

# Field evaluation of fungicides for management of anthracnose on lentils

Nesson Valley / Hofflund – approx. 30 miles east of Williston, ND (2013)

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## KEY FINDINGS:

- Under a mixture of anthracnose and Sclerotinia disease pressure, the registered fungicides **Headline** (6 fl oz/ac) and **Priaxor** (4 fl oz/ac) and the experimental fungicides **Bravo Top** (2 pt/ac) and **Omega** (0.85 pt/ac) performed well.
- Omega** exhibited a rate response, with anthracnose control increasing as the application rate increased.
- Endura** (6 oz/ac) and **Inspire** (4 fl oz/ac) provided poor control of anthracnose in this field trial. **Approach** (12 fl oz/ac), **Proline** (5 fl oz/ac), and **Quadris** (6.2 fl oz/ac) exhibited moderate efficacy intermediate between the non-treated control and the best treatments.

**Active ingredients:** Approach contains 250 g picoxystrobin per liter, Bravo Top contains 50 g difenoconazole + 500 g chlorothalonil per liter, Endura contains 700 g boscalid per kilogram, Headline contains 250 g pyraclostrobin per liter, Inspire contains 250 g difenoconazole per liter, Omega contains 500 g fluazinam per liter, Priaxor contains 333 g pyraclostrobin + 167 g fluxapyroxad per liter, Proline contains 480 g prothioconazole per liter, Quadris contains 250 g azoxystrobin per liter, Xemium contains 300 g fluxapyroxad per liter.

## SUMMARY OF KEY RESULTS:

The fungicides **INSPIRE**, **BRAVO TOP**, and **OMEGA** are currently not registered for use on lentils and should not be used. Future registration of some of these fungicides is anticipated. Results are provided for reference only.

Description (application timing) <sup>‡</sup>	Anthracnose - Anthracnose - disease severity: <sup>x</sup>		Sclerotinia stem rot: <sup>w*</sup>	Yield: lbs/ac	Test weight: lbs/bu	Seeds per pound: seeds/lb	
	Aug. 12 <sup>w</sup> 0 to 5	canopy necrosis: <sup>x†</sup> Aug. 12 <sup>w</sup> percent	Aug. 12 <sup>w</sup> percent				
1 Non-treated check (water; A,B)	3.8 c *	2 a *	0 a *	1537 bcd *	59.2 c *	10086 bcd *	
2 Omega 500F 0.5 pt/ac (A,B)	1.0 ab	0 a	1 a	1927 a-d	60.1 abc	9503 a-d	
3 Inspire 250EC 4 fl oz/ac (A,B)	3.0 bc	3 a	4 a	1307 d	59.2 c	10299 d	
4 Omega 500F 0.5 pt/ac + Inspire 250EC 4 fl oz/ac (A,B)	0.8 a	0 a	0 a	2005 a-d	60.3 abc	8893 a-d	
5 Omega 500F 0.675 pt/ac (A,B)	0.5 a	0 a	0 a	2005 a-d	60.4 abc	8990 a-d	
6 Omega 500F 0.675 pt/ac + Inspire 250EC 4 fl oz/ac (A,B)	0.5 a	0 a	0 a	2114 abc	60.3 abc	9079 a-d	
7 Omega 500F 0.85 pt/ac (A,B)	0.5 a	0 a	0 a	2323 5 scl	60.5 abc	8691 ab	
8 Omega 500F 0.85 pt/ac (A) / Headline 250SC 6 fl oz/ac (B)	0.3 a	0 a	0 a	2176 abc	61.0 ab	8431 a	
9 Headline 250SC 6 fl oz/ac (A,B)	0.0 a	0 a	0 a	2199 abc	61.1 a	8561 a	
10 Priaxor 500SC 4 fl oz/ac (A,B)	0.5 a	1 a	3 a	2285 ab	60.4 abc	8830 abc	
11 Bravo Top 550SC 2 pt/ac (A,B)	0.0 a	0 a	1 a	2040 a-d	60.5 abc	8748 abc	
12 Endura 70WG 6 oz/ac (A,B)	3.5 c	5 a	0 a	1484 cd	59.4 bc	10119 cd	
13 Proline 480SC 5 fl oz/ac + NIS 0.125% v/v (A,B)	2.0 abc	0 a	0 a	1799 a-d	59.8 abc	9666 a-d	
14 Quadris 250SC 6.2 fl oz/ac (A,B)	1.3 ab	0 a	4 a	1909 a-d	60.5 abc	8915 a-d	
15 Approach 250SC 12 fl oz/ac + NIS 0.125% v/v (A,B)	1.8 abc	0 a	1 a	1894 a-d	60.2 abc	8946 a-d	
	F:	8.71	1.64	1.84	4.06	3.11	4.94
	P > F:	< 0.0001	0.1250	0.0787	0.0006	0.0044	0.0001
	CV:	66.0	278.6	203.6	15.2	1.1	5.9

### <sup>‡</sup>Fungicide application timing:

**Application A:** July 3, 2013 just prior to canopy closure; lentils at 16 nodes.

**Application B:** July 16 at 1:00 to 2:30 pm; air temperature = 64 to 65°F, relative humidity = 76 to 80%, wind = 10 to 12.5 mph out of the north

<sup>x</sup> **Anthracnose disease severity - stem lesion severity:** The severity of anthracnose stem lesions was assessed on Aug. 12 at late pod-fill using a 0 to 5 scale, in which 0 = anthracnose lesions on stems and leaves at zero to trace levels, lower canopy green; 1 = an average of one to three anthracnose stem lesions per plant, lower canopy green; 2 = an average of four to five anthracnose stem lesions per plant, lower canopy green; 3 = an average of five or more anthracnose stem lesions per plant and the bottom 1 to 25% of the lentil canopy necrotic; 4 = an average of ten or more anthracnose stem lesions per plant and the bottom 25 to 50% of the lentil canopy necrotic; and 5 = an average of ten or more anthracnose stem lesions per plant and more than 50% of the internal lentil canopy necrotic.

<sup>w</sup> **Anthracnose - canopy necrosis:** The severity of anthracnose-related canopy necrosis was assessed on Aug. 12 at late pod-fill as the percentage of the plot exhibiting plants killed by anthracnose.

<sup>v</sup> **Sclerotinia stem rot:** The percent of the canopy exhibiting symptoms of Sclerotinia stem rot or Sclerotinia-caused plant mortality on Aug. 12 at late pod-fill.

\* **Within-column means followed by different letters are significantly different** ( $P < 0.05$ ; Tukey multiple comparison procedure).

<sup>†</sup> In order to meet model assumptions of normality and homoskedasticity, analysis of variance was conducted on the natural-log transformation of disease severity  $[\ln(x + 1)]$  for data sets including values below 1. For ease of interpretation, treatment means are reported as disease severity.

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- **Location of trial:** NDSU Williston Research Extension Center, Nesson Valley Irrigation Research Site
- **GPS coordinates of research trial location:** 48.167,-103.104
- **Tillage:** conventional    **Soil type:** Lihen - fine sandy loam    **Previous crop:** durum wheat
- **Variety:** 'CDC Richlea'
- **Seed treatment:** Seeds were treated with 1.6 fl oz/cwt Axxess (imidacloprid) insecticide + 0.4 fl oz/ac Stamina (pyraclostrobin) fungicide.
- **Experimental design:** randomized complete block    **Replicates:** 4
- **Seeded plot size:** 5 ft (center-to-center) x 18 ft long    **Harvested plot size:** 5 ft (center-to-center) x approx. 14 ft long
- **Untreated buffer plots were established between treatment plots.**
- **Row spacing:** 7.5 inches    **Rows per plot:** 7
- **Planting date:** May 6, 2013
- **Seeding rate:** 18 pure live seeds/square foot
- **Fungicide application A:** July 3, 2013 just prior to canopy closure; lentils at 16 nodes.
- **Fungicide application B:** July 16 at 1:00 to 2:30 pm; air temperature = 64 to 65°F, relative humidity = 76 to 80%, wind = 10 to 12.5 mph out of the north
- **Fungicide application details:** Fungicides were applied with a 57-inch hand boom equipped with four equally spaced Spraying Systems TeeJet 8002VS flat-fan nozzles at a spray volume of 20 gal water/A operated at 40 psi.
- **Disease establishment:** Anthracnose-infested lentil residues collected in the 2012 field season were spread in the non-treated buffer and guard plots on July 10 and overhead irrigation was applied during the bloom and early pod set growth stages.
- **Anthracnose disease assessment:** The severity of anthracnose stem lesions was assessed on Aug. 12 at late pod-fill using a 0 to 5 scale, in which 0 = anthracnose lesions on stems and leaves at zero to trace levels, lower canopy green; 1 = an average of one to three anthracnose stem lesions per plant, lower canopy green; 2 = an average of four to five anthracnose stem lesions per plant, lower canopy green; 3 = an average of five or more anthracnose stem lesions per plant and the bottom 1 to 25% of the lentil canopy necrotic; 4 = an average of ten or more anthracnose stem lesions per plant and the bottom 25 to 50% of the lentil canopy necrotic; and 5 = an average of ten or more anthracnose stem lesions per plant and more than 50% of the internal lentil canopy necrotic. The severity of anthracnose-related canopy necrosis was assessed on Aug. 12 at late pod-fill as the percentage of the plot exhibiting plants killed by anthracnose.
- **Date that lentils were desiccated:** This trial was desiccated on August 29 with paraquat (2 pts/ac Gramoxone + 3 oz/ac non-ionic surfactant applied in 15 gallons of water/ac).
- **Harvest date:** September 6, 2013
- **Statistical analysis:** Data were evaluated with analysis of variance. 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. To meet model assumptions, a systematic natural-log transformation was applied to the anthracnose canopy necrosis data and the Sclerotinia stem rot data. All other data met model assumptions. Single-degree-of-freedom contrasts were performed for all pairwise comparisons 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 they were implemented in PROC GLM of SAS (version 9.2; SAS Institute, Cary, NC).

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We gratefully acknowledge **BASF** for donating the seed treatment products Axxess and Stamina used in this trial.

## IMPORTANT NOTICE:

- Fungicide performance can differ in response to which diseases are present, levels of disease when products are applied, environmental conditions, plant architecture and the susceptibility to disease of the variety planted, crop growth stage at the time of fungicide application, and other factors.
- This report summarizes fungicide performance as tested at the NDSU Carrington Research Extension Center under the conditions partially summarized in the methods section (above).
- Fungicide efficacy may differ under other conditions; when choosing fungicides, always evaluate results from multiple trials.
- This report is shared for educational purposes and is not an endorsement of any specific products.