

PLANTING/TILLAGE/SEED FEATURE

Bioinsecticides, drought, drowning all could attack wheat stem sawfly

By SUE BOESLER

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SIDNEY and CONRAD, Mont. — Wheat stem sawfly research is taking some amazing high tech steps — including finding fungal bioinsecticides.

The sawfly pest has not yet been stopped by extensive work by scientists over the decades, although numerous tools to manage the pest have been discovered, according to Tatyana Rand, USDA Northern Plains Agriculture Research Lab-ARS research entomologist in Sidney, Mont.

"The wheat stem sawfly is actually spreading into new regions — Wyoming, Colorado, Nebraska and Kansas," Rand said.



Gadi V.P. Reddy, superintendent and entomologist of MSU's WTARC in Conrad, Mont., talks about expanding the work on biological controls to deal with pests in several crops.

At the Sidney Agricultural Research Service's (ARS) dryland field days last summer, some of the new high-tech research under way was the topic of the day.

"We want to increase our ability to predict wheat stem sawfly outbreaks so we can provide growers added tools to guide and improve management decisions," Rand said.

Inside tents all over the field, the hard red spring wheat variety Reeder, one of the varieties the wheat stem sawfly is most attracted to, was being subjected to excess precipitation through little tubes on top of the soil surface that delivered water. Rand called it "drip irrigation."

Outside the tents, Reeder was growing in plots and subjected to severe drought.

"We are trying to find out if drought or moisture influences the wheat stem sawfly," Rand said, adding research has shown the wheat stem sawfly does not do well in years of high rainfall or in severe

drought.

As of January 2016, Rand said the ARS scientists are still splitting the stems from the experiment, and don't have results yet. It was the first year of the trials last summer.

Splitting the stems will show them if wheat stem sawfly larvae had "drowned" due to excessive sap or if the larvae was

killed by the severe drought conditions.

At the same time, NPARL scientists are studying what happens to the parasitoid wasp *Bracon cephi*, a natural enemy of the wheat stem sawfly, in particular in drought or excess precipitation.

"The sawfly has one generation a year but the parasitoid wasp has two generations a year," Rand said.

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entomologist at NPARL, talked about some "exciting new possibilities" with *Beauveria*, a fungal pathogen of insects, including the wheat stem sawfly.

"Can we attack the wheat stem sawfly inside the stem with a fungal pathogen?" Jaronski asked. "We may be able to use *Beauveria* as an insecticide."

Jaronski and Gadi V.P. Reddy, superintendent and entomologist of Montana State University's Western Triangle Agricultural Research Center in Conrad, discovered wheat stem larvae with infections caused by *Beauveria* in the lab.

How did *Beauveria* attack the wheat stem sawfly?

Jaronski and Reddy think that it was already growing inside the wheat as an "endophyte" (an organism that lives harmlessly inside the plant) and attacked the sawfly larvae as they grew.

Endophytic *Beauveria* is known to have been a fungal pathogen of many insects both inside and outside of the plant in crops like corn, coffee, sorghum, banana, tomatoes, pine and grapes.

Beauveria could be made endophytic in wheat just as well as these other crops,

Jaronski said.

"We are looking at the *Beauveria* fungus as a 'seed treatment' that would be planted in furrow with the seed," Jaronski said. "This is very exciting — we need to research the possibilities and practicality of this approach."

He added it might also be applied as a spray onto plants after emergence.

Jaronski and Reddy are looking at the most efficient ways to colonize wheat with some of the new fungal strains.

"Last year, we successfully established several of the new strains in wheat," Jaronski said.

Reddy has been expanding the work on biological controls, such as with the insect fungal pathogen, *Beauveria*, to other Montana pest insects such as orange wheat blossom midge, flea beetles, alfalfa weevil, pea leaf weevil and canola insect pests.

In these cases the spores of the fungus would be sprayed like a chemical.

Strains of *Beauveria*, and a related fungus, *Metarhizium*, have already been registered by the Environmental Protection Agency since the fungus does not hurt —

However, the parasitoid's second generation may be reduced during hot years when the wheat matures early and the sawfly cuts the stem before the wasp can complete its second generation, she said. Meanwhile, Stefan Jaronski, research

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and actually protects — the plant.

Reddy said many insect pathogens are commercially available for application in the field to control insect pests. In some cases, application of the pathogen alone provides insufficient control.

"Entomopathogens like *Beauveria* can be applied in conjunction with other control methods," Reddy said, adding that research shows promising results when they are used as part of an integrated pest management (IPM) plan.

"Interestingly, many growers are interested in knowing about the benefits and the use of biologicals," he said.

He explained the biological fungus can recycle, so it may not be necessary to apply every year.

"For example, another biocontrol fungus *Beauveria brongniartii* isolates were recovered 14 years after their application in Switzerland," he said. "This is one of the areas we would like to conduct research in Montana."

Reddy and Jaronski are unsure if *Beauveria* could be hurt by fungicide applications. However, Jaronski said some fungicides do not affect *Beauveria*.

"*Beauveria* could be like a probiotic for the plants to increase the plant's health.



Tatyana Rand, left, and Stefan Jaronski, both research entomologists at USDA-ARS NPARL in Sidney, Mont., discuss new high-tech wheat stem sawfly research.

Endophytes have an effect on the overall health of the plant," Jaronski said.

The scientists believe there is a possibility that wheat stem sawfly populations could be reduced by the use of the fungal pathogen, *Beauveria*. Only time and additional research will tell.

"There is a lot going on with biological controls of the wheat stem sawfly," Jaronski said. ★