



Tebuconazole Resistant Isolate of *Fusarium graminearum* in New York

Further information and insights on an article in the May 2014 issue of Plant Disease:
Spolti, P., Del Ponte, E.M., Dong, Y., Cummings, J.A., and Bergstrom, G.C. 2014.
Triazole sensitivity in a contemporary population of *Fusarium graminearum* from New
York wheat and competitiveness of a tebuconazole-resistant isolate. Plant Dis. 98:607-
613.

Questions & Answers

Q1. What is the finding that has generated interest and concern?

In a laboratory study of 50 field isolates of the wheat head blight fungus, *Fusarium graminearum*, from commercial wheat fields in New York State, one of these isolates was found to be highly resistant to the fungicide tebuconazole. The other 49 isolates were sensitive to tebuconazole and all 50 isolates were sensitive to the fungicide metconazole.

Q2. Is tebuconazole less effective in head blight suppression against the resistant isolate?

Yes. In a growth chamber study, tebuconazole provided much less control of head blight caused by the tebuconazole-resistant isolate as compared to a tebuconazole-sensitive isolate.

Q3. Is the tebuconazole-resistant isolate less competitive in the absence of tebuconazole application?

No. In the absence of tebuconazole application, the tebuconazole-resistant isolate produced the same severity of head blight as inoculation with a sensitive isolate or a 50:50 mixture of the resistant and sensitive isolates.

Q4. Is the tebuconazole-resistant isolate sensitive to other triazole fungicides labeled for head blight control?

Yes. The fungicide metconazole (in Caramba®, Headline AMP®, and Twinline®) controlled head blight caused by the tebuconazole-resistant isolate. Dr. Kiersten Wise and graduate student Anna Noveroske at Purdue University are also testing the tebuconazole-resistant isolate and they report (personal communication): "Preliminary laboratory experiments using technical grade prothioconazole do not indicate that the New York isolate is resistant to prothioconazole." Prothioconazole is the sole active ingredient in Proline® and is combined with tebuconazole in Prosaro®.

Q5. Is the finding of a fungicide-resistant isolate surprising?

No, it isn't. It is not uncommon to find low frequencies of fungicide resistance in native fungal populations even before any exposure to a particular fungicide. The investigators just happened to find a highly resistant isolate in a fairly small sample and they suggested that more isolates with resistance to this or other fungicides are likely to be found as larger surveys are conducted. Natural variation in fungicide sensitivity should be expected in this fungus that is known for its high degree of genetic variability.

Q6. Has a *Fusarium* head blight fungicidal control failure been observed in the field?

No. There has been no report of failed control of *Fusarium* head blight due to resistance to tebuconazole or other triazole fungicides in North or South America. Control can be reduced by many factors, including timing of application and weather conditions, so a partial reduction in control due to fungicide resistance build-up would be difficult to discern.

Q7. Where does *Fusarium graminearum* exist in agricultural and natural landscapes and can isolates spread?

Fusarium graminearum is a ubiquitous fungus in many parts of North America. It is the principle cause of corn stalk rot and ear rot in northern U.S. states and Canada and of wheat and barley head blight throughout the U.S. It infects nearly all species of cereals and grasses and a number of other plants that are cultivated or present in natural landscapes. It survives between growing seasons in soil and in plant debris, and it produces huge numbers of spores on overwintered residues of corn and other cereals. Some of these spores become airborne and can be carried considerable distances by air currents to infect plants in distant locations. Spores that infect local wheat, barley or corn crops can come from within the field and from sources outside of the field. If fungicide-resistant isolates increase in proportion due to continual fungicide use in one field, they can be blown to other fields. Conversely, spores of fungicide-sensitive isolates will also be blown into a field and thereby dilute the fraction of resistant isolates in that field.

Q8. Should control strategies for *Fusarium* head blight change because of the finding of tebuconazole resistance?

Integrated management of *Fusarium* head blight utilizing moderately resistant wheat and barley varieties and judicious application of effective triazole fungicides at the onset of crop flowering when there is risk of infection will continue to be a successful strategy.

Multiple applications of the same fungicide active ingredient at different crop stages and over wide geographic areas, however, are a significant risk factor for selection of resistance in fungal populations that should be reduced. This is especially true if early growth stage applications of fungicides are made that hit crop residues that harbor large populations of the pathogen and represent an important source of spores for infections at flowering. Generic tebuconazole products are now in wide use as preventative sprays for foliar diseases at spring herbicide timing. Applying different fungicide active ingredients in alternation or combination should help delay selection for resistance based on research with other plant pathogens.

Q9. What should occur as a consequence of the findings in New York?

All involved in North American cereal production should realize that decreased effectiveness of important head blight control fungicides could occur if these materials are not managed carefully to reduce selection pressure on *Fusarium* populations. It is hoped that the New York findings will spur more routine screening of populations of *Fusarium graminearum* and other important cereal crop pathogens for sensitivity to important fungicides in order to detect fungicide resistance early and put in place resistance management strategies that prevent disease control failures in the future.

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This Q&A document can be found at:

<http://fieldcrops.org/SmallGrains/Pages/Managingdisease.aspx>