

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

Carrington, ND (2012) ■ 14-inch row spacing

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## KEY FINDINGS:

- Under the moderate Sclerotinia disease pressure observed in this trial, a single application of Endura (8 oz/ac) provided similar levels of disease control as two sequential applications of Endura (8 oz/ac).
- Applied as a single application, Endura (8 oz/ac) was more effective than Topsin 4.5FL (20 fl oz/ac); applied as two sequential applications, Endura (8 oz/ac) performed similarly to Topsin 4.5FL (20 fl oz/ac).
- The efficacy of two-application strategies involving Endura (8 oz/ac) applied first and Priaxor (4 fl oz/ac), with or without a reduced rate of Endura as a tank-mix partner, applied second could not be rigorously evaluated in this trial. A single application of Endura provided equivalent disease control as all two-application strategies, indicating that the second fungicide application provided little or no additional disease control under the conditions tested in this trial.

**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 (Fungicide timing) <sup>y</sup>	Sclerotinia incidence <sup>z</sup>	Sclerotinia severity <sup>y</sup>	Sclerotinia dis. severity index <sup>x,†</sup>	Yield	Test weight	Seeds per pound
	Aug. 22 <sup>w</sup> percent	Aug. 22 <sup>w</sup> percent	Aug. 22 <sup>w</sup> percent	lbs/ac	13% moisture lbs/bu	seeds
1 Non-treated check (water)	53 b *	20 d *	11.3 b *	2566 a *	61.0 a *	1432 abc*
2 Endura 70WG 8 oz/ac + HSOC 0.50% v/v (A)	21 a	8 ab	1.9 a	2592 a	61.3 a	1377 ab
3 Endura 70WG 8 oz/ac + HSOC 0.50% v/v (A) / Priaxor 500SC 4 fl oz/ac + HSOC 0.50% v/v (B)	13 a	6 ab	0.7 a	2697 a	61.5 a	1344 a
4 Endura 70WG 8 oz/ac + HSOC 0.50% v/v (A) / Endura 70WG 6 oz/ac + Priaxor 500SC 4 fl oz/ac + HSOC 0.50% v/v (B)	15 a	9 abc	1.3 a	2669 a	61.7 a	1408 ab
5 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)	13 a	4 a	0.6 a	2705 a	61.6 a	1362 a
6 Endura 70WG 8 oz/ac + HSOC 0.50% v/v (A,B)	13 a	5 ab	0.8 a	2663 a	61.4 a	1365 a
7 Topsin-M 4.5FL 20 fl oz/ac (A)	52 b	15 cd	7.2 b	2372 a	61.4 a	1465 bc
8 Topsin-M 4.5FL 20 fl oz/ac (A,B)	26 ab	10 bc	2.8 a	2243 a	61.2 a	1508 c
Treatment differences, <i>F</i> :	3.48	7.84	6.41	0.4025	1.02	3.46
Treatment differences, <i>P</i> > <i>F</i> :	0.0183	0.0004	0.0010	1.11	0.4557	0.0188
C.V.:	71.3	42.5	53.6	12.5	0.7	4.3

<sup>z</sup> **Sclerotinia stem rot incidence:** The percent of plants exhibiting Sclerotinia stem rot. In each plot, 40 plants were evaluated (10 plants in each of four locations in the interior of each plot)

<sup>y</sup> **Sclerotinia stem rot severity:** Disease severity of those plants exhibiting Sclerotinia stem rot. In each plot, 40 plants were evaluated (10 plants in each of four locations in the interior of each plot).

<sup>x</sup> **Sclerotinia stem rot disease severity index:** Average disease severity (including non-diseased plants). In each plot, 40 plants were evaluated (10 plants in each of four locations in the interior of each plot).

<sup>w</sup> Growth stage on Aug. 22 was R7; on average, at least one pod per plant had reached physiological maturity.

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

**Fungicide application A:** July 18 at 9:30 to 10:00 am; dry beans at 100% bloom (R1 growth stage). No foliar disease present. Wind = 6 mph out of the east to southeast, temperature = 74°F, relative humidity = 79%.

**Fungicide application B:** July 31 at 11:00 - 11:30 am; dry beans at early pod set (R3 growth stage). Sclerotinia was present at low levels in the non-treated control. Wind = 9 mph out of the south, temperature = 80°F, relative humidity = 65%.

\* Within-column means followed by different letters are significantly different (alpha = 0.05; Fisher's protected least significant difference)

<sup>†</sup> In order to meet model assumptions of normality and homoskedasticity, analysis of variance was conducted on the natural-log transformation of the disease severity index [LN(x + 1)]. For ease of interpretation, treatment means are reported as the (untransformed) percent disease.

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## METHODS:

- **Location of trial:** NDSU Carrington Research Extension Center, Carrington, ND.
- **GPS coordinates of research trial location:** 47.508324,-99.134361
- **Variety:** Maverick (pinto bean)
- **Experimental design:** randomized complete block      **Replicates:** 4
- **Seeded plot size:** 25 feet long x 6 feet (center-to-center)
- **Harvested plot size: approx.** 19 feet x 6 feet (center-to-center)
- **Row spacing:** 16 inches      **Rows per plot:** 4
- **Non-treated buffer plots were established between treatment plots.**
- **Previous crop:** spring wheat
- **Planting date:** May 24, 2012
- **Seeding rate:** 91,950 pure live seeds/ac (targeted population = 80,000 plants/ac; presumed mortality = 13%). The final population was lower than the targeted plant population due to problems with soil crusting.
- **Fungicide application A:** July 18 at 9:30 to 10:00 am; dry beans at 100% bloom (R1 growth stage). No foliar disease present. Wind = 6 mph out of the east to southeast, temperature = 74°F, relative humidity = 79%.
- **Fungicide application B:** July 31 at 11:00 - 11:30 am; dry beans at early pod set (R3 growth stage). Sclerotinia was present at low levels in the non-treated control. Wind = 9 mph out of the south, temperature = 80°F, relative humidity = 65%.
- **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.
- **Disease establishment:** This trial was established on a site with a history of Sclerotinia epidemics. Ascospores of Sclerotinia sclerotiorum were applied July 23 at 1:00-2:00 am (200,000 spores/ml in 24 gallons of water/ac), Aug. 2 at 12:05 - 1:00 am (2,400 spores/ml in 36 gallons of water/ac), and Aug. 3 at 12:40 to 1:00 pm (1,500 spores/ml in 41 gallons of water/ac) using a 60-in. hand boom with four equally spaced 8003 twin-jet nozzles operated at 20 psi. To facilitate disease establishment and development, microsprinklers were used to apply overhead irrigation to the trial 5 minutes every 30 minutes from July 19 to Aug. 21.
- **Sclerotinia disease ratings:** Sclerotinia stem rot incidence and severity were evaluated August 22 at the R7 growth stage (mid seed-fill; 50% of pods with fully developed seeds). In each plot, 40 plants (10 plants in each of four locations in the interior of each plot) were assessed individually for the percent of the plant tissue exhibiting Sclerotinia disease symptoms.
- **Harvest date:** September 18, 2012
- **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 natural-log transformation  $[\text{LN}(x+1)]$  was applied to the Sclerotinia disease severity index 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).

## 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.