

Potassium

Important To Controlling Stem Rot In Rice

FAYETTEVILLE, ARK.

Potassium may not be the first nutrient growers think about when fertilizer is on their minds, but research by University of Arkansas System Division of Agriculture scientists shows that early application in soil low in potassium improves rice yield and suppresses stem rot.

"When plants are potassium deficient, they are more susceptible to disease," said Nathan Slaton, director of soil testing for the Division of Agriculture.

"When disease is present and the environment is favorable for the disease, it's more likely a crop will suffer significant losses if there is insufficient potassium."

Silt and sandy loam soils are often potassium deficient, Slaton said. "Our soil test data show 30 percent of rice acreage in Arkansas is low in potassium and another 30 percent has marginal potassium levels," he said.

Slaton said it has long been known that there is an association between potassium and stem rot. "Quite often, when you see very severe stem rot," he said, "it raises a red flag to check potassium levels."

Rick Cartwright, extension plant pathologist, said a fungus that is highly adapted to the rice plant causes stem rot. It persists in the soil and its survival structures look like grains of pepper.

"It's very survival-oriented," Cartwright said. "It can survive at least six years in the soil without a host."

Cartwright said that when a rice field is flooded, the fungus floats to the surface and, when it comes into contact with the plant, it attaches to the sheath and begins to work its way into the stem. Once it reaches the hollow center, the stem dies.

"It's often a late-season disease that hits just about the time the heads emerge," Cartwright said.

Slaton said that too much nitrogen could make a plant susceptible to stem rot even if it has sufficient potassium. "There are two questions you want to ask up front, if you're having trouble with stem rot," he said. "Is there sufficient potassium? And, is there too much nitrogen?"

Since 2000, Slaton has been applying varying rates of potassium in rice test plots at the Pine Tree Experiment Station near Colt for a fertility study. Cartwright began collecting samples of mature plants from those plots and evaluating them for stem rot.

After six years in the study Slaton said the

lowest levels of stem rot were found in the plots with the highest application rates of potassium and the highest rates of stem rot were in the plots with the lowest rates of potassium. The results clearly indicate that stem rot can build up over time.

"This tells us that long-term mismanagement of potassium can end up costing growers in terms of losses to stem rot," Slaton said.

Graduate student Elliot Maschmann expanded the study in 2007, adding test plots on



The survival structure of the stem rot fungus resembles grains of pepper that float up in flood water and drift around until they come in contact with rice sheaths. They then attach and begin to move through the sheath toward the hollow stem, where they can kill the stalk.

farms in Lonoke and Poinsett counties, and more sites in 2008 in Poinsett and Prairie counties. In addition to application rates, Maschmann looked at application timing.

"In 2007, we saw that potassium applied before flooding worked best," Maschmann said. "And as application rate increased, yields improved. As rates decreased, stem rot increased in severity."

Slaton and Cartwright also wanted to know if late applications of potassium could reverse high levels of stem rot during a growing season.

Slaton said mid-season application of potassium reduced stem rot and gave a good yield response. Applications at late boot stage also offered a 5 percent to 6 percent bump in yield.

"It will be an economic decision on whether a late potassium application or a fungicide application will give a grower the best bang for his buck," Slaton said.

Cartwright said the fungicide Quadris has some effect on stem rot and may help control the disease until soil fertility is balanced. Fungicide studies are still underway and it appears that the economic return from a fungicide alone can be questionable with this disease under some circumstances.

"Farmers who follow Division of Agriculture recommendations for potassium and nitrogen don't have too much trouble with stem rot," Cartwright said. Δ