

# Field evaluation of fungicides for management of Sclerotinia on dry edible (pinto) beans

Carrington, ND (2013) ■ 14-inch row spacing

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## KEY FINDINGS:

Applied as two sequential applications 14 days apart, Topsis (30 fl oz/ac) and Endura (8 oz/ac) provided better control of Sclerotinia than Aproach (12 fl oz/ac) and Quash (2 and 4 oz/ac). The performance of Proline (5.7 fl oz/ac) was intermediate.

### Concentrations of active ingredients in products evaluated in this trial:

Aproach = 250 grams picoxystrobin per liter

Endura = 700 grams boscalid per kilogram

Topsis = 540 grams thiophanate-methyl per liter

Proline = 480 grams prothioconazole per liter

Quash = 500 grams metconazole per kilogram

## SUMMARY OF KEY RESULTS:

Treatment (application timing) <sup>v</sup>	Sclerotinia incidence: <sup>y</sup>	Sclerotinia severity: <sup>x</sup>	Sclerotinia sev. index: <sup>w</sup>	Yield:	Test weight:	Seeds per pound:
	Sept. 11-12 percent	Sept. 11-12 percent	Sept. 11-12 percent	lbs/ac	13.5% moisture lbs/bu	grams
1 Non-treated (water; A,B)	95 ab*	57 abc*	54 bc*	2459 cd*	59.1 ab*	1317 ab*
2 Aproach 250SC 12 fl oz/ac + NIS 0.25% v/v (A,B)	97 b	62 bc	59 bc	2492 cd	58.8 ab	1288 ab
3 Aproach 250SC 12 fl oz/ac + NIS 0.25% v/v (A)	93 ab	68 c	63 c	2456 cd	58.2 b	1338 b
4 Topsis 4.5FL 30 fl oz/ac (A,B)	86 a	51 ab	44 ab	3063 ab	59.3 ab	1243 ab
5 Proline 480SC 5.7 fl oz/ac + NIS 0.125% v/v (A,B)	89 ab	54 abc	48 abc	2843 abc	59.4 ab	1229 ab
6 Quash 50WDG 2 oz/ac + NIS 0.25% v/v (A,B)	96 b	64 bc	62 c	2176 d	58.6 b	1251 ab
7 Quash 50WDG 4 oz/ac + NIS 0.25% v/v (A,B)	92 ab	51 ab	47 abc	2512 cd	58.4 b	1281 ab
8 Confidential	94 ab	64 bc	61 bc	2547 bcd	58.4 b	1339 b
9 Confidential	95 ab	57 abc	54 bc	2330 cd	59.3 ab	1307 ab
10 Confidential	90 ab	59 bc	53 abc	2697 a-d	59.2 ab	1254 ab
11 Endura 70WG 8 oz/ac (A,B)	86 a	42 a	36 a	3185 a	60.0 a	1198 a
	F: 4.03	4.87	5.71	7.40	4.35	2.69
	F > P: 0.0012	0.0003	< 0.0001	< 0.0001	0.0006	0.0158
	CV: 4.7	13.2	15.0	9.6	1.0	4.9

<sup>y</sup> **Sclerotinia incidence:** The percent of plants exhibiting Sclerotinia stem rot. In each plot, 40 plants were evaluated (20 plants in each of the two center rows of each plot). Disease was assessed at the R7 growth stage (on average, at least one pod per plant changed color/striped).

<sup>x</sup> **Sclerotinia severity:** Disease severity of those plants exhibiting Sclerotinia stem rot. In each plot, 40 plants were evaluated (20 plants in each of the two center rows in each plot). Disease was assessed at the R7 growth stage (on average, at least one pod per plant changed color/striped).

<sup>w</sup> **Sclerotinia stem rot severity index:** Average Sclerotinia stem rot severity (including non-diseased plants). In each plot, 40 plants were evaluated (20 plants in each of the two center rows of each plot). Disease was assessed at R7 growth stage (on average, at least one pod per plant changed color/striped).

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

**Application A:** August 7 at 11:05 am to 12:05 pm; a few plots at canopy closure but shortly before canopy closure on most plots, dry beans at R3 growth stage (at least one pod per plant at maximum length), no Sclerotinia present; air temperature = 68.3 to 73.1°F, relative humidity = 52.1 to 61.6%, wind = 4.5 to 5.0 mph out of the east.

**Application B:** August 21 at 8:50 to 8:50 am; approximately 5% of the canopy wilted due to Sclerotinia in the non-treated controls, dry beans at R5 growth stage (at least one plant per plot with fully developed seeds); air temperature = 62.9 to 67.8°F, relative humidity = 70.0 to 87.3%, wind speed = 0 to 6.0 mph out of the northeast.

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

Quash is not currently labeled for use on dry beans and should not be used.

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## METHODS:

- **Location of trial:** NDSU Carrington Research Extension Center, Carrington, ND.  
**GPS coordinates of research trial location:** 47.5085, -99.1291
- **Tillage:** Disked on May 28, 2013 and cultivated twice (once deep and once shallow) on May 28.
- **Fertility:** 80 lbs/ac of Nitrogen were applied as urea (46-0-0) on May 28 and incorporated to 2 inches deep.
- **Maintenance herbicide applications:** On June 26 (at 8:00 to 9:00 pm) when the dry beans had 1 to 2 trifoliolate leaves, Raptor (2 fl oz/ac; 12.1% ammonium salt of imazamox, 1 lb ai/gal; BASF Corp.), Rezult B (16 fl oz/ac; sodium salt of bentazon, 53% and 5 lbs ai/gal; BASF Corp.), Assure II (10 fl oz/ac; quizalofop p-ethyl, 10.3%; 0.88 lb ai/gallon; DuPont Corp.), 1.5 gallons/100 gallons methylated seed oil (Drexel MES 100, 100% methylated seed oil; Drexel Chemical Company, Memphis, TN), and 2.5 gallons per 100 gallons liquid ammonium sulfate (28-0-0) were applied in 12.9 gallons of water/ac to control red-root pigweed, wild buckwheat, lambsquarters, foxtail barley, and other weeds. On July 5 when the beans had three trifoliolate leaves, Raptor (2 fl oz/ac; ammonium salt of imazamox, 12.1%, 1 lb ai/gal; BASF Corp.), Rezult B (24 fl oz/ac; sodium salt of bentazon, 53% and 5 lbs ai/gal; BASF Corp.), 1.5% (v/v) methylated seed oil (Drexel MES 100, 100% methylated seed oil; Drexel Chemical Company, Memphis, TN), and 2% v/v ammonium sulfate (28-0-0) were applied in 20 gallons of water/ac to control red-root pigweed, mustard, and other small broadleaf weeds.
- **Variety:** 'Lariat' (pinto bean) **Previous crop:** soybeans
- **Experimental design:** randomized complete block **Replicates:** 5
- **Seeded plot size:** 5 ft (center-to-center) x 25 ft long **Harvested plot size:** 5 ft (center-to-center) x approx. 19 ft long
- **Untreated buffer plots were established between treatment plots.**
- **Planting date:** May 29, 2013 **Row spacing:** 14 inches **Rows per plot:** 4
- **Seeding rate:** 91,950 pure live seeds/ac (target plant population = 80,000 plants/ac; presumed seedling mortality = 13%)
- **Fungicide application A:** August 7 at 11:05 am to 12:05 pm; a few plots at canopy closure but shortly before canopy closure on most plots, dry beans at R3 growth stage (at least one pod per plant at maximum length), no Sclerotinia present; air temperature = 68.3 to 73.1°F, relative humidity = 52.1 to 61.6%, wind = 4.5 to 5.0 mph out of the east.
- **Fungicide application B:** August 21 at 8:50 to 8:50 am; approximately 5% of the canopy wilted due to Sclerotinia in the non-treated controls, dry beans at R5 growth stage (at least one plant per plot with fully developed seeds); air temperature = 62.9 to 67.8°F, relative humidity = 70.0 to 87.3%, wind speed = 0 to 6.0 mph out of the northeast.
- **Fungicide application details:** Fungicides were applied with a 56-inch hand boom equipped with four equally spaced Spraying Systems TeeJet XR 8001 VS flat-fan nozzles at a spray volume of 15 gal water/A operated at 35 psi.
- **Disease establishment:** The trial was established on a site with a previous history of Sclerotinia epidemics. In addition, sclerotia of Sclerotinia sclerotiorum obtained from a sunflower processing plant were applied to plots on July 15. On July 15, approx. 1.25 grams of sclerotia were placed approx. 0.25 inches deep in each of eight locations per plot. Prior to placement in the field, the sclerotia were artificially vernalized by alternating them between a freezer (-20°C for at least 12 hours) and room temperature (20 to 25°C for at least 8 hours) a minimum of eight times. To facilitate disease development, overhead irrigation was applied to this trial through microsprinklers established on a 20 ft x 20 ft grid. Sprinklers were operated for 5 minutes every 20 minutes during the late evening, nighttime, and early morning hours (approximately 8 pm to 8 am) daily during the bloom period.
- **Sclerotinia disease assessment:** Sclerotinia disease incidence and severity were assessed Sept. 11-12 at the R7 growth stage (at least one pod per plant changed color/ striped). In each plot, 40 plants (10 plants in each of two locations in each row) were evaluated individually for the percent of the plant exhibiting Sclerotinia stem rot disease symptoms.
- **Harvest date:** The beans were manually pulled on October 4 at maturity and harvested October 24; cool, wet weather delayed harvest.
- **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. All data met model assumptions. Single-degree-of-freedom contrasts were performed for all pairwise comparisons of treatments; 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).

## FUNDING:

This project was partially funded by **Valent USA** and **DuPont**.

## 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 this report.
- 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.