Program 4R-2

Implementation Of New Technologies For Improving Fertilizer Use Efficiency

Presented by Dr. Timothy W. Walker
Associate Agronomist, MSU

Nitrogen (N) has become a major expense in rice production and is scrutinized because of its potential to decrease surface water quality and increase global warming. Thus, research continues to be directed towards fine-tuning practices to minimize its loss. Much research has been conducted in the last decade proving that volatilization loss can be minimized with products containing NBPT (Agrotain®, Arborite®, N-Fixx®). Recently, nitrification potential has been quantified in several Mississippi soils where rice is produced. Under real-world production practices, nitrification and subsequent denitrification can be costly with respect to the value of the N lost and in reduced grain yield. In recent years, studies have been conducted to determine the effectiveness of products aimed at minimizing nitrification.

A field study was conducted on a Sharkey clay soil in 2011 and 2012 at the Delta Research and Extension Center in Stoneville, MS. The study evaluated the effectiveness of the nitrification inhibitor dicyandiamide (DCD) and a 43%N sulfur-polymer coated urea product. Fertilizer was applied via urea and the coated N product at two rates (84 and 168 kg N ha-1), and DCD was applied at a 5, 10, and 15% N basis. Both products were applied 14 days before permanent flood establishment (dbf), and the DCD was delivered with urea liquor. The controls included N applied at the same rates without DCD at 14 and 1 dbf. An incorporating rainfall event occurred within 1 d after the 14 d application both years, thus minimizing any potential for volatilization loss. Plots were harvested with a small plot combine and yields adjusted to 12% moisture content. Grain yield data were averaged across year and subjected to analysis of variance and means separated with Fisher's LSD at $\alpha = 0.05$.

Nitrification and subsequent denitrification resulted in 25 to 30% yield loss when urea was applied 14 dbf compared to 1 dbf. When 150 lb N/acre was applied, the rate of DCD was not as important; however, averaged across DCD treatments, rice yield loss was decreased to approximately 8% compared to no DCD. When 75 lb N/acre was applied 14 dbf and DCD supplied 15% of the total N, rice grain yields were only 7% less compared urea alone and applied 1 dbf. The sulfur-polymer coated urea product applied 14 dbf produced grain yields that were approximately 5% less than the urea treatments applied 1 dbf.

These data suggest that ideally, urea should be applied as close to flood as possible. However, in situations where floods can take several days to establish, products like DCD and the sulfur-polymer coated urea could greatly reduce N and yield loss.

Program 2R-2

Recent Progress In Rice Stink Bug (Oebalus Pugnax) Management

Presented by Dr. M.O. Way
Professor of Entomology, TAMU

Introduction

The rice stink bug (RSB) is a key pest of rice in the South. This late season pest inserts its mouthparts in kernels of developing rice grains. Enzymes in the insect's saliva break down the contents of the kernel so they can be sucked up by the insect. The RSB also produces a salivary sheath surrounding the stylets which helps lubricate the stylets as they drill into the kernel. Once the stylets are removed, a "volcano-shaped" salivary sheath is left behind on the surface of the kernel. Very high populations of RSB can reduce yield, but more commonly, damage consists of discoloration of grains ("pecky rice") and breakage of kernels which are

quality issues. Adding to the problem of direct feeding is the presence of fungi, yeast and bacteria which can be found on the surface of kernels and on the mouthparts of the insects. These microorganisms are introduced into the kernels when RSBs feed. The combination of direct feeding and the action of the microorganisms exacerbate the quality problems associated with RSBs.

Prior Research

In the past, many Texas rice farmers sprayed for RSB 3 or more times a growing season because of lack of sufficient residual activity of labeled insecticides. The adults are quite mobile and can travel relatively far to invade rice fields. Populations can build up to high levels on grass weeds such as Johnsongrass and grass crops such as sorghum. Once these grasses and crops begin to senesce, adult RSBs invade flooded rice fields when rice begins to head. The most susceptible stages of rice maturation are heading and milk. Thus, farmers should scout carefully at this time to make sure applications of insecticide are justified only when population levels exceed treatment thresholds (see table below).

Revised treatment thresholds for rice stink bug (RSB).

Projected yield (lb/acre)	Average number of RSBs[1]/10 sweeps			
	Heading	Milk	Soft dough	Hard dough
4500	8	10	17	47
6000	10	14	22	63
7500	13	17	28	79
9000	16	21	34	94

[1]Includes adults and older nymphs (4th and 5th instars).

These current treatment thresholds are based on research conducted by Way's project. The original treatment thresholds basically were: 5 adult RSB per 10 sweeps at heading and milk, and 10 adult RSB per 10 sweeps at soft and hard dough. As you can see, the current treatment thresholds are higher than the originals.

For many years, Way's project attempted to obtain a rice label for acephate (Orthene), but was unsuccessful in spite of data showing excellent residual activity against RSB. Acephate is an organophosphate insecticide and the US Environmental Protection Agency was phasing out the registrations of this class of insecticide. However, in 2008, Tenchu 20SG (active ingredient dinotefuran) received a Crisis Exemption for use in Texas on rice attacked by RSB. Way's project showed excellent residual activity of Tenchu 20SG against RSB. Farmers dramatically reduced their number of insecticide applications targeting RSB.

Recent Research

From 2009-2012, Tenchu 20SG received Section 18 Emergency Exemptions for use in Texas. As for 2013, we anticipate a full federal Section 3 label which means all southern rice-producing states might be able to use Tenchu 20SG for RSB control. We are now evaluating other potential RSB insecticides, such as Endigo ZC which contains thiamethoxam and lambda-cyhalothrin as active ingredients.