

Plant biologist seeks molecular differences between rice and its mimic

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Red rice sounds like a New Orleans dish or a San Francisco treat. But it's a weed, the biggest nuisance to American rice growers, who are the fourth largest exporters of rice in the world. And rice farmers hate the pest, which, if harvested along with domesticated rice, reduces marketability and contaminates seed stocks.

Complicating matters is the fact that red rice and cultivated rice are exactly the same species, so an herbicide cannot be developed that seeks out only red rice. It would kill cultivated rice, too.

But now a plant evolutionary biologist at Washington University in St. Louis has been funded by the National Science Foundation (NSF) at \$1.12 million for two years to perform genetic studies on red rice to understand molecular differences between the two that someday could provide the basis for a plan to eradicate the weed. The particular NSF program funding the research is the Plant Genome Comparative Sequencing Program.

Kenneth M. Olsen, Ph.D., Washington University assistant professor of biology in Arts & Sciences, believes that gene flow is one factor that has been at work.

"We are looking for candidate genes that underlie particular traits that differ between the two," said Olsen. "Knowing more about the traits could help in potentially controlling the weed. We have a key advantage in this research in that we know the complete cultivated rice genome, so

it's fairly easy to target genes of interest."

Olsen and his colleagues, Ana Caicedo, Ph.D., of the University of Massachusetts, and Yulin Jia, Ph.D., of the United States Department of Agriculture National Rice Research Center, will test at least two hypotheses. One is that red rice is rice that's gone feral, or gone bad.

"In this scenario, you have a sort of selection favoring the weedy version of the crop that out-competes the crop itself," he said. "That's called de-domestication."

Another possibility, which is not mutually exclusive, is that weedy rice was introduced into the Americas from Asia, where weedy hybrids of the cultivated species and the wild species occur. These weedy strains then took hold in U.S. soils and began contaminating the U.S. cultivated species.

Meet the candidates

Olsen says that the weed has many characteristics of a wild species.

"By looking at candidate genes and those genes surrounding them we can test the hypotheses of the origins of traits and see if the traits have been introduced by hybridization of weedy and wild species, or, conversely, we can look at the molecular level to see if the de-domestication phenomenon is going on."

To control red rice infestations, growers often will rotate crops away from rice to soybeans, for instance. And there are cultivation techniques that can eliminate most of the threat, although another nasty feature of the weed is its dormancy – its seed can lie viable in soils for up to 20 years. There also is a great amount of variation in different red rice strains. Some look remarkably like cultivated rice and behave like

cultivated rice. The plants are as tall as cultivated rice and flower at the same time. These "crop mimics" are difficult to spot.

Olsen hopes understanding trait differences can lead to eradication of red rice.

"We're looking for anything that exploits the difference between the crop and the weed and the way that the weed grows versus the way that the crop grows," he said. "That's the way to eradicate it."

Source: Washington University in St. Louis

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