Efficacy of Two-treatment Fungicide Programs for FHB Management: A Multi-state Coordinated Project

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OBJECTIVE

Evaluate the integrated effects of two-treatment fungicide programs and genetic resistance on FHB and DON in all major grain classes.

INTRODUCTION

For years the recommended fungicide program for FHB and DON management has been a single well-timed application at anthesis. However, recent studies have shown that a "late" application made up to 6 days after anthesis may be just as effective as an anthesis application for FHB and DON management (Bradley et al. 2009; D'Angelo et al. 2014). This has led to questions being asked about the value of combining an anthesis and a late application. We hypothesized that at moderate to high levels of FHB, a "late" or "post-anthesis" application of a fungicide following an anthesis application, coupled with genetic resistance will be more effective at reducing FHB and DON than an anthesis application alone, resistance alone, or even resistance + an anthesis-only application. We further hypothesize that the benefit of such a program in terms of disease and toxin reduction and yield and test weight increase will be high enough to offset application cost, particularly if Folicur or some other inexpensive generic tebuconazole is used as part of the program. These hypotheses will be tested in all major grain market classes, under a range of weather conditions and baseline levels of FHB and DON.

MATERIALS AND METHODS

Field experiments were established in 15 US wheat-growing states in 2016 and 2017 to evaluate the effects of cultivar resistance and two-treatment fungicide programs on FHB and DON. Plots were established according to standard agronomic practices for each location. At least three commercial wheat cultivars, classified as susceptible (S), moderately susceptible (MS), or moderately resistant (MR), were planted in most trials. However, some trials only included two of these resistance categories. Plots were planted in four to six replicate blocks. The standard experimental design was a randomized complete block, with a split-plot arrangement of cultivar as whole-plot and fungicide treatment (Table 1) as sub-plot. All plots were artificially inoculated with either *F. graminearum*-colonized corn kernels spread on the soil surface or spray-inoculated with a spore suspension of the fungus approximately 24-36 hours following the anthesis fungicide treatment. FHB index (plot severity) was assessed during the soft dough stage of grain development. Milled grain samples were sent to a USWBSI-supported laboratory for toxin

analysis. For the purpose of this report, percent control of FHB index and DON was estimated for each cultivar x fungicide program combination relative to the untreated susceptible check (the reference treatment) for each trial/environment.

RESULTS AND DISCUSSION

FHB index and DON results from 36 environments, representing 20 soft red winter, four soft white winter, seven hard red winter, two hard red spring, two hard white spring, two soft white spring wheat classes and three durum are summarized below. Estimated means and percent controls for FHB index and DON for S, MS and MR cultivars treated with a fungicide at anthesis alone or at anthesis followed by a post anthesis application are shown in Table 2 and 3 and Figure 1. In some environments, DON data were not available at the time of this report. Mean FHB index and DON in the untreated susceptible check ranged from 0 to 63% and 0 to 38 ppm, respectively. Relative to the untreated susceptible or moderately susceptible reference, fungicide treatment applied to MR cultivars resulted in higher mean percent control of FHB index (87%) followed by MS-Treated (73%) and S-Treated (68%). Similarly, mean percent control of DON was 75% for MR-Treated, 73% for MS-Treated and 60% for S-Treated cultivars. Overall, percent controls of both FHB index and DON were highest for fungicide programs that combined an anthesis and a late application (Fig 1) than programs with an anthesis application alone or MS or MR alone. Moderately resistant cultivars alone offered higher mean percent control of both FHB index and DON (75 and 67%, respectively) than MS cultivars alone (65 to 56%, respectively) (Fig 1). Based on these results, there is evidence suggesting that the combination of a "late" or "post-anthesis" and an anthesis fungicide application, coupled with MS or MR cultivars can be more effective at reducing FHB and DON than an anthesis application alone. A more comprehensive analysis of the data as well as a cost-benefit assessment of all FHB management programs evaluated in this study will be conducted.

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