

# 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:

- Under the conditions evaluated in this trial, where conditions for Sclerotinia continued through the end of August, two sequential fungicide applications 14 days apart provided better Sclerotinia disease control than a single fungicide application at canopy closure.
- Priaxor did not show efficacy against Sclerotinia.

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

*Endura* = 700 grams boscalid per kilogram*Topsin* = 540 grams thiophanate-methyl per liter*Priaxor* = 333 grams pyraclostrobin plus 167 grams fluxapyroxad per liter.

## SUMMARY OF KEY RESULTS:

Treatment (application timing) <sup>u</sup>	Sclerotinia incidence: <sup>y</sup>	Sclerotinia severity: <sup>x</sup>	Sclerotinia sev index: <sup>w</sup>	Yield:	Test weight:	Seeds per pound:
	Sept. 13 percent	Sept. 13 percent	Sept. 13 percent	13.5% moisture lbs/ac	lbs/bu	seeds/lb
1 Non-treated (water; A,B)	77 abc*	40 bc*	32 bc*	2166 bcd*	66.2 a*	1474 a*
2 Endura 70WG 8 oz/ac + HSOC 0.50% v/v (A)	69 ab	33 ab	23 ab	2548 ab	70.3 a	1430 a
3 Endura 70WG 8 oz/ac + HSOC 0.50% v/v (A) / Priaxor 500SC 4 fl oz/ac + HSOC 0.50% v/v (B)	71 ab	31 ab	24 ab	2298 a-d	66.3 a	1431 a
4 Endura 70WG 8 oz/ac + HSOC 0.50% v/v (A) / Endura 70WG 4 oz/ac + Priaxor 500SC 4 fl oz/ac + HSOC 0.50% v/v (B)	65 a	24 a	17 a	2384 abc	66.5 a	1396 a
5 Priaxor 500SC 4 fl oz/ac + HSOC 0.50% v/v (B)	92 c	48 c	44 c	2056 cd	70.2 a	1450 a
6 Priaxor 500SC 4 fl oz/ac + HSOC 0.50% v/v (A)	84 bc	54 c	47 c	1942 d	61.6 a	1531 a
7 Topsin M 4.5FL 30 fl oz/ac + HSOC 0.50% v/v (A)	76 abc	42 bc	33 bc	2235 bcd	66.4 a	1485 a
8 Topsin M 4.5FL 30 fl oz/ac + HSOC 0.50% v/v (A,B)	66 a	32 ab	22 ab	2654 a	62.1 a	1443 a
	F: 2.50	4.10	4.22	3.03	0.87	1.87
	F > P: 0.0364	0.0026	0.0021	0.0146	0.5416	0.1071
	CV: 19.1	31.3	42.7	14.8	12.6	5.1

<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 the R7 growth stage (on average, at least one pod per plant changed color/striped).

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

**Application A:** August 7 at 12:00 to 12:40 pm; dry beans at early R2 growth stage (full bloom) and shortly before canopy closure, no Sclerotinia present; air temperature = 73 to 83°F, relative humidity = 35.5 to 52.1%, wind speed = 3.2 to 4.5 mph out of the east to southeast.

**Application B:** August 21 at 9:50 to 10:25 am; dry beans at R3 growth stage (at least one pod per plant at maximum length), no plants wilted due to Sclerotinia; air temperature = 76.7 to 69.9°F, relative humidity = 64.5 to 70.0%, wind speed = 2.2 to 6.6 mph out of the northeast.

\* Within-column means followed by different letters are significantly different ( $P < 0.05$ ; Fisher's protected least significant difference).

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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 trifoliate 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 trifoliate 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)
- **Experimental design:** randomized complete block      **Replicates:** 6
- **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.**
- **Row spacing:** 14 inches      **Rows per plot:** 4
- **Planting date:** May 29, 2013      **Previous crop:** soybeans
- **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 12:00 to 12:40 pm; dry beans at early R2 growth stage (full bloom) and shortly before canopy closure, no Sclerotinia present; air temperature = 73 to 83°F, relative humidity = 35.5 to 52.1%, wind speed = 3.2 to 4.5 mph out of the east to southeast.
- **Fungicide application B:** August 21 at 9:50 to 10:25 am; dry beans at R3 growth stage (at least one pod per plant at maximum length), no plants wilted due to Sclerotinia; air temperature = 76.7 to 69.9°F, relative humidity = 64.5 to 70.0%, wind speed = 2.2 to 6.6 mph out of the northeast.
- **Fungicide application details:** Fungicides were applied with a 57-inch hand boom equipped with four equally spaced Spraying Systems TeeJet XR 8001VS 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.
- **Sclerotinia disease assessment:** Sclerotinia disease incidence and severity were assessed August 23 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 canopy exhibiting Sclerotinia stem rot disease symptoms.
- **Harvest date:** The beans were manually pulled on October 5 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 isolates; to control the Type I error rate at the level of the experiment, Fisher's protected least significant difference was employed as a multiple comparison procedure. 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 funded by the **BASF Corporation**.

## 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.