

## **Durum Uniform Fungicide Study, Langdon 2011**

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### **Objectives**

The study objectives were to determine if fungicides in the strobilurin fungicide class increase deoxynivalenol concentration in the seed compared to an untreated and if a triazole fungicide applied after a strobilurin fungicide could negate or reduce the effect of the strobilurin on DON accumulation.

### **Materials and Methods**

A field experiment was planted on 4 May at the North Dakota State University Langdon Research Extension Center located at Langdon in NE North Dakota. The trial was conducted using best management practices for hard red spring wheat including seeding date and rate, fertility, weed control and harvest management. The experiment was a randomized complete block design with four replications. The previous crop was small grains. The soil type was Svea-Barnes loam. Divide durum wheat cultivar was seeded at a rate of 1.5 million pure live seeds /acre. Plots seven rows wide by 20 ft. long, 6-in row spacing were planted with an Almaco plot planter equipped with double disk openers and press wheels. A border plot was planted between treated plots to minimize interference from spray drift. *Fusarium* inoculums consisting of several isolates were hand-broadcast at a rate of 150 grams /plot three and two weeks prior to flowering to encourage development of *Fusarium* head blight disease (FHB). After herbicide application was completed an overhead irrigation system was installed to provide supplemental water to wet the inoculum and the grain heads to encourage the development of FHB. Fungicide treatments, rates and application timings are listed in Table 1. The primary active ingredients for the treatments were Cogito-blend of propiconazole and tebuconazole, Caramba-metconazole, Prosaro-blend of tebuconazole and prothioconazole, Headline-pyraclostrobin, Quadris-azoxystrobin, Evito-fluoxastrobin, Stratego YLD-blend of trifloxystrobin and prothioconazole, Quilt-blend of propiconazole and azoxystrobin, Twinline-blend of pyraclostrobin and metconazole. The fungicides were applied with a CO<sub>2</sub>-pressurized backpack sprayer operated at 40 psi and delivering 18.4 GPA. The sprayer was equipped with a three-nozzle boom, nozzles spaced 20 inches on center. The foliar treatments were made using Spraying Systems XR8002 nozzles oriented vertically. The flowering treatments were made using Spraying Systems XR8001 nozzles mounted on a double swivel and oriented to spray forward and backward 30 degrees downward from horizontal. The fungicide applications were made at Feekes growth stage 9. 10.5 or 10.51 on 27 June (wind NW speed 3 MPH, temperature 55° F at 10:15 a.m.), 8 July (wind SE speed 3 MPH, temperature 70° F at 8:00 a.m.) or 11 July (wind West speed 3 MPH, temperature 66° F at 10:30 a.m.) by maturity. *Fusarium* head blight (FHB) incidence (I), head severity (HS) and index (FS) were determined from a twenty grain head sample collected at Feekes 11.2 growth stage. Leaf severity was determined from a sample of five leaves at the same growth stage. Plots were harvested 22 Aug with a small plot combine and the yield and test weight determined. Deoxynivalenol accumulation (DON) was determined by the NDSU

Toxicology Lab. Data were analyzed with the general linear model (GLM) in SAS. Least significant (LSD) were used to compare means at the  $P \leq 0.05$  level.

## Results

Strobilurin fungicides are recommended by extension pathologists for control of foliar diseases in small grains. Some researchers have reported elevated DON levels when strobilurin fungicides have been applied for foliar disease control. Divide durum is one of the most resistant durum cultivars to FHB. Durum as a class is possibly the most susceptible wheat to FHB. Fungicide treatments that included a triazole fungicide increased yield compared to the untreated with the exception of Stratego YLD, Table 1. Treatments that were applied at Feekes' growth stage (GS) 10.51 increased test weight and 1000 seed weight. In addition, Headline applied at GS 10.5 increased seed weight. Fusarium head blight incidence was reduced by treatments applied at GS 10.51. The sequential treatment (Headline followed by Prosaro) was more effective than all other treatments in reducing FHB incidence. Fusarium head blight index and head severity were both reduced by the treatments applied at GS 10.51. No differences in leaf diseases were determined. Leaf disease severity was low. Only the Cogito treatment reduced the Fusarium damaged kernels (FDK) in the grain sample. However, there appeared to be a trend toward elevated FDK and DON levels compared to the untreated by many of the strobilurin treatments. Four treatments, Cogito, Caramba, Prosaro and Headline followed by Prosaro were very effective in reducing DON compared to the untreated and all other treatments.

Table 1. Yield, test weight and 1000 seed weight by treatment, fungicide rate and timing on Divide durum, Langdon 2011.

Treatment <sup>a</sup>	Fungicide Rate	Application Timing	Yield Bu./acre	Test Weight Lb./bu.	1000 Seed Weight g
	Fl. oz. /acre + %v/v	Feekes GS			
Untreated	Na	Na	37.1	56.8	35.3
Cogito	7	10.5.1	53.6	59.6	39.9
Caramba	14 + 0.125	10.5.1	62.7	60.1	39.8
Prosaro	6.5 + 0.125	10.5.1	57.5	60.1	40.7
Headline	6 + 0.125	9	38.2	56.0	34.9
Headline and Prosaro	6 + 0.125 and 6.5 + 0.125	9 and 10.5.1	64.2	59.9	39.5
Headline	6 + 0.125	10.5	52.2	57.8	37.3
Quadris	6.2 + 0.125	10.5	39.9	56.8	34.5
Evito	4 + 0.125	10.5	38.2	55.9	34.5
Stratego YLD	4 + 0.125	10.5	39.9	56.7	35.7
Quilt	10.5 + 0.125	10.5	42.6	57.1	33.9
TwinLine	9 + 0.125	10.5	48.3	57.8	37.1
LSD <sub>(0.05)</sub>			9.2	1.1	2.0
Pr>F			<0.0001	<0.0001	<0.0001
% C.V.			13.3	1.3	3.7

<sup>a</sup> Induce adjuvant added to all fungicides except Cogito. GS = growth stage.

Table 2. Fusarium head blight disease incidence, index and head severity, leaf disease, Fusarium damaged kernels and deoxynivalenol accumulation by treatment, fungicide rate and timing on Divide durum, Langdon, 2011

Treatment <sup>a</sup>	Fungicide Rate Fl. oz. /acre + %v/v	Application Timing Feekes GS	FHB			Leaf		
			Incidence %	Index %	Severity %	Disease %	FDK %	DON PPM
Untreated	Na	Na	98.8	40.7	42.6	42.4	7.0	12.9
Cogito	7	10.5.1	86.3	16.6	22.1	34.3	1.8	4.4
Caramba	14 + 0.125	10.5.1	82.5	10.8	15.3	39.6	2.6	2.1
Prosaro	6.5 + 0.125	10.5.1	81.3	11.9	17.0	42.5	2.8	1.8
Headline	6 + 0.125	9	96.3	51.4	54.2	38.3	7.7	14.8
Headline and Prosaro	6 + 0.125 and 6.5 + 0.125	9 and 10.5.1	65.0	5.7	12.2	30.6	3.0	2.7
Headline	6 + 0.125	10.5	91.3	24.9	29.9	30.7	6.8	11.8
Quadris	6.2 + 0.125	10.5	97.5	38.4	40.0	32.1	10.9	15.1
Evito	4 + 0.125	10.5	96.3	48.3	49.6	34.9	11.6	13.2
Stratego YLD	4 + 0.125	10.5	95.0	31.5	34.9	54.8	9.7	12.0
Quilt	10.5 + 0.125	10.5	96.3	42.9	45.0	39.4	10.1	12.4
TwinLine	9 + 0.125	10.5	92.5	25.7	29.4	37.7	8.9	11.8
LSD <sub>(0.05)</sub>			10.5	18.7	18.6	NS	4.7	3.4
Pr>F			<0.0001	<0.0001	0.0003	0.3689	0.0003	<0.0001
% C.V.			8.1	44.7	39.5	33.0	47.6	24.6

<sup>a</sup> Induce adjuvant added to all fungicides except Cogito. GS = growth stage. FDK = Fusarium damaged kernels. DON = deoxynivalenol accumulation in the seed.