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Rice Briefs

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Potassium Fertility in Rice

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In past newsletters and extension meetings the topics of N and P fertility have been covered recurrently. This year, Bruce Linquist, UC Davis Research Scientist, will begin a project to evaluate the status of K in rice soils in several locations across the Valley. His results will help explain occurrences of K deficiency. In the meantime, here is some basic information about K in rice systems.

Potassium in soil and plants

In the soil, K originates from slowly weathering minerals. In the soil solution, K is present as K ion (K^+), the form used by plants. In rice plants, K participates in many enzymatic and physiological processes; notably in the opening and closing of stomata (leaf openings responsible for gas exchange). In general, K increases tillering, grain size and weigh, and disease resistance. In rice plants about 75% of plant K remains in leaves and stems, and the rest is translocated to grains.

Diagnosing potassium deficiency

In general, plant symptoms of K deficiency are observed after panicle initiation (PI) or as late as heading. From afar, the field has a reddish, burned appearance. When inspected closely, older leaf tips look chlorotic and burned, leaf blades show small brown spots that coalesce to form irregular necrotic areas. Potassium is very mobile within the plant; therefore, deficiency symptoms are observed fist in older leaves (when deficient, K is transported from older leaves to growing points where it is needed).

Soil and plant samples can be used to confirm K deficiency (Table 1). When using soil samples, make sure the ammonium acetate (NH_4OAc) method is used since this method has been calibrated for California soils. When using plant tissue, sample the Y leave (the most recent fully expanded leaf).

If K fertilizer is needed, pre-plant applications are the most effective. Topdressing at mid-tillering is also possible; however, applications at this time are not as effective as pre-plant applications. Late K applications (after PI) may not affect yield but can reduce symptoms and help increase overall plant vigor.

Pre-plant K can be surfaced applied—K does not volatilize, like N, and it does not increase algae problems, like P. However, if a blend including N and P is used, the material should be incorporated to avoid the previously mentioned problems. The K rate needed will vary depending on soil characteristics and the intensity of deficiency. Growers should experiment using different rates to see which gives the best results.

Straw management and potassium

An 8,000 lbs rice crop extracts 174 lbs of K per acre, 26 lbs on the grain and 148 lbs on the straw. When incorporating or burning the straw, all of the straw K returns to the soil. However, when burning, the distribution of the K might not be uniform because of movement of the remaining ash due to wind and rains.

If baling during the fall, approximately 34 lbs of K are removed per ton of baled straw. When baling occurs during the spring, much less K is removed because a large proportion of the K in the straw leaches from the plants with winter rains. Baling has the potential of mining K out of the soil relatively quickly. Experiments in California have shown that after three seasons of baling, the amount of extractable K in the top soil can be reduced below critical levels.

While baling increases the probability of seeing K deficiency in a relatively short period of time, many years of rice production and grain-K extraction without resupplying the soil can lead to K deficiency in a longer time frame. This might explain why growers experience K deficiency problems in soils that were considered high in K in the past.

Table 1. Critical levels of K in the soil and plant tissues.

Phase/Growth stage	Critical value for deficiency	Notes
K in soil	<60 ppm	Ammonium acetate extraction method
K in plant—mid tillering	<1.4%	Y leave content
K in plant—PI	<1.0%	
K in plant—flag leaf	<1.0%	

Managing Late Planted Rice

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Once again we may be facing a difficult planting season. Stand establishment, weed control, and nitrogen management are particularly problematic in wet springs. Below are a few points that you might want to keep in mind. As always, if I can be of assistance don't hesitate to give me call.

Seed Bed Preparation

Well prepared, dry soil improves seedling vigor and stand establishment. Unless there are other overriding constraints, take the time to let the soil dry rather than rush planting into a wet seedbed.

Weeds

In wet years, another important objective of groundwork is to dry the soil to kill germinated weeds. Working wet soil may just transplant them although it may be unavoidable if spring rains persist this year. Consider taking the extra time to work the soil to allow it to dry, at least in the top 1-2" where most of the weeds arise.

Herbicide program tradeoffs are likely because it is hard to achieve optimum weed control when weeds germinate before planting and get a head start on the rice. For example, timing of water applied materials is more critical. To avoid crop injury with Bolero®, it should be applied at the two leaf stage of the rice, but watergrass should have less than two leaves. This narrow timing of applicaiton window may be lost because the weeds are ahead of the rice. The same idea is also true with Cerano® , which can be applied at day of seeding. Consider reserving it for those fields which have had an opportunity to dry out thoroughly; Cerano® in a wet field with germinated weed seeds may result in poor grass control. All these early applied materials still have a role, but may not work as well unless the seed bed gets dried out first.

A backup program involving foliar materials, such as Abolish®, propanil, Clincher® or Regiment® in sequences or combinations are options. Timing and possibly rate will be affected if weeds germinate prior to planting. Foliar applications provide a greater degree of flexibility.

Fertilizer

Switching to dry fertilizer and using lower N rates are useful strategies. What are the differences between dry N fertilizer and aqua? Both urea and ammonium sulfate are viable alternatives but differ in their form and concentration. Urea is about 46% N and is a neutral salt, so it will move with the water until it converts to the ammonium form (about two

days), after which it adsorbs on soil colloids. Urea is subject to volatile loss when applied to bare, moist soil so it should be incorporated promptly after application. In contrast, ammonium sulfate is 21% N, does not require conversion, adsorbs on soil colloids as soon as it dissolves and is much less subject to volatilization. The higher concentration of urea can lead to streaked applications, but may be cheaper to apply because less material is used. Plant response should not differ between these two materials, but experience suggests that broadcast N is generally less efficient than N which is incorporated into the soil.

As we move through the month of May and into June, N rates should come down to accommodate a shorter growing season and to offset the gain in soil N from more complete mineralization of organic N. In very late fields consider using only starter at planting and top dress later, based on crop need and leaf analysis.

In extreme circumstances some rice may get planted without any preplant N. In such a case consider 20% to 30% of the total N rate be applied within the first 20 days after planting (probably as ammonium phosphate or blend), and the balance split equally between early tillering (about 6 leaf stage) and the mid-tillering (8 leaf stage) to panicle initiation (10 leaf stage). An important point is not to apply too much P early on plants that are under water. This is a recipe for algae. Wait for emergence or drop the water to make sure the plants are emerged.

Shrimp/Midge/Algae

With wet seedbeds and warm temperatures, shrimp eggs may be primed and ready to go, so be on the alert. Although midges are very difficult to predict, they seem to be associated with slow flooding and warm temperatures. With the potential for water competition because everyone will flood at the same time, this combination could occur, especially if it suddenly gets warm. With late planting and wet soils, the chances are good we will see some hot weather on young stands that are not yet emerged. This is ripe for algae to bloom. If you cannot incorporate fertilizer P prior to flooding consider waiting until 20 to 25 days after planting and apply it into the water to avoid algae problems.

Tillage and Seedbed Preparation

Is crusting a problem? This is uncertain and probably varies with the soil, but some field observations suggest that crusts can affect stand establishment. It may be a good idea to do a light tillage to break the crust. A crust will soften under water allowing roots to penetrate. But, if it is smooth and slick, seeds may move and won't have a chance to root. Land planes don't work very well in moist soil so you may have to use some sort of float or skip this step completely if the ground is reasonably smooth. Rollers may have less appeal this year if you can't get the seedbed dry. The objectives of seedbed preparation remain the same, with emphasis on drying to kill weeds and to prepare a surface that will provide a seedbed appropriate for maximum stand establishment.

Winged Primrose Willow (WPW)

WPW was discovered south of Richvale at the end of the 2011 season. This is the first confirmed occurrence west of Texas. WPW is a native of South America and is an invasive species with the potential to become well established in seasonal wet lands. It is a annual plant which may exhibit perennial behavior in mild climes. One plant can produce vast quantities of seeds that are easily transported in water and on equipment. Its biology and appropriate eradication strategies are still under investigation. However, the seeds may germinate while floating on the water. It's likely that WPW can vegetatively propagate; i.e. plant fragments, such as stem and root pieces, form roots then develop into new plants. It appears that foliar-active broadleaf herbicides provide a degree of control. A cooperative effort to eradicate WPW involving growers, PCAs, the Agricultural Commissioner, the Rice Experiment Station, and the University of California is underway.

If you farm a field where WPW was found in 2011 the following actions are recommended where possible:

- Move the contaminated field(s) to end of your planting schedule to avoid transporting seeds to a 'clean' field, i.e. cultivate the 'dirty' field last;

- Alternatively, thoroughly wash down and clean your equipment on-site before leaving the contaminated field;

- Routinely scout your fields, especially ditch banks, areas with cattails, and field edges to identify and control WPW before it flowers. WPW develops its characteristic square stem around the 4th leave stage;

- If you suspect WPW in your fields or need more information call your local UC farm advisor or agricultural commissioner's office. Thank you.

For pictures of winged primrose willow, go to the UC IPM website (www.ipm.ucdavis.edu) and navigate to the Rice Pest Management Guidelines. On the top of the page you will find the link for winged primrose willow under "New Pest in California".

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