Field evaluation of fungicides for management of Ascochyta blight of chickpeas

Carrington, ND (2011)

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Michael Wunsch, Michael Schaefer, and **Blaine Schatz**; NDSU Carrington Research Extension Center 701-652-2951 / michael.wunsch@ndsu.edu

KEY FINDINGS:

- **Priaxor** (a premix of pyraclostrobin + fluxapyroxad) **showed excellent efficacy against Ascochyta blight on chickpea.**
- **Omega** (fluazinam) **showed excellent potential for controlling Ascochyta blight on chickpea in early to mid-bloom when the canopy was open and excellent coverage was achieved.**
- **Proline** (prothioconazole) **was more effective when rotated with another fungicide with a different mode of action than when applied sequentially.**
- **Headline** (pyraclostrobin) **and Quadris** (azoxystrobin) **showed no efficacy.**

DETAILED RESULTS:

		DISEASE SEVERITY [2]				AUDPC [3]	YIELD [4]
		July 14	July 28	Aug. 9	Aug. 20		
	TREATMENT (application timing[1])	percent necrosis	percent necrosis	percent necrosis	percent necrosis	0 to 100	pounds / acre
1	**Priaxor 500SC** 6 fl oz/ac **(A,B,C,D,E)**	13 **a***	11 **a***	48 **a***	66 **a***	23 **a***	82 **a***
2	**Priaxor 500SC** 4 fl oz/ac **(A,B,C,D,E)**	21 **a**	26 **a**	65 **b**	78 **b**	33 **ab**	50 **a**
3	**Omega 500F** 16 fl oz/ac **(A,B,C,D,E)**	19 **a**	36 **ab**	95 **c**	100 **c**	43 **bc**	0 **b**
4	**Proline 480SC** 5.0 fl oz/ac + **NIS** 0.125% v/v **(A,C,E) / Endura 70WG** 6 oz/ac **(B,D)**	42 **ab**	64 **bc**	98 **c**	98 **c**	56 **cd**	0 **b**
5	**Omega 500F** 10 fl oz/ac **(A,B,C,D,E)**	38 **ab**	76 **cd**	99 **c**	100 **c**	58 **cd**	0 **b**
6	**Omega 500F** 13 fl oz/ac **(A,B,C,D,E)**	41 **ab**	77 **cd**	99 **c**	99 **c**	59 **cde**	0 **b**
7	**Echo 720 54SC** 1.4 pt/ac **(A) / Proline 480SC** 5 oz/ac + **NIS** 0.125% v/v **(B,C,D,E)**	61 **bcd**	79 **cd**	94 **c**	96 **c**	64 **def**	0 **b**
8	**Proline 480SC** 5 fl oz/ac + **NIS** 0.125% v/v **(A,B,C,D,E)**	56 **bc**	83 **cd**	97 **c**	98 **c**	65 **def**	0 **b**
9	**Proline 480SC** 5 fl oz/ac **(A,B,C,D,E)**	59 **bcd**	85 **cd**	97 **c**	98 **c**	66 **def**	0 **b**
10	**Echo 720 54SC** 1.4 pt/ac **(A) / Proline 480SC** 5 oz/ac + **NIS** 0.125% v/v **(B,D) / Endura 70WG** 6 oz + **NIS** 0.125% v/v **(C,E)**	70 **bcd**	84 **cd**	96 **c**	98 **c**	69 **def**	0 **b**
11	**Headline 250SC** 6 fl oz/ac **(A,B,C,D,E)**	85 **cd**	98 **d**	100 **c**	100 **c**	77 **ef**	0 **b**
12	**Quadris 250SC** 6.2 fl oz/ac **(A,B,C,D,E)**	85 **cd**	96 **cd**	100 **c**	100 **c**	77 **ef**	0 **b**
13	**Non-treated check**	90 **d**	99 **d**	100 **c**	100 **c**	79 **f**	0 **b**
	Treatment differences, *F*:[5]	16.50	20.89	22.27	28.04	24.37	7.42
	Treatment differences, *P* > *F*:[6]	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
	C.V.:	24.4	17.7	7.5	4.2	11.7	185.6

[1] **Fungicide application timing: (A)** = June 23 at 6:30-8:00 am, prior to bloom and 3 days after the first appearance of disease symptoms; **(B)** = July 6 at 11:20 am - 12:45 pm; **(C)** = July 18 at 7:30-10:00 am; **(D)** = July 29 at 9:00 am; **(E)** = August 10.

[2] **Disease severity:** Percent necrosis: percent of the canopy (leaves and stems) that was necrotic due to Ascochyta blight.

[3] **Relative AUDPC:** Disease progress over time relative relative to maximum disease; a rating of 100 equals 100% disease from June 23 (first fungicide application) to August 20 (last disease rating), and a rating of 0 equals 0% disease over the same interval.

[4] **Yield:** High Ascochyta blight pressure precluded seed production in most treatments; recurrent, torrential rains, the use of crop residues to promote disease development, and the use of a highly susceptible chickpea cultivar combined to create extraordinarily high disease pressure. In future years, crop residues will only be used to inoculate the trial if disease has not developed by early bloom and weather conditions do not favor disease development from ambient inoculum; a split-plot design in which treatments are imposed to both susceptible and moderately resistant chickpeas may also be utilized.

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

[6] **Treatment differences, *P* > *F*:** Probability of observing an *F*-statistic greater than that observed; an assessment of significance of treatment differences.

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

Due to severe disease pressure, chickpea yields were zero or nearly zero in all treatments. A highly susceptible cultivar (CDC Xena) was planted, and recurrent, torrential rainfall occurred from mid-June to mid-August.

The fungicide OMEGA is currently not registered for use on chickpeas and should not be used. Future registration of this fungicide is anticipated, and results for Omega are provided for reference only.

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Michael Wunsch, Plant Pathologist; **Michael Schaefer**, Research Specialist; and **Blaine Schtaz**, Director and Agronomist

NDSU Carrington Research Extension Center 701-652-2951 / michael.wunsch@ndsu.edu

METHODS:

- **Location of trial:** NDSU Carrington Research Extension Center, Carrington, ND.
- **Experimental design, seeding, planting, and harvest:** Soil type was Heimdal-Emrick loam, and cconventional tillage was used. Chickpeas were planted May 25 at 4.5 pure live seeds per square foot (targeted plant population was 4 plants per square foot). Seeds were treated with Cruiser 5FS (1.28 fl oz/cwt), ApronMaxxRTA (5.0 fl oz/cwt), and Mertect 340F (2.04 fl oz/cwt). The experiment was a randomized complete block design with four replicates. Plots consisted of seven rows, each 25 ft long and 7 in apart; an 18-in alley separated plots (plot size = 5 ft by 25 ft). To minimize spray drift between treatments, treatment plots were separated by buffer plots. 'CDC Xena', a large kabuli chickpea highly susceptible to ascochyta blight, was seeded in treatment plots; 'Amit', a Desi-type chickpea moderately resistant to ascochyta blight, was seeded in buffer and guard plots. After plant emergence, plots lengths were trimmed to19 to 20 feet; to ensure accurate yield calculations, plot lengths were recorded at harvest. Due to recurrent rainfall that precluded the natural senescence of the chickpeas, the trial was desiccated Aug. 22 with paraquat. The trial was harvested Sept. 7.
- **Fungicide applications:** Fungicides were applied Thursday, June 23 at 6:30-8:00 am (chickpeas 5-6 in. tall, ascochyta blight incidence approx. 1-3%, ascochyta severity approx. 1%), Wednesday, July 6 at 12:00-1:30 pm, Monday, July 18 at 7:30-10:00 am, Thursday, July 29 at 9:00 am, and Tuesday, Aug. 10 at 10:00 am. A 60-in hand boom with four equally spaced XR TeeJet 8001VS nozzles was used for applications. Applications were made with 17.5 gal/ac water and 35 psi pressure.
- **Inoculation:** Chickpea residues from the 2010 field season that were naturally infected with Ascochyta rabiei were spread evenly across the trial on June 10 at the V1 crop stage (first multifoliate leaf unfolded from stem).
- **Relative AUDPC calculations:** Disease progress over time was calculated with the following formula:

$$\text{Relative AUDPC} = \left\{\sum_{i=1}^{n}\left[\left(\frac{x_i+x_{i+1}}{2}\right)*(t_{i+1}-t_i)\right]\right\}\Big/(t_n-t_i)$$

  Where xi = disease severity index at the ith observation, ti = time in days at the ith observation, and n = number of observations.
- **Statistical analysis:** All 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. The yield data were characterized by several large outliers that violated the assumption of normality; however, no systematic transformation could be idenified to resolve the problem, and analyses were conducted on the untransformed data. The 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 with interactions included in the model, and they were implemented in PROC GLM of SAS (version 9.2; SAS Institute, Cary, NC).

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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 2011 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.