USDA, Field Station Study Examines Whether Rice Can Help Clean Agricultural Residues from Water

Contributed by Michelle Edwards
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OXFORD, Miss. – Clean water has always been a precious commodity, but recent droughts and regional "water wars" underscore the importance of protecting and conserving it. One of the biggest threats to the country's water supply is contamination from pesticides and excess fertilizers that can come from either agricultural or urban sources.

Ecologist Matt Moore examines rice plants from his test plot at the UM Field Station. UM photo by Michelle Edwards.

But one of the world's most common food crops may provide the key to solving this problem. A research collaboration between the U.S. Department of Agriculture's Agricultural Research Service and the University of Mississippi is studying whether rice might be used to mitigate pesticide and fertilizer runoff.

Researchers at the ARS National Sedimentation Laboratory Water Quality and Ecology Research Unit in Oxford have teamed up with the UM Field Station for the project. Matt Moore, ecologist at the "Sed Lab," directs an ongoing study that focuses on rice and its ability to take up pesticides and nutrients (fertilizer) from agricultural runoff water. An aquatic plant and a food source, rice is a major production crop in California and the Southeastern U.S., and in developing and populous countries all over the world.

"In today's economy, agriculture has to maximize the use of limited resources," Moore said. "I've worked with pesticide remediation through constructed wetlands and drainage ditches for over a decade, and the challenge is to always try to think outside the box. I kept asking myself, 'What's a plant that loves water, is not threatening to other plants and grows quickly?' One drive home to the family farm in Arkansas answered the question – rice."

Modern farming operations depend on pesticides and fertilizers for higher crop production. These chemicals may eventually drain off to local streams, rivers and lakes, possibly making the water dangerous for human consumption and wildlife.

"Just think of the environmental potential," Moore said. "If rice crops can filter out pesticides and nutrients from storm water runoff but still not transfer the pesticide up to the actual seed, you could use a rice field to clean runoff water and produce a food crop. It's the best of both worlds, potentially."

Moore and his team conduct experiments on rice plants at his test plot at the UM Field Station. UM photo by Michelle Edwards.

Moore and his team plant rice in study plots at the Field Station. When the plants reach a certain age, Moore releases specific concentrations of pesticides into the plots' water supply, simulating storm runoff. Rice samples are collected at

measured time and distance intervals for chemical analyses to see if the plants indeed take up the pesticides and nutrients, thus reducing concentrations in the water.

If rice does diminish the impact of pesticides and nutrients on runoff water, this could have major implications for the agricultural industry and individual farmers. First, though, scientists must determine how the pesticides and excess nutrients affect rice grains that are to be harvested for food. If rice does concentrate these compounds, is the rice safe to eat?

"I am wrapping up a greenhouse experiment to hopefully start to address those very questions," Moore said. "We're in the final weeks of rice growth. When the rice matures, we'll harvest the plants and seeds separately to see if the pesticides traveled to the seeds."

Whether the seeds contain pesticide residues will determine which direction the research heads next.

Rice is not the only plant that may be useful to help treat runoff from agricultural fields. Wetlands, of course, have an abundance of aquatic plants.

"Wetlands are known to decrease sediment, nutrients and pesticides in runoff waters," says Richard Lizotte, first year research ecologist at the Sed Lab. To understand this important function of wetlands in more detail, he and his team are conducting a series of experiments at the Field Station using constructed wetlands and comparing the results to similar experiments (but on a larger scale) in Mississippi Delta wetlands.

Lizotte's research focuses on a better understanding of wetland efficiency in mitigating complex chemical mixtures found in agricultural runoff. He wants to learn how various chemical combinations potentially alter plant and wetland mitigation capabilities.

"There's an old saying, you are what you eat, and that also applies to what you drink," said Ray Highsmith, Field Station director. "In this case, we have two Sed Lab teams devoting their efforts to improving both food and water quality through controlled study of individual food plants and communities of natural wetland plants. I, for one, am very glad they're doing this research."

The National Sedimentation Laboratory, a unit of the USDA-Agricultural Research Service, conducts interdisciplinary research dealing with the processes of soil erosion; transport and deposition of sediment; movement of chemicals on upland areas and in streams; the impact of agricultural practices, in-stream structures and bank protection on these processes; water quality; and the ecological well-being of streams.

The UM Field Station offers opportunities for research in aquatic and terrestrial ecology. Located 11 miles northeast of the Oxford campus on Bay Springs Road, the 740-acre station lies in a scenic, three-mile-long, V-shaped valley

surrounded by wooded hills and teeming with natural springs and seeps. To learn more about research and education programs at the Field Station, go to http://baysprings.olemiss.edu/ .