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Field evaluation of fungicides and partial host resistance for management of Sclerotinia stem rot on soybeans

Carrington, ND (2012)

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KEY FINDINGS:

- **Endura** (boscalid) **applied at 8 oz/ac as a single application at early bloom** (early R2 growth stage) **significantly reduced Sclerotinia stem rot on 4 of 4 soybean varieties on which it was tested.**
- **Under moderate Sclerotinia stem rot disease pressure, there was a trend towards increased yield when Endura was applied.** The Endura treatment averaged a 4-bushel yield increase across the four soybean varieties on which it was tested.
- **Neither the fungicide Proline** (prothioconzole) applied at 4.3 fl oz/ac **nor the herbicide Cobra** (lactofen) applied at 6 fl oz/ac at early bloom **resulted in statistically significant increases in disease control or an upward trend in soybean yield.**
- **In solid-seeded soybeans, foliar fungicides may be a more effective Sclerotinia management strategy than the use of partially resistant soybean varieties.** Note that results may differ in soybeans planted to wider rows; in this trial, row spacing was 7 inches. Additional testing is needed before final recommendations can be made.

KEY RESULTS: susceptible versus partially resistant soybean variety, 0.2 to 0.4 maturity

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

Fungicide application timing:
A: July 16 at early R2 growth stage; no Sclerotinia present

Fungicide treatment	Soybean variety	Sclerotinia incidence, %, Sept. 5		Yield, bushels per acre	
		0 15		0 60	
Non-treated check (water; **A**)	Susceptible	15	a	51	a
Cobra 6 fl oz/ac + COC 1.0 pt/ac **(A)**	Susceptible	10	ab	51	a
Proline 4.3 fl oz/ac + NIS 0.25% v/v **(A)**	Susceptible	8	ab	50	a
Endura 8 oz/ac **(A)**	Susceptible	4	b	55	a
Non-treated check (water; **A**)	Partially resist.	10	ab	51	a
Cobra 6 fl oz/ac + COC 1.0 pt/ac **(A)**	Partially resist.	9	ab	47	a
Proline 4.3 fl oz/ac + NIS 0.25% v/v **(A)**	Partially resist.	7	ab	51	a
Endura 8 oz/ac **(A)**	Partially resist.	3	b	55	a
***F*:**		4.59		1.71	
***P* > *F*:**		0.0023		0.1553	
CV:		45.5		9.0	

KEY RESULTS: susceptible versus partially resistant soybean variety, 0.8 to 0.9 maturity

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

Fungicide application timing:
A: July 16 at early R2 growth stage; no Sclerotinia present

Fungicide treatment	Soybean variety	Sclerotinia incidence, %, Aug. 31		Yield, bushels per acre	
		0 25		0 45	
Non-treated check (water; **A**)	Susceptible	21	b	40	a
Proline 4.3 fl oz/ac + NIS 0.25% v/v **(A)**	Susceptible	12	ab	40	a
Endura 8 oz/ac **(A)**	Susceptible	5	a	38	a
Non-treated check (water; **A**)	Partially resist.	21	b	37	a
Proline 4.3 fl oz/ac + NIS 0.25% v/v **(A)**	Partially resist.	14	ab	40	a
Endura 8 oz/ac **(A)**	Partially resist.	5	a	44	a
***F*:**		5.56		0.44	
***P* > *F*:**		0.0029		0.8155	
CV:		51.8		20.2	

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METHODS:

- **Location of trial:** North Dakota State University Carrington Research Extension Center; Carrington, ND
- **GPS coordinates of research trial location:** 47.508519, -99.128955 (0.8 to 0.9 maturity soybeans); 47.508231,-99.128915 (0.2 to 0.4 maturity soybeans)
- **Varieties:** Two pairs of varieties were used for this study; in each pair, one was partially resistant to Sclerotinia stem rot and the other was susceptible. One pair of varieties was in the 0.2 to 0.4 maturity range, and the other pair of varieties was in the 0.8 to 0.9 maturity range.
- **Experimental design:** randomized complete block **Replicates:** 5
- **Seeded plot size:** 5 feet wide (center-to-center) x 25 feet long
- **Harvested plot size:** 5 feet wide (center-to-center) x approx. 19 feet long
- **Row spacing:** 7 inches **Rows per plot:** 7
- **Non-treated buffer plots were established between treatment plots.**
- **Previous crop:** sunflowers
- **Planting date:** May 16, 2012.
- **Seeding rate:** 220,000 pure live seeds/ac
- **Fungicide application A, 0.8 to 0.9 maturity soybean varieties:** July 16, 2012 at 6:00-6:30 pm at the early R2 growth stage (an open flower at one of the two uppermost nodes); temperature = 78˚F, relative humidity = 74%, wind speed = 9 miles per hour from the northeast. No Sclerotinia stem rot was present.
- **Fungicide application A, 0.2 to 0.4 maturity soybean varieties:** July 16, 2012 at 7:00-7:30 pm at the early R2 growth stage (an open flower at one of the two uppermost nodes); temperature = 78˚F, relative humidity = 74%, wind speed = 9 miles per hour from the northeast. No Sclerotinia stem rot was present.
- **Fungicide application details:** Fungicides were applied in 15 gallons of water/ac using a 60" hand boom equipped with four equally spaced Spraying Systems TeeJet flat-fan 8001VS nozzles and operated at 35 psi.
- **Disease establishment:** This trial was established on a site with a history of Sclerotinia epidemics. Laboratory produced ascospores of *Sclerotinia sclerotiorum* were applied July 19 at 11:00 pm to 12:00 am (280,000 spores/ml in 60 gallons of water/ac). Spores were applied with a 60-in. hand boom with four equally spaced 8003 twin-jet nozzles that was operated at 20 psi. Spore applications were made at 20 psi with a 60-in. hand boom with four equally spaced twin-jet 8003 nozzles. To facilitate disease development, overhead microsprinkler irrigation was utilized during the bloom and pod-fill growth stages.
- **Disease assessments:** Sclerotinia stem rot incidence and severity were evaluated August 31 at the early R6 growth stage (full seed; one or more pods at the four uppermost nodes containing a green seed that fills the pod capacity) in the 0.8 to 0.9 maturity soybeans and September 5 at the late R6 growth stage in the 0.2 to 0.4 maturity soybeans. 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 date:** 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. The Sclerotinia incidence, severity and disease severity index data deviated slightly from the assumption of homoskedasticity, but no systematic transformations were found that resolved the problem, and analyses were conducted on the untransformed data. All other data fully 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 chickpea 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 in 2012 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.