

Field evaluation of fungicides for management of anthracnose on lentils

Michael J. Wunsch and Blaine G. Schatz, NDSU Carrington Research Extension Center, Carrington, ND

2010

OBJECTIVE:

Evaluate the efficacy of registered and unregistered fungicides for management of anthracnose on lentils.

METHODS:

Experimental design, seeding, planting, and harvest: The experiment was a randomized complete block design with four replicates and was placed under a center pivot irrigation system to enhance disease pressure. Plots were seeded May 3 and harvested August 18. The large-seeded green lentil 'Pennel' was seeded in 7-inch rows at a rate of 12 pure live seeds per square foot. Plots consisted of seven rows, each 25 ft long, with an 18-inch alley between plots (plot size, including alley = 5 feet by 25 feet). Buffer plots were established between treatment plots in order to minimize spray drift between treatments. Plot ends were trimmed prior to harvest. Seed moisture content was determined for each plot, and seed yield, test weight, kernel weight and seeds per pound were adjusted to 12% moisture.

Fungicide applications: Fungicides were applied June 28 between 1:30 and 2:00 pm (wind speed approx. 2 to 3 mph) 3 to 4 days after initiation of bloom and when foliar disease lesions were pinprick-sized and July 9 between 2:25 and 3:10 pm (wind speed approx. 0 to 2 mph). A 60-in. hand boom with four equally spaced TeeJet 8002 (twin-jet) nozzles was used for applications. Applications were made with 17.5 gal/ac water and 35 PSI pressure.

Inoculation: Lentil residues from the 2009 growing season were placed along the length of all treatment and buffer plots between the center rows (rows 3 and 4) on June 18 when lentils were at the 8 to 10 leaf stage (6 to 7 days before flowering). Guard plots (on edges of trial) did not receive inoculum.

Disease assessment: The percent of canopy that was necrotic was evaluated July 27 at late bloom. The predominant disease was anthracnose, caused by the fungal pathogen *Collectotricum truncatum*, but stemphylium blight, caused by *Stemphylium botryosum*, was also present.

Statistical analysis: Disease severity, seed yield, and seed quality were evaluated with analysis of variance. Seed moisture levels were evaluated for each sample, and yields were adjusted to 12.0% moisture. The assumption of constant variance was assessed by plotting residuals against predicted values, and the assumption of normality was assessed with a normal probability plot. The assumptions were met, and systematic transformations were not applied to the data. Single-degree-of-freedom contrasts were performed for all pairwise combinations of isolates; to control the Type I error rate at the level of the experiment, the Tukey multiple comparison procedure was employed. Analyses were conducted with replicate and treatment as main factor effects and with all interactions included in the model, and they were implemented in PROC GLM of SAS (version 9.2; SAS Institute, Cary, NC).

CONCLUSIONS:

Fungicide efficacy: The predominant foliar disease was anthracnose, caused by the fungal pathogen *Collectotricum truncatum*, but low levels of stemphylium blight, caused by *Stemphylium botryosum*, were also present. When applied at initiation of disease symptoms and again 11 days later, ProPulse 400SC (6.84 fl oz/ac), Omega 500F (10 fl oz/ac), Proline 480SC (5.0 fl oz/ac), and a rotational strategy involving Bravo WS (21.2 fl oz/ac) first and Headline 2.09EC (8.0 fl oz/ac) second reduced foliar disease severity relative to the non-treated control ($P < 0.01$). Quash 50WG (2.5 oz/ac), Vertisan 200EC (16.9 fl oz/ac), and Endura 70WG (6.0 oz/ac) were not effective ($\alpha = 0.05$). When applied as a single application when disease development was moderate and approx. 12 to 13 days after the first appearance of pinprick-sized disease lesions, Headline 2.09EC (8.0 fl oz/ac) but not ProPulse 400SC (6.84 fl oz/ac) or Proline (5.0 fl oz/ac) reduced disease severity relative to the non-treated control ($\alpha = 0.05$).

Seed yield and quality: When applied at initiation of disease symptoms and again 11 days later, Omega 500F (10 fl oz/ac), Proline 480SC (5.0 fl oz/ac), and a rotational strategy involving Bravo WS (21.2 fl oz/ac) first and Headline 2.09EC (8.0 fl oz/ac) second increased lentil seed yields relative to the non-treated control ($P < 0.01$). ProPulse 480SC (6.84 fl oz/ac), Quash 50WG (2.5 oz/ac), Vertisan 200EC (16.9 fl oz/ac), and Endura 70WG (6.0 oz/ac) did not provide a yield benefit ($\alpha = 0.05$). When applied as a single application when disease development was moderate and approx. 12 to 13 days after the first appearance of pinprick-sized disease lesions, Headline 2.09EC (8.0 fl oz/ac) but not ProPulse 400SC (6.84 fl oz/ac) or Proline (5.0 fl oz/ac) increased lentil yields relative to the non-treated control ($\alpha = 0.05$). Applications of Bravo WS at the first appearance of disease symptoms (June 28) followed by Headline 11 days later (July 9) increased yields relative to a single application of Headline on July 9 ($P < 0.05$). The rotational strategy of Bravo WS followed by Headline increased lentil kernel weight relative to the non-treated control ($P < 0.05$). Due to inadequate seed, test weights could not be determined for all treatments. For those treatments for which test weights were obtained, none of the fungicide applications resulted in statistically significant differences in test weight relative to the non-treated control after controlling for the effect of experimental replicate ($\alpha = 0.05$).

This experiment evaluated both registered and unregistered products for control of lentil anthracnose. Please refer to the 2011 North Dakota Field Crop Fungicide Guide (NDSU Extension Service publication PP-622) for a list of currently registered products. As of March 2011, only Serenade, chlorothalonil (Bravo WS and others), Endura, Proline, Headline, and Quadris were registered for foliar use on lentils.

Field evaluation of fungicides for management of anthracnose on lentils

Michael J. Wunsch and Blaine G. Schatz, NDSU Carrington Research Extension Center, Carrington, ND

2010

Means followed by different letters are significantly different (alpha = 0.01)

Treatment, application rate (timing = A,B) ¹	DISEASE SEVERITY percent of canopy ²	YIELD lbs/ac	TEST WEIGHT lbs/bu	KERNEL WEIGHT gr/1000seeds	SEEDS per POUND
Bravo WS, 21.2 fl oz/ac (A) / Headline 2.09EC, 8.0 fl oz/ac (B)	22 ab	1110 a	59.2 a	44.4 a	10251 a
Proline 480SC, 5.0 fl oz/ac (A,B)	27 ab	823 abc	57.7 a	ND	ND
Omega 500F, 10 fl oz/ac (A,B)	15 a	808 ab	58.0 a	39.6 ab	11463 a
ProPulse 400SC, 6.84 fl oz/ac (A,B)	28 ab	444 b-e	56.7 a	35.2 ab	12913 a
Serenade ASO, 6 pts/ac (A) / Quadris 2.08SC, 6.6 fl oz/ac (B)	47 a-d	431 b-e	56.4 a	36.4 ab	12454 a
Quash 50WG, 2.5 oz/ac (A,B)	54 bcd	340 cde	ND	33.2 b	13688 a
Vertisan (LEM17) 200EC, 16.9 fl oz/ac (A,B)	68 cd	190 e	ND	32.5 b	13986 a
Endura 70WG, 6.0 oz/ac (A,B)	81 d	154 e	ND	32.8 b	13971 a
Headline 2.09EC, 8.0 fl oz/ac (B)	46 abc	751 a-d	58.9 a	43.6 ab	10430 a
Proline 480SC, 5.7 fl oz/ac (B)	48 a-d	499 b-e	56.7 a	38.3 ab	11952 a
ProPulse 400SC, 8.6 fl oz/ac (B)	53 bcd	240 de	ND	34.4 ab	13208 a
Non-treated control	79 cd	198 e	ND	35.0 ab	13097 a
Treatment differences, F : ³	18.7	23	3.56	6.39	5.167
Treatment differences, $P > F$: ⁴	< 0.0001	< 0.0001	0.0433	0.001	0.0029
C.V.:	20.3	24.2	1.8	8.2	8.6

Means followed by different letters are significantly different (alpha = 0.05)

Treatment, application rate (timing = A,B) ¹	DISEASE SEVERITY percent of canopy ²	YIELD lbs/ac	TEST WEIGHT lbs/bu	KERNEL WEIGHT gr/1000seeds	SEEDS per POUND
Bravo WS, 21.2 fl oz/ac (A) / Headline 2.09EC, 8.0 fl oz/ac (B)	22 ab	1110 a	59.2 a	44.4 a	10251 a
Proline 480SC, 5.0 fl oz/ac (A,B)	27 abc	823 ab	57.7 a	ND	ND
Omega 500F, 10 fl oz/ac (A,B)	15 a	808 ab	58.0 a	39.6 abc	11463 ab
ProPulse 400SC, 6.84 fl oz/ac (A,B)	28 abc	444 cd	56.7 a	35.2 abc	12913 ab
Serenade ASO, 6 pts/ac (A) / Quadris 2.08SC, 6.6 fl oz/ac (B)	47 bcd	431 cd	56.4 a	36.4 abc	12454 ab
Quash 50WG, 2.5 oz/ac (A,B)	54 cde	340 cd	ND	33.2 bc	13688 b
Vertisan (LEM17) 200EC, 16.9 fl oz/ac (A,B)	68 def	190 d	ND	32.5 c	13986 b
Endura 70WG, 6.0 oz/ac (A,B)	81 f	154 d	ND	32.8 c	13971 b
Headline 2.09EC, 8.0 fl oz/ac (B)	46 a-d	751 bc	58.9 a	43.6 ab	10430 ab
Proline 480SC, 5.7 fl oz/ac (B)	48 b-f	499 bcd	56.7 a	38.3 abc	11952 ab
ProPulse 400SC, 8.6 fl oz/ac (B)	53 cde	240 d	ND	34.4 bc	13208 ab
Non-treated control	79 ef	198 d	ND	35.0 bc	13097 ab
Treatment differences, F : ³	18.7	23	3.56	6.39	5.167
Treatment differences, $P > F$: ⁴	< 0.0001	< 0.0001	0.0433	0.001	0.0029
C.V.:	20.3	24.2	1.8	8.2	8.6

¹ Proline and ProPulse were applied with 0.25% (v/v) of the non-ionic surfactant 'Induce'.

¹ Application timing: (A) June 28, 3 to 4 days after first bloom, pinprick-size disease lesions present; (B) July 9

² Disease severity: Percent of lentil canopy necrotic; anthracnose (*Collectotrichum truncatum*) predominant disease; rated July 27 at late bloom

³ Treatment differences, F : F -values associated with the test of the null hypothesis that there are no differences among treatments.

⁴ Treatment differences, $P > F$: Probability of observing an F -statistic greater than that observed; an assessment of the significance of treatment differences.

This experiment evaluated both registered and unregistered products for control of lentil anthracnose. Please refer to the 2011 North Dakota Field Crop Fungicide Guide (NDSU Extension Service publication PP-622) for a list of currently registered products. As of March 2011, only Serenade, chlorothalonil (Bravo WS and others), Endura, Proline, Headline, and Quadris were registered for foliar use on lentils.

Field evaluation of fungicides for management of anthracnose on lentils

Michael J. Wunsch and Blaine G. Schatz, NDSU Carrington Research Extension Center, Carrington, ND

2010

TYPE I SUM OF SQUARES:

	YIELD			KERNEL WEIGHT	
	<i>F</i>	<i>P > F</i>		<i>F</i>	<i>P > F</i>
replicate	1.43	0.2491	replicate	0	0.9793
treatment	23	< 0.0001	treatment	6.39	0.001
rep*trt	2.04	0.0951	rep*trt	0.45	0.8962

	DISEASE SEVERITY			SEEDS PER POUND	
	<i>F</i>	<i>P > F</i>		<i>F</i>	<i>P > F</i>
replicate	0.12	0.7352	replicate	0.01	0.7525
treatment	18.7	< 0.0001	treatment	5.167	0.0029
rep*trt	1.32	0.2982	rep*trt	0.39	0.9321

	TEST WEIGHT	
	<i>F</i>	<i>P > F</i>
replicate	1.21	0.3006
treatment	3.56	0.0433
rep*trt	0.55	0.7576