Pest-fighting fungi granted patent for biocontrol

Dr. Gadi V.P. Reddy with USDA Agricultural Research Service (formerly at Montana State University Western Triangle Ag Research Center, Montana, U.S.) recently received a patent for a number of unique fungi (Beauveria pseudobassiana, B. amorpha, B. bassiana, Metarhizium pemphigi, M. anisopliae) that, when applied to wheat crops as a biocontrol, are effective at reducing damage by wheat stem sawfly and Hessian fly, two prominent wheat pests. New Ag International's Editor Janet Kanters decided to find out more with a rapid-fire Q&A with Dr. Reddy.

Why do wheat stem sawfly and Hessian fly pose a particularly challenging threat to wheat crops?
Wheat stem sawfly has been one of the topmost pests of wheat around the world. This pest is an internal borer so difficult to monitor and control. One of the main approaches of the management of wheat stem sawfly is planting of resistant solid-stemmed wheat varieties and some cultural practices. However, resistant wheat varieties have been not widely adopted by wheat growers and reported to cause lower yield and protein levels. Cultural practices such as tillage partially reduces populations. Synthetic chemical insecticide-Thimet 20-G (an organophosphate insecticide) has recently been registered in Montana against wheat stem sawfly.
but this chemical poses many health and environmental risks. Being a stem borer, other insecticides cannot kill the larvae of this pest. There are two parasitoids, *Bracon cephi* and *Bracon lissogaster* available for the wheat stem sawfly but they are effective only when the sawfly population is low. So, to date there is no effective control method for wheat stem sawfly. On the other hand, Hessian fly is not a serious pest at this moment, but this situation may change at any time in the future.

**When did your research begin and why?**
My research began in 2012 when Montana State University started an entomology and ecology unit at the research center in Conrad. There has been severe insect pest incidence in the Golden Triangle area of Montana. Therefore, growers and stakeholders wanted the research on these insect pests and their management in that region. Based on the request from the community, Montana State University started the entomology/ecology unit at Western Triangle Agricultural Research Center in Conrad in June 2012. I was appointed as associate professor of entomology/ecology and superintendent of that center. In 2017, I became full professor and head of the entomology/ecology unit at the research center.

**Prior to this new, patented fungi, what methods were used to battle wheat stem sawfly and Hessian fly? Were these methods effective? Why or why not?**
None of the available control methods are reliable and effective in managing the wheat stem sawfly. This is because all stages of the insect occur inside the plant stem and emerged adult are short-lived, but emergence occurs for a long period of time. The most damaging stage of this insect is larvae and contact insecticides are not effective because the larvae and pupae are protected inside the plant stem.

**Where does the patented fungi go from here? i.e. licensing through ag companies?**
Currently, Montana BioAgriculture Inc., from Missoula, Montana, is doing some initial work before it can be licensed and commercially available to growers. Once this fungus is available to farmers, they can apply this to manage the wheat stem sawfly not only in Montana but also at other places. This way farmers can save spending millions of dollars on insecticides and also save the environment.