

USWBSI Supported Uniform Fungicide Trials – 2014 Final Report

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Introduction

Fungicides are an important tool for the management of Fusarium head blight (FHB) and deoxynivalenol (DON). As a continued collaborative effort among plant pathologist in the United States, USWBSI funded uniform fungicide efficacy trials (UFT) are conducted each year to update information on fungicide recommendations. Previous research has demonstrated only triazole class fungicides are effective in managing FHB and DON. However, efficacy differences exist among the labeled triazole chemistries. Also, generic formulations of a commonly used active ingredient (tebuconazole) are now marketed and have raised questions on fungicide efficacy. Therefore, the objectives of the 2014 UFT were to evaluate several generic formulations of tebuconazole and compare them to the fungicides Prosaro (prothioconazole+tebuconazole) and Caramba (metaconazole) for the management of FHB and DON.

Materials and Methods

Nineteen UFTs were established in six states (Arkansas, Illinois, Minnesota, New York, North Dakota and South Dakota) on five small grain market classes (Spring Barley, Spring Durum, Hard Red Spring Wheat, Hard Red Winter Wheat and Soft Red Winter Wheat). Specifically, five soft red winter wheat trials were conducted across Arkansas (1 location), Illinois (3 locations) and New York (1 location); ten hard red spring wheat trials across Minnesota (1 location – data not presented), North Dakota (3 locations) and South Dakota (3 locations, 6 trials); two hard red winter wheat trials in South Dakota; two spring barley trials in North Dakota; and one spring durum trial in North Dakota. Each location had added inoculum in the form of *F. graminearum* infested corn spawn, infected residue harboring *F. graminearum* or a conidial (spore) suspension applied at flowering for wheat and at heading for barley. Several sites used mist irrigation to promote disease development. Appropriate fungicide application methodology was followed at each location. Assessments of FHB severity, FHB incidence, FHB index, DON, test weight and yield were made at all locations and Fusarium damaged kernels (FDK) assessments were made at most locations. Data analysis was performed using PROC GLIMMIX.

The standard set of treatments for **wheat**:

#	<u>Treatment</u>	<u>Rate</u>	<u>Timing</u>
1	Non-Treated		
2	Prosaro	6.5 fl. oz.	Feekes 10.51 (early flowering)
3	Prosaro	6.5 fl. oz.	Feekes 10.51 (early flowering)
	Taegro	5.2 fl oz.	

<u>#</u>	<u>Treatment</u>	<u>Rate</u>	<u>Timing</u>
4	Caramba	13.5 fl oz	Feekes 10.51 (early flowering)
5	Monsoon	4 fl oz	Feekes 10.51 (early flowering)
6	Muscle 3.6F	4 fl oz	Feekes 10.51 (early flowering)
7	Onset	4 fl oz	Feekes 10.51 (early flowering)
8	Orius	4 fl oz	Feekes 10.51 (early flowering)
9	Tebustar	4 fl oz	Feekes 10.51 (early flowering)
10	Toledo	4 fl oz	Feekes 10.51 (early flowering)

Additional Treatments for **wheat**:

<u>#</u>	<u>Treatment</u>	<u>Rate</u>	<u>Timing</u>
11	Approach	12 fl oz	Feekes 10.51 (early flowering)
12	Approach Prima	6.8 fl oz	Feekes 10.51 (early flowering)
13	Prosaro	8.2 fl oz	Feekes 10.51 (early flowering)
14	Caramba	17 fl oz	Feekes 10.51 (early flowering)

The standard set of treatments for **barley**:

<u>#</u>	<u>Treatment</u>	<u>Rate</u>	<u>Timing</u>
1	Non-Treated		
2	Prosaro	6.5 fl. oz.	Feekes 10.51 (early flowering)
3	Prosaro Taegro	6.5 fl. oz. 5.2 fl oz.	Feekes 10.51 (early flowering)
4	Caramba	13.5 fl oz	Feekes 10.51 (early flowering)
5	Muscle 3.6F	4 fl oz	Feekes 10.51 (early flowering)

Results

Disease development varied across locations and only one location (Fargo, ND – warm and dry) did not have FHB. Across all small grain classes, several locations had significant differences among treatments for FHB index (severity), FDK, DON, test weight and yield. With some exceptions, triazole fungicides applied at early flowering had lower disease severities and FDK when compared to the non-treated control (data not presented). Metconazole and prothioconazole+tebuconazole often had lower FHB severity and FDK values when compared to tebuconazole (data not presented).

Across locations and market classes, DON was lowest for early-flowering (wheat) and early-heading (barley) applications of metconazole and prothioconazole+tebuconazole (Tables 1-5). Also, higher rates of metconazole and prothioconazole+tebuconazole did not equate to statistically lower levels of DON. No consistent DON or FHB differences occurred among the tebuconazole products. Applications that included a strobilurin fungicide at early flowering in wheat often had higher DON levels than the non-treated control (Tables 1-5). Statistically significant yield differences were observed in two of the nineteen UFT trials. Numerically, plots that received a fungicide application often had higher yield values than the non-treated control (Tables 1-5).

Table 1. Results from UFTs conducted on soft red winter wheat.

#	Treatment	Rate (oz/A)	IL		IL		IL		AR		NY	
			Dixon Springs		Brownstown		Urbana				Ithaca	
			DON	Yield	DON	Yield	DON	Yield	DON	Yield	DON	Yield
1	Non-Treated		21.9	22.3	23.9 ab	19.4	5.9	60.1	14.0 a	79.0	1.7 a	107.5
2	Prosaro	6.5	19.1	27.4	15.5 cde	32.7	3.4	65.2	7.4 efg	87.6	0.4c	119.1
3	Prosaro Teagro	6.5 5.2	14.8	28.1	13.9 de	35.3	4.3	63.4	6.1 fg	88.9	0.5 bc	109.1
4	Caramba	13.5	20.4	22.6	14.8 cde	32.1	3.7	66.5	8.1 defg	83.0	0.7 bc	111.0
5	Monsoon	4.0	20.1	21.2	18.6 abcde	30.3	4.9	65.4	9.5 bcde	85.4	-	-
6	Muscle 3.6F	4.0	25.9	28.0	15.8 cde	31.6	4.8	59.7	9.5 bcde	87.3	-	-
7	Onset	4.0	24.4	23.6	20.5 abcd	27.8	5.5	61.4	8.1 defg	88.0	-	-
8	Orius	4.0	18.5	21.0	17.2 bcde	27.3	5.7	63.8	12.4 ab	86.2	-	-
9	Tebustar	4.0	21.6	21.6	14.8 cde	29.1	5.2	62.5	8.9 cdef	80.5	0.8 b	107.5
10	Toledo	4.0	-	-	18.7 abcde	27.4	5.6	62.0	11.0 abcd	87.3	-	-
11	Approach	12.0	28.5	23.3	21.9 abc	28.8	6.7	60.0	12.0 abc	84.6	-	-
12	Approach Prima	6.8	27.9	15.7	25.9 a	23.3	7.2	59.9	11.7 abc	85.0	-	-
13	Prosaro	8.2	23.7	25.3	19.9 bcde	31.8	6.3	64.6	6.0 fg	96.8	0.3 c	113.6
14	Caramba	17.0	19.6	29.6	12.5 e	31.8	4.0	66.5	5.6 g	93.9	0.4 bc	105.9
			ns	ns		ns	ns	ns		ns		ns
			0.415	0.410	0.036	0.133	0.156	0.785	0.001	0.484	0.001	0.231

Table 2. Results from UFTs conducted on susceptible hard red spring wheat varieties.

#	Treatment	Rate (oz/A)	ND		ND		ND		SD		SD		SD	
			Langdon		Fargo		Carrington		Volga		South Shore		Groton	
			DON	Yield	DON	Yield	DON	Yield	DON	Yield	DON	Yield	DON	Yield
1	Non-Treated		7.9 abcde	50.7	0.0	56.5	1.8 a	75.2	6.4bc	58.0	11.8 a	69.5	4.6	76.5
2	Prosaro	6.5	5.3 e	55.3	0.0	56.3	1.0 bc	76.4	5.4c	61.9	7.5 cd	69.0	4.1	82.6
3	Prosaro Teagro	6.5 5.2	6.9 cde	56.9	0.0	60.0	1.7 ab	75.4	7.3b	63.3	7.1 d	72.7	4.5	77.4
4	Caramba	13.5	6.0 de	61.4	0.0	61.5	0.8 c	79.9	5.4c	63.5	7.4 cd	66.6	3.2	82.7
5	Monsoon	4.0	8.0 abcde	56.9	0.0	58.5	1.3 abc	78.1	6.8bc	62.0	9.1 bc	71.6	4.6	77.6
6	Muscle 3.6F	4.0	9.0 abc	57.8	0.0	58.6	2.0 a	77.0	5.2c	56.0	10.4 ab	69.1	5.2	77.5
7	Onset	4.0	7.3 bcde	58.9	0.0	58.0	1.7 ab	80.2	6.2 bc	63.6	7.4 cd	69.6	4.3	80.8
8	Orius	4.0	8.8 abc	55.9	0.0	65.6	1.3 abc	77.4	7.7 ab	65.2	8.2 cd	72.5	4.7	81.0
9	Tebustar	4.0	8.5 abcd	59.1	0.0	53.8	1.5 ab	77.0	6.6 bc	61.2	8.8 bcd	68.5	4.7	81.1
10	Toledo	4.0	6.2 cde	54.9	0.0	57.7	1.6 ab	77.1	6.8 bc	64.8	7.7 cd	69.9	4.5	75.8
11	Approach	12.0	10.6 a	60.7	0.0	59.9	-	-	9.2 a	64.4	8.5 bcd	70.2	5.5	77.6
12	Approach Prima	6.8	9.9 ab	55.7	0.0	65.2	-	-	9.2 a	61.5	8.8 bcd	70.0	4.9	77.0
13	Prosaro	8.2	6.6 cde	60.3	-	-	1.0 bc	80.5	6.1 bc	68.3	6.9 d	70.6	5.0	79.5
14	Caramba	17.0	5.9 de	63.9	-	-	-	-	5.3 c	60.2	7.7 cd	74.4	4.1	79.5
			ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
			0.001	0.089		0.787	0.007	0.15	0.001	0.232	0.0001	0.393	0.702	0.230

*DON levels are reported as ppm and yield values as bu/A for all tables.

Table 3. Results from UFTs conducted on moderately resistant hard red spring wheat varieties.

#	Treatment	Rate (oz/A)	SD		SD		SD	
			Volga		South Shore		Groton	
			DON	Yield	DON	Yield	DON	Yield
1	Non-Treated		2.3 bcde	65.0	2.2 a	57.1 d	1.2	75.2
2	Prosaro	6.5	1.8 cdefg	67.6	1.4 cd	64.7 abc	1.0	85.6
3	Prosaro Teagro	6.5 5.2	2.0 cdefg	67.7	1.4 cd	65.8 ab	1.0	79.9
4	Caramba	13.5	1.6 gf	70.4	1.5 bcd	65.1 abc	0.9	80.9
5	Monsoon	4.0	2.4 abcd	68.6	1.6 bc	67.1 a	0.9	78.9
6	Muscle 3.6F	4.0	2.2 cdef	63.7	2.2 a	59.6 cd	1.5	79.2
7	Onset	4.0	2.4 abc	66.3	1.8 abc	60.4 bcd	1.0	79.8
8	Orius	4.0	2.1 cdefg	68.6	1.6 bcd	64.7 abc	1.2	80.2
9	Tebustar	4.0	1.8 defg	65.1	1.5 bcd	66.1 ab	1.5	80.6
10	Toledo	4.0	1.7 efg	66.1	1.5 bcd	68.4 a	1.0	77.8
11	Aproach	12.0	2.9 a	66.8	1.8 abc	63.2 abc	1.3	76.8
12	Aproach Prima	6.8	2.9 ab	63.3	1.9 ab	63.7 abc	1.0	76.4
13	Prosaro	8.2	2.1 cdefg	72.3	1.2 d	66.3 ab	0.9	80.0
14	Caramba	17.0	1.6 g	66.2	1.2 d	64.6 abc	0.9	80.4
			ns				ns	
			0.001	0.238	0.001	0.020	0.351	0.149

Table 4. Results from UFTs conducted on hard red winter wheat.

#	Treatment	Rate (oz/A)	SD		SD	
			Volga		South Shore	
			DON	Yield	DON	Yield
1	Non-Treated		6.3 ab	48.4	3.6	56.8
2	Prosaro	6.5	3.3 f	65.0	2.8	59.1
3	Prosaro Teagro	6.5 5.2	4.2 def	57.0	2.6	61.0
4	Caramba	13.5	4.4 def	56.3	3.2	59.6
5	Monsoon	4.0	5.1 bcd	51.3	2.8	60.6
6	Muscle 3.6F	4.0	5.3 abcd	50.1	4.0	63.3
7	Onset	4.0	4.8 cde	59.2	3.6	54.6
8	Orius	4.0	4.3 def	56.0	2.8	57.3
9	Tebustar	4.0	4.6 de	60.9	6.5	57.5
10	Toledo	4.0	5.1 bcd	54.9	3.4	61.3
11	Aproach	12.0	6.0 abc	58.1	3.6	52.1
12	Aproach Prima	6.8	6.5 a	56.8	3.3	58.8
13	Prosaro	8.2	3.7 ef	63.9	2.7	64.8
14	Caramba	17.0	4.5 def	61.3	3.1	60.5
			ns		ns	
			.0001	.01092	.2317	.3326

*DON levels are reported as ppm and yield values as bu/A for all tables.

Table 5. Results from UFTs conducted on spring durum and spring barley.

#	Treatment	Rate (oz/A)	Spring Durum		Spring Barley		Spring Barley	
			ND		ND		ND	
			Langdon		Langdon		Fargo	
			DON	Yield	DON	Yield	DON	Yield
1	Non-Treated		9.8 a	64.5 e	4.1 a	110.9	0.0	136.5
2	Prosaro	6.5	6.9 bc	80.2 a	2.0 b	122.8	0.0	140.2
3	Prosaro Teagro	6.5 5.2	5.6 c	77.4 abc	2.0 b	114.6	0.0	143.8
4	Caramba	13.5	5.78 c	79.3 abc	2.1 b	117.2	0.0	138.8
5	Monsoon	4.0	7.78 abc	73.0 abcd	-	-	-	-
6	Muscle 3.6F	4.0	6.43 c	71.5 bcde	3.6 a	109.6	0.0	138.8
7	Onset	4.0	7.30 abc	69.8 cde	-	-	-	-
8	Orius	4.0	7.98 abc	70.2 cde	-	-	-	-
9	Tebustar	4.0	7.90 abc	69.0 de	-	-	-	-
10	Toledo	4.0	9.30 ab	70.0 cde	-	-	-	-
					ns		-	ns
			0.0001	0.0043	0.0001	0.4295	-	0.95

*DON levels are reported as ppm and yield values as bu/A for all tables.

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