

DISEASES OF WHEAT

Revised Fungicide Spray Recommendations for Fusarium Head Blight

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Fusarium head blight (FHB), caused by the fungus *Fusarium graminearum*, is currently the most economically important disease affecting wheat in the United States. As it colonizes wheat heads, it reduces grain yield and quality by turning healthy kernels into lightweight, “tombstone” grains (Figure 1). Moreover, the FHB fungus produces the mycotoxin deoxynivalenol (DON), also known as vomitoxin. This toxin can harm humans or animals that consume it. For specific information about the disease and its management, see *Diseases of Wheat: Fusarium Head Blight of Wheat* (Purdue Extension publication BP-33-W), available from the Education Store, www.edustore.purdue.edu.

Current FHB management recommendations advise farmers to plant moderately resistant wheat varieties, avoid planting wheat after corn, till infested stubble into the soil, and apply a demethylase inhibitor (DMI) fungicide. The same recommendations advise that the best time to apply fungicide is at early flowering (Feekes growth stage 10.5.1), because the fungus enters through the opening created by the anthers. More information about wheat fungicides is available in *Diseases of Wheat: Fungicide Efficacy for Control of Wheat Diseases* (BP-162-W).

However, timing a fungicide spray at precisely Feekes 10.5.1 can be difficult because tillers flower unevenly across a field. Additionally, heavy spring rains can keep spray equipment out of a field, causing applicators to miss the optimal application window.

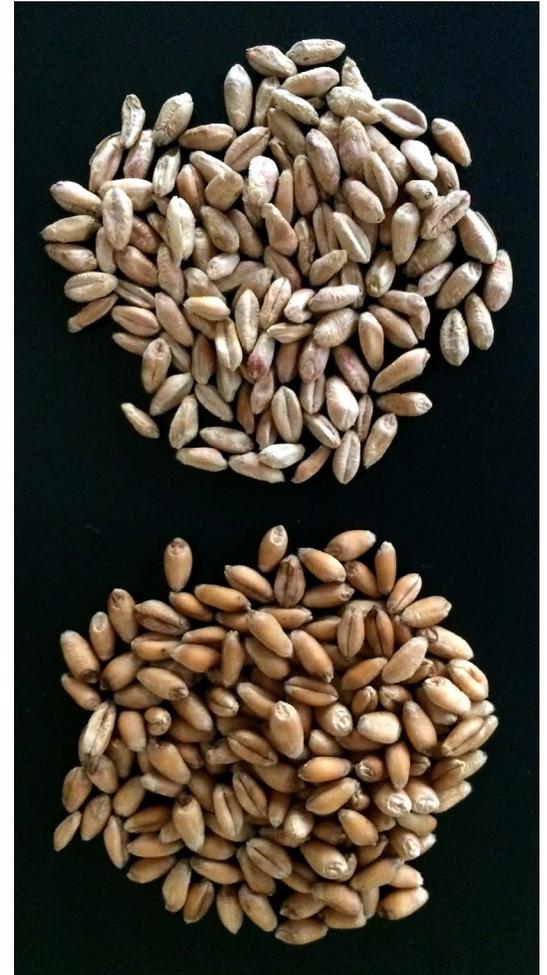


Figure 1. “Tombstone” wheat kernels damaged by Fusarium head blight (top) compared to healthy wheat kernels.

Because of these difficulties, Purdue University researchers set out to:

1. Determine if post-anthesis fungicide applications are able to reduce FHB and DON.
2. Examine how long after early anthesis wheat is susceptible to *F. graminearum*.

When Is a Field at Anthesis?

The Feekes scale describes wheat growth stages from seedling emergence (stage 1) through ripening (stage 11).

Feekes growth stage 10.5.1 refers to anthesis, the time when half of the flowers on an individual wheat head are visible (Figure 2). An entire field is considered to be at anthesis when half of the wheat heads across the field have entered Feekes 10.5.1.

Many factors can affect the rate of head development and flowering, including nutrient levels across a field, sunlight patterns, and planting density. Shorter tillers are easy to overlook when trying to determine wheat growth stages.

To accurately assess the growth stage for an entire field, it is important to evaluate the wheat from multiple locations and at multiple heights throughout the field. For details, see *Managing Wheat by Growth Stage* (Purdue Extension publication ID-422-W), available from the Education Store, www.edustore.purdue.edu.



Figure 2. A wheat head undergoing anthesis.

Research Results

Recent research suggests that Prosaro® (Bayer CropScience) applications made up to 11 days after anthesis are able to reduce DON and FHB, and increase yield (with results that are similar to applications made at Feekes 10.5.1) when inoculum is present (Figures 4 and 5). However, even when Prosaro® was applied, DON levels in the study never fell below 2.0 parts per million (ppm), the level at which grain quality dockages may begin to accrue depending on final use of the grain.

The research demonstrated that wheat can be susceptible to FHB infection for nearly two weeks after Feekes 10.5.1. We have long known that weather is the main factor in determining when inoculum will be present in a given field. *Fusarium graminearum* spores form on previously infected crop stubble during periods of high humidity when temperatures are between 68°F and 77°F (20-25°C).

Our research suggests that if weather conditions do not favor infection at early anthesis, then it may be justified to delay spraying until the time spores become available to infect wheat heads. Such a delay appears to have similar positive effects on yield and DON levels as an earlier spray.



Figure 3. Wheat heads infected with Fusarium head blight.

Monitor the weather to determine when and if a spray may be justified. The Fusarium Head Blight Prediction Center website is a forecasting system that helps assess the risk of *F. graminearum* infection: www.wheatscab.psu.edu. However, do not base your decision to spray on the forecasting system alone.

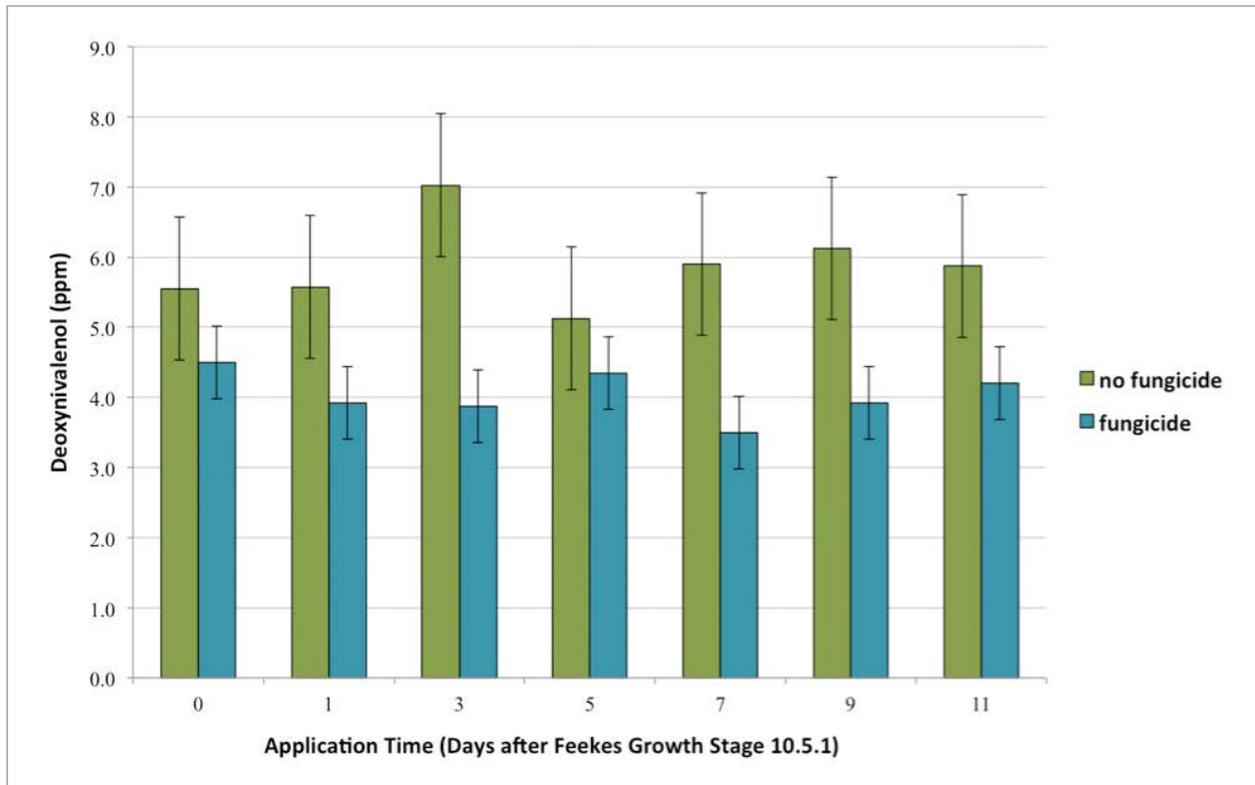


Figure 4. This graph shows the effects of Prosaro® on deoxynivalenol in 2013. All plots were inoculated with *F. graminearum* on the day indicated by the application time.

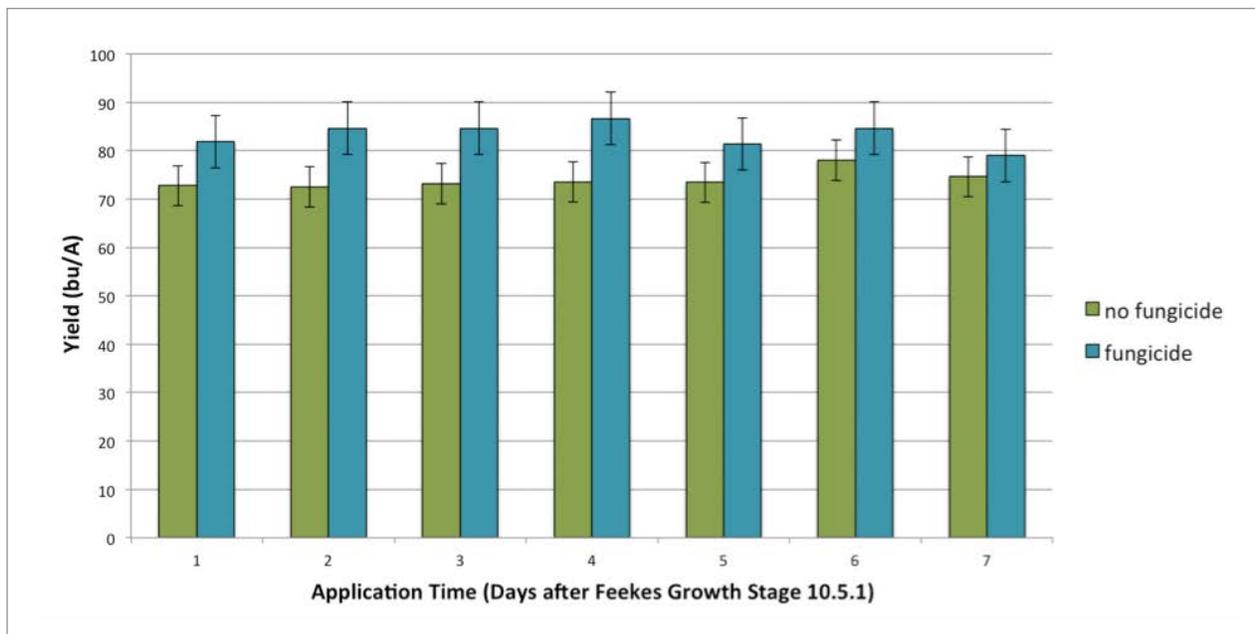


Figure 5. This graph shows the effect of Prosaro® on wheat yield in 2013. All plots were inoculated with *F. graminearum* on the day indicated by the application time.

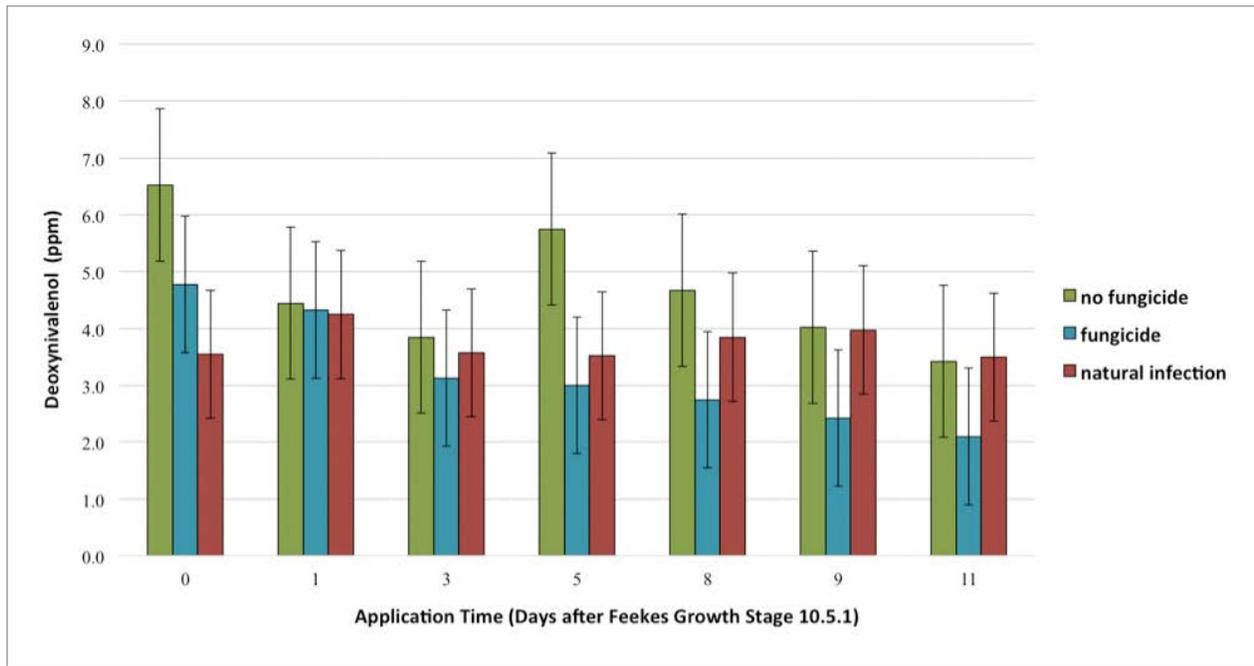


Figure 6. This graph shows the effect of Prosaro® on deoxynivalenol in 2014. All plots except the natural infection treatment were inoculated with *F. graminearum* on the day indicated by the application time.

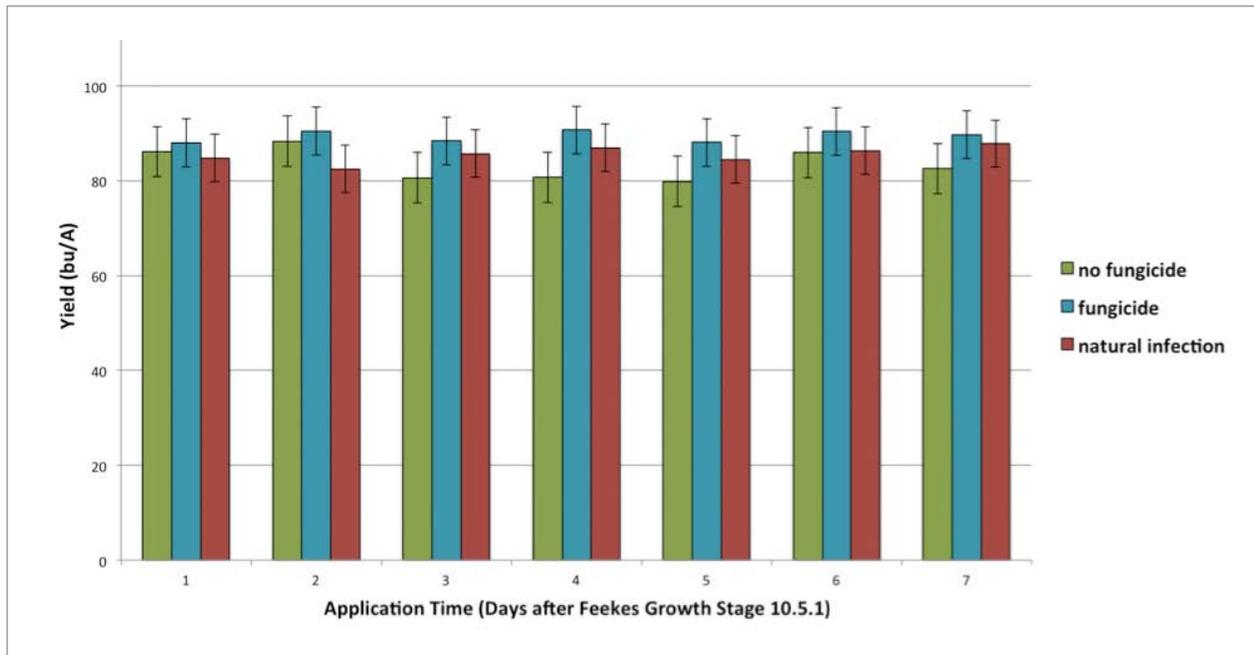


Figure 7. This graph shows the effect of Prosaro® on wheat yield in 2014. All plots except the natural infection treatment were inoculated with *F. graminearum* on the day indicated by the application time.

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It is important for farmers to continue to use a combination of management techniques, even if they decide to apply a fungicide. Management techniques include planting moderately resistant varieties, not planting wheat after corn, and tilling infected stubble into the soil when possible. Farmers who do decide to apply fungicide should continue to try to spray their wheat at Feekes 10.5.1. However, if weather or another emergency prevents application, farmers may still see benefits post anthesis. As with all fungicides, be aware of the pre-harvest interval and follow all manufacturer instructions.

Find Out More

Complete details about the research and more detailed findings are available in:

Freije, A. N. and Wise, K.A. 2015. Impact of Fusarium graminearum inoculum availability and fungicide application timing on Fusarium head blight in wheat. *Crop Protection*. 77: 139-147.

More information about Fusarium head blight is available in *Diseases of Wheat: Fusarium Head Blight (Head Scab)* (Purdue Extension publication BP-33-W). This and other publications in the *Diseases of Wheat series* are available from the Purdue Extension Education Store: www.edustore.purdue.edu.

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