

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

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

Michael Wunsch, plant pathologist

Michael Schaefer, research specialist

Billy Kraft, research technician

North Dakota State University Carrington Research Extension Center

## KEY FINDINGS:

- Applied as two sequential applications, **Endura** (boscalid) applied at 8 oz/ac and **Topsin** (thiophanate-methyl) applied at 40 fl oz/ac provided excellent control of **Sclerotinia** in this trial.
- A rate response was apparent for **Topsin**. Disease control and yields improved as the application rate increased from 20 to 30 to 40 fl oz/ac. Under the high **Sclerotinia** disease pressure observed in this trial, the 40 fl oz/ac rate was optimal.
- Applied as two sequential applications, **Proline** (prothioconazole) applied at 5.7 fl oz/ac and **Topsin** (thiophanate-methyl) applied at 20 fl oz/ac did not provide satisfactory **Sclerotinia** control. The performance of **Omega** (0.85 pt/ac) and **Propulse** (10.3 fl oz/ac followed by 8.6 fl oz/ac) was intermediate but lower than **Endura** (8 oz/ac).

**Concentrations of active ingredients in products evaluated in this trial:** Endura = 700 grams boscalid per kilogram; Omega = 500 grams fluazinam per liter; Proline = 480 grams prothioconazole per liter; ProPulse = 200 grams prothioconazole + 200 grams fluopyram per liter; Topsin = 540 grams thiophanate-methyl per liter.

## SUMMARY OF KEY RESULTS:

Treatments (APPLICATION TIMING) <sup>y</sup>	Sclerotinia			Yield	Test Weight	
	Sclerotinia incidence <sup>z</sup>	Sclerotinia severity <sup>y</sup>	Sclerotinia severity index <sup>x</sup>			
	September 7 and 10 <sup>w</sup>		13% moisture			
	percent	percent	percent	lbs/ac	bu/ac	
1 Non-treated check (water)	85 bcd*	53 de*	46 cde*	2271 cd*	61.7 a*	
2 Confidential	83 bcd	46 b-e	38 b-e	2160 cd	61.8 a	
3 Confidential	90 bcd	48 b-e	43 cde	2291 cd	61.5 a	
4 ProPulse 400SC 10.3 fl oz/ac + NIS 0.125% v/v (A)	88 bcd	38 b	34 bcd	2311 cd	61.8 a	
5 ProPulse 400SC 10.3 fl oz/ac + NIS 0.125% v/v (A) / Confidential (B)	81 bcd	46 b-e	38 b-e	2489 a-d	61.2 a	
6 Proline 480SC 5.7 fl oz/ac + NIS 0.125% v/v (A)	93 cd	59 e	54 e	2057 cd	61.2 a	
7 Proline 480SC 5.7 fl oz/ac + NIS 0.125% v/v (A,B)	91 bcd	58 e	53 e	1982 d	61.2 a	
8 Topsin 4.5FL 20 fl oz/ac + Proline 480SC 5.0 fl oz/ac (A)	73 b	45 b-e	34 bcd	2429 bcd	61.5 a	
9 Topsin 4.5FL 30 fl oz/ac (A)	82 bcd	42 bcd	35 bcd	2440 bcd	61.9 a	
10 Topsin 4.5FL 30 fl oz/ac (A,B)	77 bcd	42 bcd	35 bcd	2602 abc	61.8 a	
11 Omega 500F 0.85 pt/ac (A,B)	78 bcd	35 b	30 bc	2310 cd	61.6 a	
12 Endura 70WG 8.0 oz/ac (A,B)	54 a	19 a	10 a	3009 a	61.8 a	
13 Topsin 4.5FL 20 fl oz/ac (A,B)	93 d	51 cde	48 de	2350 cd	61.7 a	
14 Topsin 4.5FL 40 fl oz/ac (A,B)	75 bc	35 b	26 ab	2917 ab	61.7 a	
	F:	2.70	4.30	3.80	2.26	1.26
	P>F:	0.0083	0.0003	0.0006	0.0249	0.2761
	C.V.:	15.4	23.3	31.4	16.0	0.7

<sup>z</sup> Sclerotinia stem rot incidence was assessed by evaluating 40 plants in each plot (20 plants in each of two locations per plot).

<sup>y</sup> Sclerotinia severity: Percent disease severity among those plants exhibiting Sclerotinia stem rot. In each plot, 40 plants were evaluated.

<sup>x</sup> Sclerotinia disease severity index: Average percent disease severity across all plants, including those that were not diseased. In each plot, 40 plants were evaluated.

<sup>w</sup> Dry beans were at the R6 growth stage on Sept. 7 and 10 (mid seed-fill; 50% of pods with fully developed seeds).

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

**Fungicide application A:** July 25 at 7:45 to 8:45 am (temperature = 71-74°F, relative humidity = 93-99%, wind speed = 8 miles per hour); dry beans at 100% bloom (at least one open blossom on each plant). No sclerotinia disease symptoms were present.

**Fungicide application B:** Aug. 7 at 10:30 am to 12:00 noon (temperature = 73 to 75°F, relative humidity = 47 to 49%, wind speed = 7.6 to 10.4 miles per hour). Sclerotinia stem rot was at low levels (approx. 5% incidence) in the non-treated controls.

\* 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:** North Dakota State University Carrington Research Extension Center; Carrington, ND
- **GPS coordinates of research trial location:** 47.507795,-99.127452
- **Variety:** 'Othello' (pinto bean)
- **Experimental design:** randomized complete block      **Replicates:** 4
- **Harvested plot size:** 5 feet wide (center-to-center) x approx. 19 feet long
- **Row spacing:** 14 inches      **Rows per plot:** 4
- **Non-treated buffer plots were established between treatment plots.**
- **Previous crop:** soybeans
- **Planting date:** June 15, 2012. This experiment was originally planted May 24. Due to problems with soil crusting, emergence was poor, and the experiment was replanted on June 15.
- **Seeding rate:** 86,500 pure live seeds/ac
- **Fungicide application A:** July 25 at 7:45 to 8:45 am (temp. = 71-74°F, relative humidity = 93-99%, wind speed = 8 miles per hour); dry beans at 100% bloom (at least one open blossom on each plant). No sclerotinia disease symptoms were present.
- **Fungicide application B:** Aug. 7 at 10:30 am to 12:00 noon (temperature = 73 to 75°F, relative humidity = 47 to 49%, wind speed = 7.6 to 10.4 miles per hour). Sclerotinia stem rot was at low levels (approx. 5% incidence) in the non-treated controls.
- **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. Overwintered sclerotia of Sclerotinia sclerotiorum were spread across treatment plots in October 2011 (approx. 0.2 sclerotia per square foot). Ascospores of Sclerotinia sclerotiorum were applied July 29 at 11:30 pm (4,150 spores/ml in 30 gallons of water/ac) and Aug. 3 at 4:30-5:15 pm (2,550 spores/ml in 53 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 water to the trial 5 minutes every 30 minutes from late July to early September.
- **Disease assessments:** Sclerotinia stem rot incidence and severity were evaluated September 7 and 10 at the R6 growth stage (mid seed-fill; 50% of pods with fully developed seeds). In each plot, 40 plants (20 plants in each of two locations in the interior of each plot) were assessed individually for the percent of the plant tissue exhibiting Sclerotinia disease symptoms.
- **Harvest date:** September 25, 2012
- **Statistical analysis:** Data were evaluated with analysis of variance. Seed moisture levels were assessed during grain processing after harvest, and seed yield and quality results were adjusted to 13% grain moisture. (1) The assumption of constant variance was assessed with Levene's test for homogeneity of variances and visually confirmed by plotting residuals against predicted values. (2) The assumption of normality was assessed the Shapiro-Wilk test and visually confirmed with a normal probability plot. (3) The assumption of additivity of main-factor effects across replicates (no replicate-by-treatment interaction) was evaluated with Tukey's test for nonadditivity. 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, the Tukey multiple comparison procedure was employed. For reference, Fisher's protected least significant difference was also calculated; note that Fisher's protected LSD does not control the Type I error rate for all pair-wise comparisons of treatments at the level of the experiment. Analyses were conducted with replicate and treatment as main factor effects, and they were implemented in PROC UNIVARIATE and PROC GLM of SAS (version 9.3; SAS Institute, Cary, NC).

## FUNDING:

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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 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.