

Field evaluation of fungicides for management of Sclerotinia stem rot on soybeans

Carrington, ND (2012)

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KEY FINDINGS:

- Endura (boscalid) was the only fungicide to provide statistically significant improvements in disease control in this trial.** Applied as two sequential applications at 8 oz/ac, Endura improved disease control relative to the non-treated control. Applications of Omega (0.75 or 1 pt/ac), Topsin (20 fl oz/ac), or Domark (5 fl oz/ac) did not result in statistically significant differences in disease control across treatments.

Treatment (application timing) ^w	Sclerotinia severity index		Yield 13% moisture bu/ac	Test weight 13% moisture bu/ac	Seeds per pound 13% moisture seeds	Protein 13% moisture percent	Oil 13% moisture percent	
	Sclerotinia incidence ^z % Sept. 5 ^x	severity index ^y % Sept. 5 ^x						
1 Non-treated check (water)	13.1 b *	0.33 a *	44.9 a *	60.3 a *	3245 ab *	32.8 a *	18.4 a *	
2 Omega 500F 0.75 pt/ac (A,B)	14.4 b	0.36 a	41.4 a	60.2 a	3352 b	33.0 a	18.2 a	
3 Omega 500F 1.00 pt/ac (A,B)	5.3 ab	0.12 a	43.3 a	60.1 a	3280 ab	32.6 a	18.4 a	
4 Omega 500F 0.75 pt/ac + Topsin 4.5FL 15 fl oz/ac (A,B)	9.7 ab	0.22 a	47.6 a	60.2 a	3261 ab	32.8 a	18.5 a	
5 Omega 500F 0.75 pt/ac + Domark 230ME 3 fl oz/ac (A,B)	6.7 ab	0.17 a	42.2 a	60.4 a	3237 ab	32.2 a	18.5 a	
6 Topsin 4.5FL 20 fl oz/ac (A)	15.8 b	0.37 a	42.5 a	59.9 a	3317 ab	32.8 a	18.2 a	
7 Topsin 4.5FL 20 fl oz/ac (A,B)	10.3 ab	0.28 a	46.8 a	60.1 a	3224 ab	32.4 a	18.4 a	
8 Domark 230ME 5 fl oz/ac (A,B)	13.9 b	0.35 a	40.7 a	60.1 a	3276 ab	33.0 a	18.3 a	
9 Endura 70WG 8 oz/ac (A,B)	2.5 a	0.04 a	51.5 a	59.9 a	3157 a	32.6 a	18.5 a	
Treatment differences, F:		3.80	1.70	1.49	2.38	2.63	1.59	1.27
Treatment differences, P > F:		0.0052	0.1495	0.2110	0.0898	0.0320	0.1801	0.4208
C.V.:		27.9	71.8	12.9	0.4	2.1	1.2	1.3

^z Sclerotinia stem rot incidence: The percent of plants exhibiting Sclerotinia stem rot. In each plot, 90 plants were evaluated (30 plants in each of three locations per plot)

^y Sclerotinia stem rot disease severity index: Average disease severity across all plants, including those without any disease. A 0 to 3 scale was employed: 0 = no symptoms, 1 = lesions on lateral branches only, 2 = lesions on main stem, no wilt, and normal pod development, 3 = lesions on main stem resulting in wilting, poor pod fill, and plant death. In each plot, 90 plants were evaluated (30 plants in each of three locations per plot).

^x On September 5, soybeans in this trial were at the late R6 growth stage (full seed; one or more pods at the four uppermost nodes containing a green seed that fills the pod capacity).

^w Fungicide application timing:

Fungicide application A: July 14, 2012 at 6:15 - 7:30 am at the R1 to early R2 growth stage. Temperature = 62F, relative humidity = 98%, wind speed = 3.0 miles per hour from the west. No Sclerotinia stem rot was present.

Fungicide application B: July 27, 2012 at 11:00 am-12:00 pm am at the R3 growth stage. Temperature = 72F, relative humidity = 53%, wind speed = 4.5 miles per hour from the west.

* Within-column means followed by different letters are significantly different (alpha = 0.05; Tukey multiple comparison procedure)

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

Active ingredients in the fungicides evaluated in this trial:

Domark =

tetraconazole (230 grams tetraconazole per liter)

Endura = boscalid (700 grams boscalid per kilogram)

Omega = fluazinam (500 grams fluazinam per liter)

Topsin FL = thiophanate-methyl (540 grams thiophanate-methyl per liter)

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METHODS:

- **Location of trial:** North Dakota State University Carrington Research Extension Center, Carrington, ND
- **GPS coordinates of research trial location:** 47.508537,-99.129854
- **Variety:** Dairyland 'DSR 0401'
- **Experimental design:** randomized complete block **Replicates:** 4
- **Seeded plot size:** 25 feet long x 5 feet (center-to-center)
- **Harvested plot size:** approx. 19 feet x 5 feet (center-to-center)
- **Row spacing:** 7 inches **Rows per plot:** 7
- **Non-treated buffer plots were established between treatment plots.**
- **Previous crop:** sunflower
- **Planting date:** May 16, 2012.
- **Seeding rate:** 220,000 pure live seeds/ac
- **Fungicide application A:** July 14, 2012 at 6:15 - 7:30 am at the R1 to early R2 growth stage. Temperature = 62F, relative humidity = 98%, wind speed = 3.0 miles per hour from the west. No Sclerotinia stem rot was present.
- **Fungicide application B:** July 27, 2012 at 11:00 am-12:00 pm am at the R3 growth stage. Temperature = 72F, relative humidity = 53%, wind speed = 4.5 miles per hour from the west.
- **Fungicide application methods:** Fungicides were applied in 17.5 gallons of water/ac with a 60" hand boom with 4 equally spaced Spraying Systems TeeJet flat-fan 8001VS nozzles 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 22 at 10:30 pm to 11:30 pm (200,000 spores/ml in 54 gallons of water/ac) and August 3 at 9:15 to 9:45 pm (13,650 spores/ac in 25.4 gallons of water/ac). Spore applications were made using a 60-in. hand boom equipped with four equally spaced Spraying Systems 8003 twin-jet nozzles operated at 20 psi. To facilitate disease development, overhead microsprinkler irrigation was utilized.
- **Sclerotinia disease ratings:** Sclerotinia stem rot incidence and severity were evaluated Sept. 5 at the late R6 growth stage (full seed; one or more pods at the four uppermost nodes containing a green seed that fills the pod capacity). The 0 to 3 scale developed by Craig Grau at the University of Wisconsin was used: 0 = no symptoms, 1 = lesions on lateral branches only, 2 = lesions on main stem, no wilt, and normal pod development, 3 = lesions on main stem resulting in wilting, poor pod fill, and plant death. In each plot, 90 plants were evaluated (30 plants in each of three locations per plot).
- **Harvest:** October 2, 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 the assumption of homoskedasticity, a systematic natural-log transformation was applied to the Sclerotinia incidence data. The disease severity index and seeds per pound data violated the assumption of homoskedasticity, but no systematic transformation could be identified that corrected the problem, and analyses were conducted on the untransformed 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).

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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 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.