Field evaluation of fungicides for management of Ascochyta blight of chickpeas

Carrington, ND (2012)

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KEY FINDINGS:

Due to hot, dry weather, **disease pressure was inadequate to rigorously assess fungicide efficacy in this trial.** In future trials, overhead irrigation capabilities will be established, and overhead irrigation will be used when the weather is not conducive to Ascochyta blight.

DETAILED RESULTS:

	Treatment (fungicide application timing)[w]	Ascochyta Severity[z‡] July 5[x] percent	Ascochyta Severity[z‡] July 18[x] percent	Seeds per lb[y] 13% moisture seeds	Test weight 13% moisture lbs/bu	Seed diameter[y] > 10.3 mm percent	Seed diameter[y] 9.5-10.3 mm percent	Seed diameter[y] 8.7-9.5 mm percent	Seed diameter[y] < 8.7 mm percent	Yield 13% moisture lbs/ac
1	**Non-treated check** (water; **A,B,C**)	**4** a*	**12** a*	**1362** a*	**66.0** a*	**0**	**25** a*	**57** a*	**18** a*	**3449** a*
2	**Priaxor 500SC** 4 fl oz/ac **(A,B,C)**	**3** a	**10** a	**1390** a	**66.3** a	**0**	**18** a	**64** a	**18** a	**3450** a
3	**Priaxor 500SC** 6 fl oz/ac **(A,B,C)**	**2** a	**7** a	**1398** a	**66.2** a	**0**	**20** a	**60** a	**20** a	**3378** a
4	**Proline 480SC** 5.7 fl oz/ac + **NIS** 0.125% v/v **(A,B,C)**	**2** a	**4** a	**1357** a	**66.1** a	**0**	**22** a	**60** a	**18** a	**3709** a
5	**Omega 500F** 13.6 fl oz/ac **(A,B,C)**	**2** a	**6** a	**1369** a	**65.9** a	**0**	**25** a	**59** a	**16** a	**3411** a
6	**Omega 500F** 8 fl oz/ac **(A) / Priaxor 500SC** 4 fl oz/ac **(B) / Proline 480SC** 5.7 fl oz/ac + **NIS** 0.125% v/v **(C)**	**6** a	**14** a	**1377** a	**65.9** a	**0**	**24** a	**58** a	**18** a	**3171** a
7	**Omega 500F** 13.6 fl oz/ac **(A) / Priaxor 500SC** 4 fl oz/ac **(B) / Proline 480SC** 5.7 fl oz/ac + **NIS** 0.125% v/v **(C)**	**5** a	**7** a	**1407** a	**66.3** a	**0**	**17** a	**60** a	**23** a	**3359** a
8	**Omega 500F** 16 fl oz/ac **(A) / Priaxor 500SC** 4 fl oz/ac **(B) / Proline 480SC** 5.7 fl oz/ac + **NIS** 0.125% v/v **(C)**	**3** a	**8** a	**1367** a	**65.7** a	**0**	**30** a	**56** a	**14** a	**3402** a
9	**Bravo WS** 1.5 pt/ac **(A) / Priaxor 500SC** 4 fl oz/ac **(B) / Proline 480SC** 5.7 fl oz/ac + **NIS** 0.125% v/v **(C)**	**4** a	**8** a	**1373** a	**66.2** a	**0**	**22** a	**60** a	**18** a	**3374** a
10	**Non-treated check** water **(A) / Priaxor 500SC** 4 fl oz/ac **(B) / Proline 480SC** 5.7 fl oz/ac + **NIS** 0.125% v/v **(C)**	**3** a	**8** a	**1367** a	**65.8** a	**0**	**23** a	**58** a	**19** a	**3530** a
11	**Omega 500F** 13.6 fl oz/ac **(A,B) / Priaxor 500SC** 4 fl oz/ac **(C)**	**3** a	**8** a	**1378** a	**65.8** a	**0**	**29** a	**55** a	**16** a	**3468** a
12	**Non-treated check** water **(A,B) / Priaxor 500SC** 4 fl oz/ac **(C)**	**3** a	**9** a	**1370** a	**66.1** a	**0**	**23** a	**59** a	**18** a	**3344** a
13	**Proline 480SC** 5.7 fl oz/ac + **NIS** 0.125% v/v **(A,C) / Priaxor 500SC** 4 fl oz/ac **(B)**	**2** a	**4** a	**1372** a	**66.0** a	**0**	**29** a	**57** a	**15** a	**3552** a
14	**Proline 480SC** 5.7 fl oz/ac + **NIS** 0.125% v/v **(A,C) / Priaxor 500SC** 6 fl oz/ac **(B)**	**3** a	**7** a	**1384** a	**66.1** a	**0**	**23** a	**58** a	**18** a	**3360** a
15	**Priaxor 500SC** 4 fl oz/ac **(A,C) / Proline 480SC** 5.7 fl oz/ac + **NIS** 0.125% v/v **(B)**	**1** a	**4** a	**1390** a	**66.0** a	**0**	**21** a	**59** a	**20** a	**3428** a
16	**Priaxor 500SC** 6 fl oz/ac **(A,C) / Proline 480SC** 5.7 fl oz/ac + **NIS** 0.125% v/v **(B)**	**3** a	**4** a	**1389** a	**66.3** a	**0**	**18** a	**59** a	**23** a	**3464** a
17	**Priaxor 500SC** 4 fl oz/ac **(A,C) / Inspire 250EC** 6.4 fl oz/ac + **Bravo WS** 1.4 pt/ac **(B)**[u]	**3** a	**5** a	**1355** a	**66.3** a	**0**	**26** a	**58** a	**16** a	**3299** a
18	**Inspire 250EC** 6.4 fl oz/ac + **Bravo WS** 1.4 pt/ac **(A,C)**[u] **/ Priaxor 500SC** 4 fl oz/ac **(B)**	**4** a	**12** a	**1392** a	**66.2** a	**0**	**22** a	**59** a	**19** a	**3534** a
19	**Proline 480SC** 5.7 fl oz/ac + **NIS** 0.125% v/v **(A,C) / Vertisan 1.67EC** 20 fl oz/ac + **NIS** 0.25% v/v **(B)**	**3** a	**8** a	**1406** a	**66.1** a	**0**	**19** a	**61** a	**20** a	**3400** a
20	**Vertisan 1.67EC** 20 fl oz/ac + **NIS** 0.25% v/v **(A,C) / Proline 480SC** 5.7 fl oz/ac + **NIS** 0.125% v/v **(B)**	**2** a	**5** a	**1364** a	**65.7** a	**0**	**33** a	**54** a	**14** a	**3465** a
21	**Proline 480SC** 5.7 fl oz/ac + **Bravo WS** 1.5 pt/ac + **NIS** 0.125% v/v **(A,C) / Priaxor 500SC** 4 fl oz/ac **(B)**	**2** a	**8** a	**1391** a	**65.9** a	**0**	**23** a	**59** a	**18** a	**3330** a
22	**Quash 50WDG** 3 oz/ac + **NIS** 0.25% v/v **(A,C) / Priaxor 500SC** 4 fl oz/ac **(B)**	**2** a	**8** a	**1379** a	**65.6** a	**0**	**29** a	**56** a	**15** a	**3478** a
23	**Quash 50WDG** 4 oz/ac + **NIS** 0.25% v/v **(A,C) / Priaxor 500SC** 4 fl oz/ac **(B)**	**2** a	**5** a	**1374** a	**66.0** a	**0**	**22** a	**61** a	**17** a	**3570** a
24	**Priaxor 500SC** 4 fl oz/ac **(A,C) / Quash 50WDG** 4 oz/ac + **NIS** 0.25% v/v **(B)**	**2** a	**7** a	**1388** a	**66.0** a	**0**	**21** a	**60** a	**19** a	**3416** a
	***F*:**	1.13	1.39	0.42	0.58		1.55	0.96	1.43	1.10
	***P* > *F*:**	0.3498	0.1654	0.9857	0.9193		0.1005	0.5254	0.1447	0.3768
	CV:	34.8	32.0	3.2	0.8		28.3	7.6	22.9	5.9

[z] **Ascochyta disease severity:** Percent of the canopy exhibiting symptoms of Ascochyta.

[y] **Seeds per pound:** Calculated from the weight of 250 seeds.

[x] The chickpeas were in full bloom on July 5 and July 18.

The fungicides BRAVO TOP, OMEGA, and QUASH are currently not registered for use on chickpeas and should not be used. Future registration of these fungicides is anticipated, and results for these products are provided for reference only.

[w] **Fungicide application timing:**

Application A: June 20, 2012 at 7:15-9:15 am. Chickpeas at bloom initiation (1% of plants with at least one open blossom); Ascochyta severity = 0.25% (trace levels of disease present). Wind = 4-7 mph out of the west, temperature = 55-60˚F, relative humidity = 91-99%.

Application B: July 1, 2012 at 8:20-10:00 pm. Chickpeas in full bloom. Wind = 3-4 mph out of the southeast, temperature = 72-80˚F, relative humidity = 59-80%.

Application C: July 14, 2012 at 9:00-11:00 am. Chickpeas in full bloom. Wind = 3-4 mph out of the southeast, temperature = 73-83˚F, relative humidity = 59-88%.

[y] **Seed diameter:** Seed size was determined by assessing the percent (by weight) of a 200-gram seed sample that passed through seives with round 26/64, 24/64, and 22/64-inch diameter holes.

[u] **Applied to approximate the performance of Bravo Top 4.59SC.** Syngenta had insufficient supplies of Bravo Top available for testing. To obtain obtain preliminary information on the potential performance of Bravo Top, the component ingredients of Bravo Top (difenoconazole and chlorothalonil) were evaluated by tank-mixing Inspire and Bravo WeatherStik.

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

‡ In order to meet 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 that include values between 0 and 1; otherwise LN(x)]**. For ease of interpretation, treatment means are reported as disease severity.**

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METHODS:

- **Location of trial:** NDSU Carrington Research Extension Center, Carrington, ND.
- **GPS coordinates of research trial location:** 47.5167,-99.1430
- **Soil type:** Heimdal-Emrick loam **Soil preparation:** conventional tillage
- **Variety:** CDC 'Frontier'
- **Experimental design:** randomized complete block **Replicates:** 4
- **Seeded plot size:** 5 feet wide (center-to-center) x 25 feet long **Harvested plot size:** 5 feet wide (center-to-center) x approx. 19 feet long
- **Row spacing:** 7 inches **Rows per plot:** 7
- **Non-treated buffer plots were established between treatment plots.**
- **Previous crop:** spring wheat
- **Planting date:** April 30, 2012 **Seeding rate:** 4.5 pure live seeds/square foot (targeted plant population = 4 plants/square foot).
- **Seed treatment:** Cruiser 5FS 1.28 fl oz/cwt + ApronMaxxRTA 5.0 fl oz/cwt + Mertect 340F 2.04 fl oz/cwt
- **Rhizobium inoculant:** "Soil Implant" granular inoculant for chickpeas ((Mesorhizobium cicer; Novozymes BioAg, Saskatoon, SK) was applied with the seed at seeding at the commercially recommended rate of 6 oz/1000 feet of row.
- **Fungicide application A:** June 20, 2012 at 7:15-9:15 am. Chickpeas at bloom initiation (1% of plants with at least one open blossom); Ascochyta severity was 0.25% (trace levels of disease present). Wind = 4-7 mph out of the west, temperature = 55-60˚F, relative humidity = 91-99%..
- **Fungicide application B:** July 1, 2012 at 8:20-10:00 pm. Chickpeas in full bloom. Wind = 3-4 mph out of the southeast, temperature = 72-80˚F, relative humidity = 59-80%.
- **Fungicide application C:** July 14, 2012 at 9:00-11:00 am. Chickpeas in full bloom. Wind = 3-4 mph out of the southeast, temperature = 73-83˚F, relative humidity = 59-88%.
- **Fungicide application details:** Fungicides were applied with a 60-inch hand boom equipped with four equally spaced Spraying Systems TeeJet XR 8001VS flat-fan nozzles at a spray volume of 17.5 gal water/A operated at 35 psi.
- **Ascochyta inoculation details:** To promote disease development, the trial was established within 1,000 feet of a chickpea study conducted in 2011 that had severe Ascochyta blight. In addition, laboratory-grown pycnidiospores of Ascochyta rabiei were applied to the buffer and guad plots from 12:00 to 1:00 am on July 4 at an application rate of 300,000 spores/ml and 19.4 gallons of water/ac (426,000 spores/square foot). Spore applications were made at 20 psi with a 60-inch hand boom equipped with four equally spaced Spraying Systems TeeJet TJ60-8003 twin jet nozzles.
- **Disease assessments:** Ascochyta severity was assessed as the percent of the canopy exhibiting Ascochyta disease symptoms. Severity was assessed at four locations per plot.
- **Desiccation:** Hot, dry weather facilitated rapid and uniform maturity of the chickpeas in this trial. Herbicides were not utilized to desiccate this trial.
- **Harvest date:** August 13, 2012.
- **Seed size:** Seed diameter was determined by assessing the percent (by weight) of a 200-gram seed sample that passed through sieves with round 26/64, 24/64, and 22/64-inch diameter holes.
- **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 [LN(x+1) when the data set includes values between 0 and 1; otherwise, LN(x)] was applied to the July 3 and July 20 disease data and to the <7 mm diameter seed size 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).

OUR DEEPEST GRATITUDE:

This project was made possible with grants from the **Northern Pulse Growers Association** and the **North Dakota Department of Agriculture Crop Protection Product Harmonization Board and Registration Board.** Supplementary financial support was provided by the **BASF Corporation** and **ISK BioSciences**.

We gratefully acknowledge **Novozymes BioAg** for donating Rhizobium inoculant, **Syngenta Crop Protection** for donating the seed treatment fungicides and insecticide, and **JM Grain** for helping us obtain seed of CDC Frontier chickpeas for use 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 chickpea 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 in 2012 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.