EFFECT OF TIMING OF FOLIAR FUNGICIDE APPLICATIONS ON FUSARIUM HEAD BLIGHT AND DON

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OBJECTIVE:
To compare fungicide treatments applied at mid-head emergence and early flowering for effectiveness in managing Fusarium Head Blight (FHB) and deoxynivalenol (DON) accumulation in harvested grain.

INTRODUCTION:
FHB is periodically a very serious problem in Kentucky. The disease can substantially reduce yields and negatively impact seed quality. In addition, DON, a mycotoxin frequently associated with FHB, can contaminate grain and result in reduced price at sale or even rejection, depending on the level of DON.

Fungicides are commonly deployed in Kentucky to manage a variety of foliar and head diseases. However, fungicide applications targeted at managing FHB and DON in production fields have not been deployed until recently. In 2004, EPA granted Kentucky the use of Folicur (tebuconazole) for managing FHB and DON; approximately 17,000 acres were treated. In addition, other products, such as Headline (pyraclostrobin), were used by some producers in an attempt to manage FHB/DON. All available data indicate that modern fungicides, such as Folicur, suppress, but do not control FHB and DON.

Worldwide, data indicate that DON values are often numerically higher (not always significantly different) than non-treated wheat where strobilurin fungicides, such as azoxystrobin (Quadris) or pyraclostrobin, are applied at early flowering for FHB control. It is unknown if treatments applied earlier in crop development for control of foliar and other head diseases may also impact DON. Historical data and experience from Kentucky indicate that, on average, fungicide applications made at early to mid-head emergence (i.e., Feekes 10.1-10.3) are typically the most useful (and economical) treatments for managing most foliar diseases and glume blotch. It is important to know if applying a stobilurin at early head emergence may increase DON levels compared to non-treated wheat.

MATERIALS AND METHODS:
The study was conducted at the UK Research and Education Center in Caldwell County, Kentucky. The soft red winter wheat variety Sisson was planted in 7-in rows on October 8, 2003. Wheat was planted no-till into corn stubble; plots were 6-rows wide and 15-ft long. Plots were separated by a 3-ft alley. The seeding rate and nitrogen fertility were aimed at producing high-yielding wheat. Split nitrogen applications (ammonium nitrate, 34-0-0) were made on 17 Feb 2004 (47 lbs N) and 23 Mar 2004 (51 lbs N) for a total of 98 lbs actual N/A. No herbicides or insecticides were applied.

Thirteen foliar fungicide treatments and a non-treated check, were established following a randomized complete-block design with five replications. Most fungicide treatments were applied at either mid-head emergence (Feeke's 10.3; 21 Apr) or early flowering (Feeke's 10.51; 27 Apr). A few treatments were applied only at Feeke's 10.51. The latter application stage is the recommended application timing to achieve FHB and DON suppression. Fungicide treatments

were applied in 20 gallons of water/A at 40 psi. Treatments were applied using a hand-held, CO^2-powered backpack sprayer; the spray boom was equipped with forward and rear facing XR TeeJet 8001 flat-fan nozzles. The plots were sprayed late afternoon and the conditions at the time of application were calm and 65°F. There were no symptoms of any disease at the time the treatments were applied. At the mid-dough stage (23 May), 100 heads were arbitrarily collected from each plot and visually rated for percent surface area showing FHB symptoms. These ratings were the basis of % incidence, % severity, and % index (incidence x severity/100) estimates. Entire plots were harvested with a Hege small plot combine on 11 Jun. Yields were calculated based on 13.5% moisture and 60 lbs/bu test weight. Percentage visually scabby kernels (VSK) were determined by examining 200 seed per plot twice (average used) for kernel health (i.e., healthy and plump vs. diseased and shriveled). DON levels (parts per million) associated with plots were determined by the DON Testing Laboratory at Michigan State University, based on 200-g samples from each plot.

RESULTS AND DISCUSSION:

Overall, FHB pressure was light to moderate. DON accumulation in harvested grain was evident, but light. Late-season appearance of barley yellow dwarf was uniform throughout the test, and uniformly reduced yields an estimated 10%.

Tilt, Folicur, and Stratego applied at Feeke's 10.3 significantly reduced FHB index compared to the check (Table 1). Folicur was the only product to significantly reduce FHB index at both application dates. JAU 6476 + Folicur at the two rates, plus JAU 6476 applied alone at Feeke's 10.51 also significantly reduced FHB index compared to the control. These treatments were not evaluated at the Feeke's 10.3 timing. Neither Quilt nor Headline significantly reduced FHB index at either application date. No treatment significantly reduced % VSK. Both rates of JAU 6476 + Folicur applied at Feeke's 10.51 were the only treatments to significantly reduce DON accumulation compared to the check. Headline applied at 10.51, but not at 10.3, significantly increased DON compared to the check. The only treatment to significantly increase yield was JAU 6476 (2.85 fl oz/A) + Folicur (3.2 fl oz/A) applied at Feeke's 10.51. No fungicide treatment significantly increased test weight.

Overall, fungicide treatments controlled FHB/DON by about as much as expected, based on previous tests and experience. No treatment provided better than average control, and only suppression was achieved. Differences among fungicide active ingredients and timings suggest that these are important considerations in making fungicide use decisions for FHB/DON suppression. In is interesting, and unexpected, that the 10.3 treatment performed better than the 10.51 treatment for Tilt and Stratego. The fact that no treatment involving a strobilurin (Headline, Stratego, Quilt) applied at Feeke's 10.3 increased DON is encouraging, and may indicate that these fungicides may not increase the risk of increasing DON when applied pre-flowering. However, additional data are needed before a definitive statement can be made.

CONCLUSION:

Overall, fungicide treatments suppressed FHB by about as much as expected, based on previous tests and experience. No treatment provided better than average FHB/DON control. Differences among fungicide active ingredients and timings suggest that these are important considerations in making fungicide use decisions for FHB/DON suppression.

TABLE 1. 2004 FUNGICIDE TIMING STUDY PRINCETON, KY.

Fungicide, Rate/A, and Stage Applied		Fusarium Head Blight**						
		% Inc.	% Sev.	% Index	% VSK	DON (ppm)	Yield (bu/A)	Test Wt (lbs/bu)
Non-treated	-	18.2	19.3	3.3	24.6	0.8	62.8	53.7
Tilt 4 fl oz	10.3	9.9*	15.1	1.4*	21.8	0.8	65.0	54.3
Tilt 4 fl oz	10.51	11.2	17.1	1.8	21.4	0.8	63.1	54.4
Folicur 4 fl oz	10.3	11.0*	14.6	1.7*	21.7	0.7	65.2	54.2
Folicur 4 fl oz	10.51	12.1	11.2	1.4*	23.6	0.6	64.3	54.4
Stratego 10 fl oz	10.3	9.6*	12.1	1.1*	22.2	0.7	69.2	54.7
Stratego 10 fl oz	10.51	14.9	12	1.8	24.6	1.1	61.4	54.1
Quilt 14 fl oz	10.3	13.6	14.6	2.1	21.2	1.0	69.6	54.1
Quilt 14 fl oz	10.51	16.9	14.2	2.4	23.8	1.2	70.6	53.2
Headline 6 fl oz	10.3	14.3	14.5	2.1	21.4	0.9	62.8	54.5
Headline 6 fl oz	10.51	17.9	12.5	2.2	24.6	1.4*	61.3	54.4
Jau 6476 2.85 fl oz+								
Folicur 3.2 fl oz	10.51	8.1*	19.3	1.4*	20.4	0.4*	71.8*	54.7
Jau 6476 3.6 fl oz+								
Folicur 4	10.51	9.0*	17.2	1.5*	23.2	0.4*	64.5	54.1
Jau 6476 5.12	10.51	7.0*	19.5	1.3*	23.9	0.6	64.6	54.9

* Significantly different from control, Student-Newman-Keuls, *P*=0.05.

**Inc = incidence; Sev = severity; Index is Inc x Sev/100; VSK = visually scabby kernels; DON is deoxynivalenol