

Researchers study insecticide-free method for control of soybean aphids

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(PhysOrg.com) -- Two Iowa State University researchers are examining a new method of controlling soybean aphids without the use of chemical pesticides.

Bryony Bonning, professor of entomology, and Allen Miller, professor of plant pathology and director of the Center for Plant Responses to Environmental Stresses, are looking at a way to genetically modify soybeans to prevent damage from aphids.

If the research is successful, soybeans will carry in-plant protection from aphids, similar to the way genetically modified corn now keeps the European Corn Borer from destroying corn yields, but using a different molecular tool. Modified corn technology has been in use for about 12 years.

The study is being funded by a Grow Iowa Values Fund Grant. The goal of the grant program is to support development of technologies with commercial potential and to support the growth of companies using those technologies.

The researchers are working with Pioneer Hi-Bred, a DuPont business, as their corporate partner.

Previous research at Iowa State University indicated that if major soybean aphid outbreaks were left untreated, the loss in yield could exceed \$250 million in Iowa. The annual cost to prevent the yield loss with insecticides can reach \$64 million for Iowa soybean growers.

Soybean aphid outbreaks have become an annual phenomenon in Iowa, according to Miller.

The current research focuses on introducing a gene into soybeans that is harmless to mammals, but creates a toxin that is lethal to aphids that feed on soybean plants.

In order to be effective, the toxin needs to be taken intact into the body cavity of the aphid, not broken down by the digestive system in the bug.

Miller and Bonning identified a [plant virus](#) coat protein eaten by soybean aphids that doesn't break down and goes into the aphid body cavity intact.

They know the virus coat protein remains intact because the aphids often spread the virus from plant to plant while they are feeding.

Coat proteins make up the outer shell of a virus particle.

The researchers devised a method to use virus coat proteins to their advantage. The researchers have fused their toxin to the virus' protein coat. Since the protein coat is only part of the virus to be used, there is no risk of an infectious virus. Also, the coat protein is from a virus that normally doesn't infect soybeans.

When the hybrid toxin coat protein is eaten by the aphid, the fatal toxin should get into the aphid body cavity intact.

"What we thought was, if this (virus) protein has this ability to be taken up into the aphid (intact), let's take advantage of that specialization and fuse that to other proteins that are toxic," said Miller.

In addition to possibly curbing the aphid problem and the yield loss it

causes, there are other benefits to the farmers and the ecosystems.

"The (potential) economic impact overall is huge," said Bonning. "There will be less insecticide use, and also less fossil fuel used to apply the insecticides."

Also, spraying soybeans with insecticides doesn't just control the aphids, according to Bonning.

"When you spray, you also control beneficial insects," said Bonning.

"Lady beetles are affected, for example, and they are a natural enemy of the aphids. So when the aphids come back to a field after spraying, there won't be any lady beetles to naturally control the aphid populations."

Miller adds that if growers spray for aphids and don't eliminate them all, the aphids simply disperse to other fields, making the problem worse.

"There are many reasons not to spray, but you can't tell the growers to stop spraying until you give them an alternative for [soybean aphid](#) management," said Bonning.

Provided by Iowa State University ([news](#) : [web](#))

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