisture rice. Don't assume that the rice can be harvested at the ultra-low moisture levels in all years.

On a related topic, there is some concern that water supplies may run short at the end of the season in some areas. In other words, there may not be enough water to finish the crop. If you are faced with this possibility, remember that drain time experiments demonstrated that rice fields in with heavy clay soils can be safely drained 24 to 28 days after 50% heading without compromising yield and quality. Applying this concept to lack of irrigation would mean that the deep water from blanking protection would be held and allowed to slow subside; some additional water may need to be applied. The target is no standing water but the soil is still fully saturated in the intake check at 24 days after 50% heading (assuming that the water recedes in the intake check first). Compared to typical practices this could shorten the irrigation season by about 7 days. If you have any questions regarding this management option, please give me a call (530.521.6670)

DON’T FORGET THE RICE FIELD DAY!

★ Wednesday, August 27, 2014 ★

The annual Rice Field Day will be Wednesday, August 27, 2014, at the Rice Experiment Station (RES), Biggs, California. You and your associates are cordially invited to join us to observe and discuss research in progress at RES. The Rice Field Day is sponsored by the California Cooperative Rice Research Foundation and University of California with support from many agricultural businesses.

7:30 - 8:30 A.M.	**REGISTRATION** • Posters and Demonstrations
8:30 - 9:15 A.M.	**GENERAL SESSION** • CCRRF Annual Membership Meeting • D. Marlin Brandon Rice Research Fellowship • California Rice Industry Award
9:30 – NOON	**FIELD TOURS OF RICE RESEARCH** • Variety Improvement • Disease Resistance • Insects and Control • Weeds and Control
NOON	**LUNCH**

The program will begin at 8:30 a.m. with a General Session that serves as the Annual CCRRF Membership Meeting. Posters and demonstrations will be in place during registration until after lunch. Field tours of research will emphasize progress in rice variety improvement, disease, insect, and weed control. The program will conclude at noon with a complimentary luncheon. The RES is located at 955 Butte City Highway (Hwy. 162), approximately two and one half miles west of Highway 99 north of Biggs, California.

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