Research identifies wheat streak resistance gene

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A microscopic look into the genes of a Colorado wheat variety has allowed Texas AgriLife Research scientists to identify a wheat streak mosaic virus-resistance gene.

Wheat streak mosaic virus is one of the most common wheat viruses found in the 75 million acres of wheat across the U.S. - 3.3 million acres in Texas, said Dr. Charlie Rush, AgriLife Research plant pathologist in Amarillo.

Because there are no chemicals labeled for control of the wheat curl mite, the vector for this virus, researchers must work with wheat breeders to try to find some resistance, Rush said.

Dr. Huangjun Lu, who was a post-doctorate research associate in Amarillo during the study, led the AgriLife Research-Amarillo team of Rush; Dr. Jackie Rudd, wheat breeder; Jacob Price, associate researcher; and Dr. Ravindra Devkota, assistant research scientist. Lu has since become an assistant professor at the University of Florida.

The research was funded by grants from the Texas Wheat Producers Board, the Texas AgriLife Research Monocot Improvement Program and the Texas Cropping Systems Program. This research will be featured in an upcoming issue of *Crop Science* journal, Rudd said.

"Our goal was to look at the resistance in a germplasm line that was used to produce a variety of wheat in western Kansas called RonL," he said.

"This variety's resistance is well known but the inheritance has not been studied until now."

The first part of the study compared the resistance of a known-susceptible variety to wheat streak mosaic virus, Karl 92, with a known-resistant variety, CO960293-2, which is a parent of the RonL variety, Rudd said.

A Nebraska wheat variety, Mace, which showed a high level of wheat streak mosaic resistance was included in the study, as were TAM 111 and TAM 112, two of the top varieties developed by the Amarillo wheat breeding program and grown in Texas that also show some resistance to the virus in field trials, he said.

The growth chamber experiment confirmed previous field work, Rudd said. Mace and CO960293-2 were highly resistant, while Karl 92 was highly susceptible. Both TAM 111 and TAM 112 were intermediate in resistance, with TAM 112 being slightly better than TAM 111.

For the genetic portion of the study, the Colorado line was crossed with TAM 111 and based on that cross, Lu determined the wheat streak mosaic virus resistance was due to a single dominant gene from the Colorado germplasm line, Rudd said.

Further molecular mapping has found the location of the specific gene that provides the resistance, he said.

Rudd explained that wheat has 21 pairs of chromosomes and this gene was mapped to chromosome 3B, "so we now know the general location, and we are developing molecular markers that can be used to track the gene in wheat breeding programs."

Only the Mace gene with known resistance to wheat streak mosaic virus

had been named previously and it is Wsm1, he said.

"Now that we have determined they are different genes, this newly identified gene will be known as Wsm2."

The difference, however, is that Wsm1 is on a chromosomal translocation from intermediate wheat grass, a wild relative of wheat, which means it could carry along some less-desirable characteristics such as lower yields, Rudd said. The Wsm2 gene was identified from a bread wheat that does not have the negative traits associated with it.

"Breeders from throughout the U.S. have been using RonL and other sources of Wsm2," he said. "Now that it has been identified, they can track that through marker-assisted selection."

The AgriLife Research wheat breeding program already has a number of crosses with the Wsm2 gene in it, Rudd said. With this information, they now can develop wheat streak mosaic virus resistant varieties quicker.

Previously, the varieties had to go through a series of field trials to help select for the desired trait, he said. The consistency of seeing the symptoms in the field is environmentally influenced and differs from season to season.

"This way, we can develop resistance without the laborious field testing," Rudd said. "A lot of programs will use this information to accelerate their breeding and increase the levels of resistance in new cultivars."

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