

Arkansas Rice Update

Dr. Jarrod Hardke and Dr. Trent Roberts

May 29, 2015

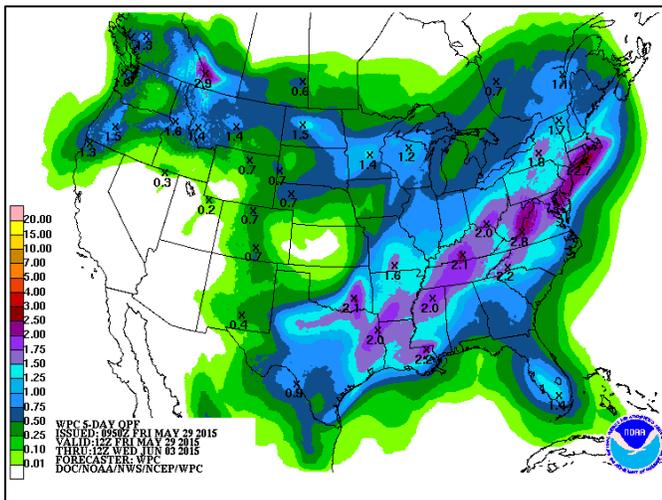
No. 2015-14

Crop Progress

Yogi Berra would say this year is déjà vu all over again. Here we find ourselves at the end of May with plenty of rice ready to go to flood. Once again rice is nearing the end of the nitrogen application window and we can't find dry ground to put it on. Most of this update focuses on managing pre-flood nitrogen in these difficult conditions and on the use of urease inhibitors which will greatly aid us in the fight.

The 5-day rainfall forecast (Fig. 1) has much of eastern Arkansas set to receive around 2 inches of rain. Not exactly what we were looking for. Based on DD50 enrollment, nearly half of the rice in the state is due to be fertilized and flooded by the end of this week. The majority of the acres remaining fall into the next two weeks. Simply put, we need dry weather to get fertilizer and herbicide applications out.

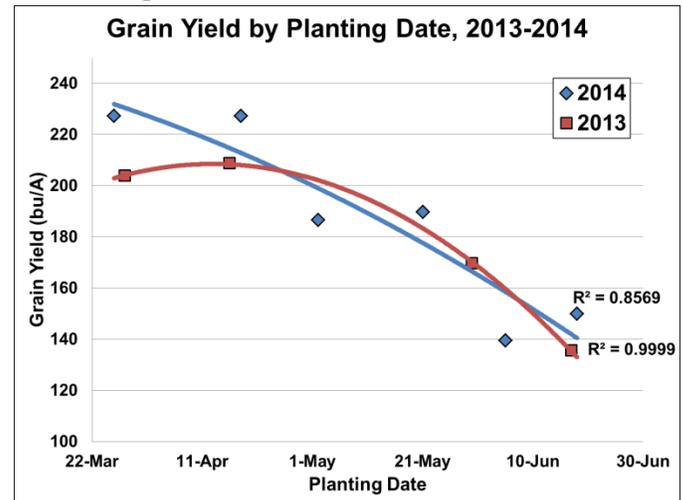
Figure 1. 5-day rainfall forecast.



How Late is Too Late?

Questions are still coming in about how late is too late to plant rice. The short answer is probably that \$4 rice is too late to plant rice, but ultimately that's an individual decision. Figure 2 shows the yield trends for planting date studies conducted over the past two years. The trends are very close between the two years and the data includes a range of widely planted long- and medium-grain cultivars.

Figure 2. Average grain yield by planting date at the Rice Research & Extension Center near Stuttgart, AR, 2013-2014.



Generally speaking, once we move into May we start to see up to a 15% yield decline below optimum (usually mid-April plantings). By the very end of May and into the beginning of June, we start to see 20-30% yield reductions below optimum. For a specific farm/field, based on your optimum yield potential when planted mid-April, can you afford a 20-30% yield reduction and still be profitable? Some can, others can't.

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If the decision is to continue planting rice in June, it is strongly advised that you consider either a hybrid or Jupiter – yield potential and disease packages of these are critical considerations. If you want to plant a long-grain variety, similar performance on average is found for the mid-range of maturities such as Wells, LaKast, and CL151. However, disease susceptibility remains a concern; and you should avoid extremely early or late maturing cultivars.

The power of the pencil rules at this time. Evaluate potential rice yield and price versus potential yield and price for other replacement crops when making these planting decisions. Go with the most profitable option.

Preflood Nitrogen Management Issues

For many rice fields, options are running out for preflood nitrogen (N) applications. It's time to play the hand we're being dealt with no time to wait for new cards. Last year we encountered similar problems, but no one was prepared to see a repeat of those prolonged wet and cool conditions. In some ways conditions may be worse this year than last. Regardless, it's back to the same drawing board as last year as we're experiencing tremendous difficulty applying preflood nitrogen to rice the way we want – on dry ground at the 4- to 5-leaf stage before establishing the permanent flood.

In order of preference, based on yield response and N efficiency, here are options for applying preflood N based on field situations:

1. **Field is dry:** Apply NBPT-treated urea onto dry soil and establish the permanent flood in a timely manner to incorporate N below the soil surface. If you have any time

to spare, it is always best to apply preflood N onto dry soil – applications onto muddy soil or into standing water are far less favorable and much less efficient methods of N fertilization.

2. **Field is muddy:** Apply NBPT-treated urea onto muddy soil and attempt to let the soil dry if you have time. If a significant rainfall event occurs (~0.5 in or more) to re-wet the field then begin flooding; otherwise let the soil dry before establishing the flood. If you're applying N to mud we do not know how much N will be lost, but if you feel the need to increase the N rate, do so only slightly (10-20 lbs N higher). This increase may or may not provide much benefit, but it's less likely to hurt in this case. Watch the crop closely and apply extra N if N deficiency occurs.
3. **Field has standing water:** Get the water off the field if at all possible (if time allows). Many no longer have time to get the water off and let the soil dry. In this case, holding the water and “spoon-feeding” N into the flood in small quantities every 5-7 days for 3-4 weeks is the best option – lean toward every 5 days. A small quantity means 45 lbs N per acre (100 lbs urea per acre). If you have a short time to internode elongation, maybe applying N for 3 weeks at 45, 60, and 60 lbs N per acre will be better. However, smaller quantities applied more frequently are your best option in this situation. **Do not, for any reason, apply the entire recommended preflood N rate in one application into standing water.**

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Preferred “worst-case” management:

Apply N to muddy/wet soil as rice reaches the end of the N application window according to the DD50 program. Attempt to let the soil dry out underneath the applied N and if a significant rainfall occurs, start flooding. Realize that some N is lost in this case and be prepared to monitor the crop closely and apply additional N later if the rice looks like it needs it.

Fields unable to hold a flood (levees and gates unfinished): Apply a small amount of N and wait for the soil to dry or receive upcoming rainfall. If heavy rain is expected and movement is a concern, ammonium sulfate should be used for this application; otherwise, apply NBPT-treated urea. If conditions are still not dry enough to flood the field in a week, subsequent N applications will be needed in the same manner until a flood can be established. At the point the flood can be established, apply any remaining N requirements to the dry soil and flood.

When pre-flood N is applied onto dry soil to rice at the 4- to 5-leaf stage and a flood is applied timely, plants take up at least 60% of the total N applied over the course of 3 weeks (10% week 1, 20% week 2, 30% week 3). In general the period from the optimum time to apply pre-flood N until internode elongation (IE) is about 3 weeks, but from the final recommended application time to IE is about 2 weeks. However, these timings are based on plant development when rice has received timely N fertilization and flooding – delaying these causes rice to develop more slowly. Keep in mind that

we can only make up a small amount of yield with N applied at midseason.

Previous research has shown that N applied onto dry soil has the most yield benefit. Applying urea onto muddy soil can result in a 20% yield loss. However, applying ammonium sulfate or urea + NBPT onto muddy soil and letting the soil dry can reduce the yield loss to only 10%. In this research, N was applied just prior to permanent flood at the 4- to 5-leaf stage.

Past the 4- to 5-leaf stage, potential yield losses could become more dramatic. However, many factors influence how much flexibility we have in our N fertilization timing, including cultivar, length of maturity, native soil N, soil type, etc. If native soil N is high, then the effect is reduced. If it is a longer season cultivar then there is a greater window before midseason. In any case don't let it get too late before applying N. Use of the DD50 Rice Management Program can help to time management decisions in these situations (<http://DD50.uaex.edu>).

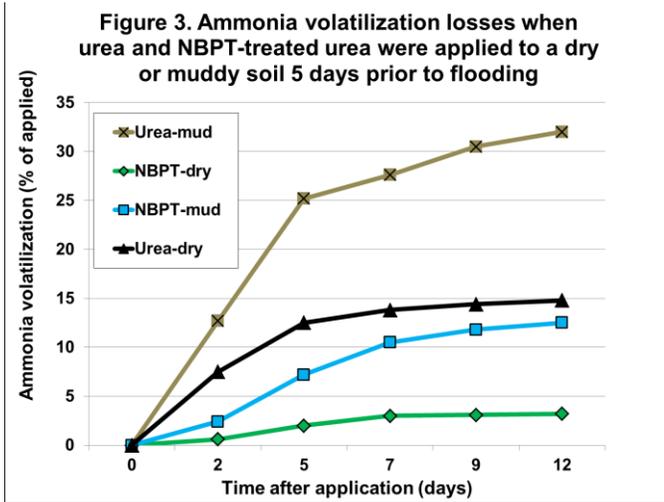
Managing Ammonia Volatilization Losses from Urea in Less than Ideal Conditions

Ammonia volatilization losses from surface-applied urea can be significant and result in as much as 30-40% of the total N being volatilized and unavailable to the crop (**Fig. 3**). Losses of urea as ammonia gas increase as wind speed, soil moisture, humidity (>70%), soil pH, and temperature increase. Under warm (spring and summer) conditions, urea needs to be incorporated with tillage, rainfall (>0.5 inch rainfall), or irrigation immediately and within at least two days following application to significantly reduce gaseous ammonia loss.

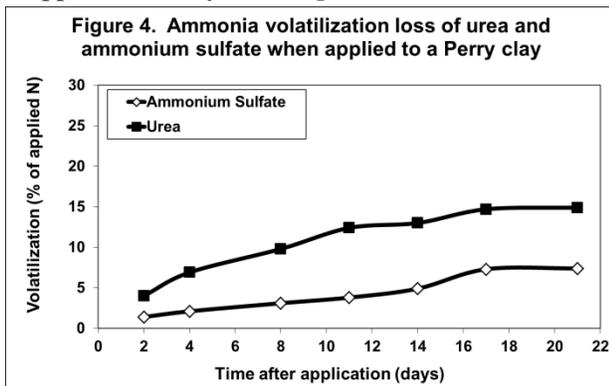
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Ammonia volatilization loss of urea is much more rapid and extensive when urea is applied at high rates or to a muddy, low cation exchange capacity soil compared to a dry soil (**Fig. 3**). The ammonia loss potential tends to be lower in clayey soils because of their higher cation exchange capacity compared to silt or sandy loam soils (**Fig. 4**). Research in Arkansas shows that under warm/summer conditions, ammonia loss from surface-applied urea occurs most rapidly the first five days after application to a silt loam (**Fig. 3**) and the first ten days when applied to a clay soil (**Fig. 4**).



The use of NBPT (N-(n-butyl) thiophosphoric triamide), a urease inhibitor, can help minimize urea loss via ammonia volatilization when applied to a muddy soil; however, every effort should be made to apply urea to a dry soil even when NBPT is used.

A number of NBPT-containing products are now available for adding to urea and urea-ammonium-nitrate (UAN) fertilizers. These products may contain different amounts of the active ingredient NBPT. The concentration of each individual ingredient is typically given on the product label. However, some NBPT-containing products have elected to not show the specific concentration of NBPT on the label, which makes it difficult to compare the cost and potential effectiveness among products applied at equal NBPT rates.

A limited amount of research has shown that the duration and magnitude of urease inhibition is dependent on NBPT rate, which makes knowledge of a product's NBPT concentration critical. Application of the proper NBPT rate to urea or UAN fertilizer is important and assumes that the ability of NBPT to inhibit ammonia volatilization is not affected by the other ingredients that may be included in the actual product or other products (other inhibitors and drying agents) that may also be added to the fertilizer.

Manufacturers of NBPT-containing products are encouraged to list the concentration (percentage by weight) of each individual ingredient including NBPT on the label. The most common recommended NBPT application rate ranges from 1.6 to 1.8 lb NBPT per ton of urea which is equivalent to the addition of 0.08

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to 0.09% NBPT by weight. Note that the NBPT application rate for UAN fertilizer is different than that for granular urea.

Farmers have adopted the use of NBPT as a management tool for surface-applied urea, particularly in rice fields where establishing a flood in two days or less is difficult, or in upland crops where urea may remain on the soil surface for extended periods of time following application (e.g., not incorporated by tillage or irrigation). The high adoption rate of products containing NBPT has stimulated the marketing of numerous products with claims of similar benefits (i.e., reducing ammonia volatilization).

Before the University of Arkansas Division of Agriculture recommends a product that claims to have inhibitory effects on the enzyme urease or simply “ammonia volatilization loss of urea” the products must be subjected to a laboratory test, which measures ammonia volatilization from urea amended with the commercial product of question compared to the volatilization losses of urea and NBPT-treated urea. At the time this article was written only the NBPT-containing products listed in **Table 1** have been tested and shown to effectively inhibit ammonia volatilization from urea when applied at 0.08 to 0.09% NBPT.

Table 1. List of tested and recommended NBPT-containing urease inhibitors (based on product labels available in May 2015) and suggested application rates for urea and urea-ammonium-nitrate (UAN).

Product Name	Manufacturer	Weight per gallon	NBPT concentration	Label Recommended Volume †	
		lb/gal	%	Urea	UAN
				qt/ton fertilizer	
Agrotain Ultra	Koch Fertilizer, LLC	8.84	26.7	3.0	1.5
Arborite AG	MicroSource Co	9.15	20.0	2.0 - 3.0	1.5
Arborite AG-NT	Weyerhaeuser NR Co. ‡	9.15	24.0	3.0	1.5
Factor X2	Rosen’s Inc.	9.1	50.0	1.63	0.815
Factor	Rosen’s Inc.	9.09	24.5	3.25	1.625
Limus	BASF Corporation	9.06	16.9 §	3.0	1.5
N-Fixx	Helena Chemical	8.80	Unknown ¶	3.0 – 4.0	1.5 – 2.0
Nitrain	Loveland Products Inc.	8.93	26.7	3.0	1.5
NitroGain #	Arclin, Inc.	8.92	20.0	4.0	1.5 – 2.8
NitroGain #	Arclin, Inc.	9.00	26.7	3.0	1.5 – 2.8
N-Veil	Invictis Crop Care, LLC	8.92	26.7	3.0 – 5.0	1.5 – 2.8

† One ton of fertilizer approximates 181 gallons of 32% UAN and 187 gallons of 28% UAN.

‡ Arborite AG-NT distributed by Gavilon Fertilizer.

§ Limus also contains 5.6% N-(n-propyl) thiophosphoric triamide [NPPT] for a total thiophosphoric triamide concentration of 22.5%.

¶ Unknown, the product label does not specify the concentration of NBPT in the product.

NitroGain will be sold containing a single trade name (NitroGain) with one of two concentrations. Anyone using this product should pay close attention to the NBPT concentration listed on the label to match the appropriate product use rate (3 or 4 qt/ton urea) which may vary with NBPT concentration.

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Taking the time to manage pre-flood N correctly will pay dividends come harvest time. When choosing a urease inhibitor to protect your pre-flood N investment a little due diligence in making sure you are applying a documented inhibitor and applying it at the correct rate will be money well spent in a year such as this. For more information of urease inhibitors please refer to University of Arkansas Division of Agriculture publication FSA 2169.



The DD50 program can be accessed at <http://DD50.uaex.edu>. It has now been improved for use on both your computer and your **mobile devices**.

Additional Information

Arkansas Rice Updates are published periodically to provide timely information and recommendations for rice production in Arkansas. If you would like to be added to this email list, please send your request to jhardke@uaex.edu.

This information will also be posted to the Arkansas Row Crops blog (<http://www.arkansas-crops.com/>) where additional information from Extension specialists can be found.

More information on rice production, including access to all publications and reports, can be found at <http://www.uaex.edu/rice>.

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