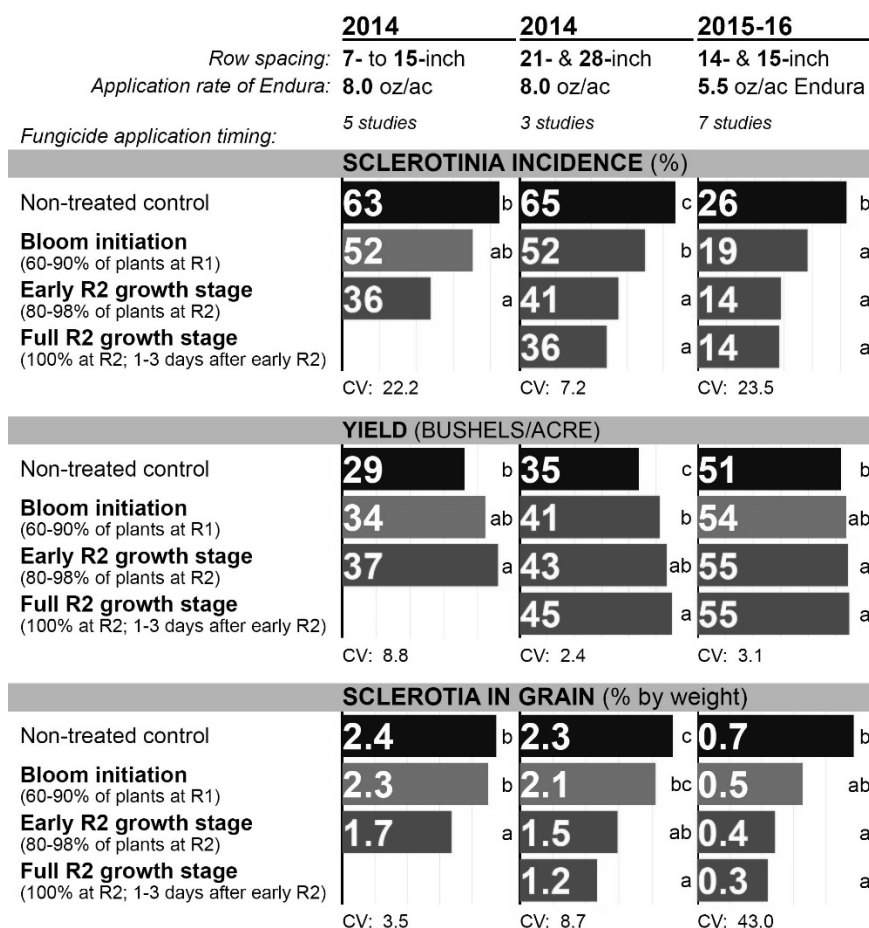# Optimizing Application Timing of Endura (boscalid) for Management of Sclerotinia in Soybeans
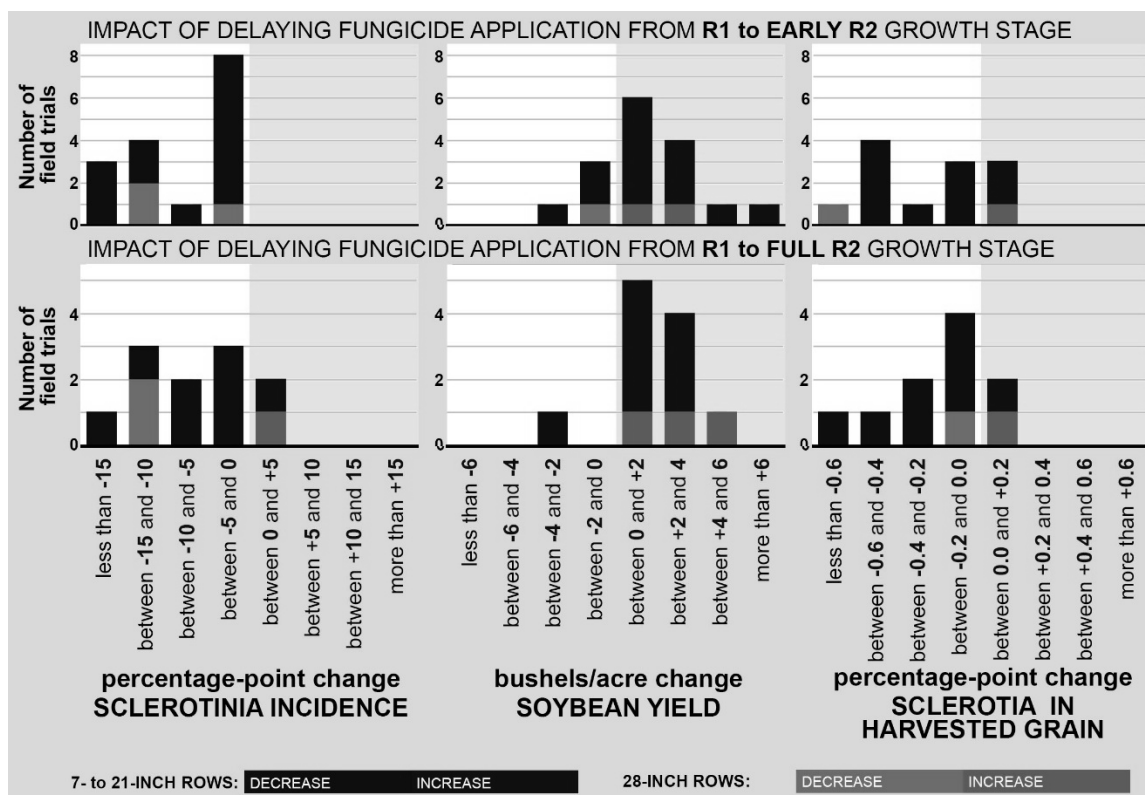
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Multi-location research conducted from 2014 to 2016 has shown that the current recommendation of applying fungicides at bloom initiation (R1 growth stage) when targeting Sclerotinia stem rot is not optimal when utilizing the fungicide Endura (boscalid). Across 16 field trials conducted on soybeans seeded to narrow, intermediate, or wide rows, delaying applications of the fungicide Endura (5.5 or 8.0 oz/ac) until the early R2 growth stage (80 to 98% of plants at R2) or full R2 growth stage (100% of plants at R2; generally 1 to 3 days after early R2) improved Sclerotinia control, increased soybean yields, and reduced contamination of the grain with sclerotia (Figures 1 and 2). Under conditions favoring Sclerotinia disease development, applications of Endura at bloom initiation (60 to 90% of plants at R1) resulted in an average yield gain of 3 to 6 bu/ac, applications at early R2 resulted in an average yield gain of 4 to 8 bu/ac, and applications at full R2 resulted in average yield gains of 4 to 10 bu/ac (Figure 1). Applying Endura at the early to full R2 growth stage was advantageous irrespective of fungicide application rate (5.5 or 8.0 oz/ac; Figure 1), soybean row spacing (Figures 1 and 2); or the timing of canopy closure.

Figure 1. Average Sclerotinia disease control, soybean yield, and contamination of grain with sclerotia in non-treated soybeans versus soybeans treated with the fungicide Endura at the R1 (bloom initiation) or R2 (full bloom) growth stages. *Within-column bars followed by different letters are significantly different (P < 0.05). Data are from 15 field trials conducted in 2014 to 2016; testing was conducted in Carrington (2015), Hofflund (2016), and Langdon and Oakes (2015 and 2016) utilizing soybean varieties of appropriate maturity at each location.*

2014 — Row spacing: **7-** to **15**-inch — Application rate of Endura: **8.0** oz/ac — 5 studies

2014 — Row spacing: **21-** & **28**-inch — Application rate of Endura: **8.0** oz/ac — 3 studies

2015-16 — Row spacing: **14-** & **15**-inch — Application rate of Endura: **5.5** oz/ac Endura — 7 studies

Fungicide application timing:

SCLEROTINIA INCIDENCE (%)

Timing	2014		2014		2015-16	
Non-treated control	63	b	65	c	26	b
Bloom initiation (60-90% of plants at R1)	52	ab	52	b	19	a
Early R2 growth stage (80-98% of plants at R2)	36	a	41	a	14	a
Full R2 growth stage (100% at R2; 1-3 days after early R2)			36	a	14	a
	CV: 22.2		CV: 7.2		CV: 23.5	

YIELD (BUSHELS/ACRE)

Timing	2014		2014		2015-16	
Non-treated control	29	b	35	c	51	b
Bloom initiation (60-90% of plants at R1)	34	ab	41	b	54	ab
Early R2 growth stage (80-98% of plants at R2)	37	a	43	ab	55	a
Full R2 growth stage (100% at R2; 1-3 days after early R2)			45	a	55	a
	CV: 8.8		CV: 2.4		CV: 3.1	

SCLEROTIA IN GRAIN (% by weight)

Timing	2014		2014		2015-16	
Non-treated control	2.4	b	2.3	c	0.7	b
Bloom initiation (60-90% of plants at R1)	2.3	b	2.1	bc	0.5	ab
Early R2 growth stage (80-98% of plants at R2)	1.7	a	1.5	ab	0.4	a
Full R2 growth stage (100% at R2; 1-3 days after early R2)			1.2	a	0.3	a
	CV: 3.5		CV: 8.7		CV: 43.0	

Figure 2. Frequency of observing increased or decreased Sclerotinia incidence, soybean yield, and sclerotia contaminants in grain as application timing of Endura (5.5 or 8 oz/ac) was delayed from the R1 to the early or full R2 growth stage. Bars denote the number of field trials exhibiting different magnitudes of responses. *Dark shading within bars represents results from soybeans seeded to 7- to 21-inch rows; light shading within bars represents results from soybeans seeded to 28-inch rows. Data are from 16 field trials conducted in 2014 to 2016; testing was conducted in Carrington (2015), Hofflund (2016), and Langdon and Oakes (2015 and 2016) utilizing soybean varieties of appropriate maturity at each location.*

IMPACT OF DELAYING FUNGICIDE APPLICATION FROM R1 to EARLY R2 GROWTH STAGE

IMPACT OF DELAYING FUNGICIDE APPLICATION FROM R1 to FULL R2 GROWTH STAGE

Number of field trials

percentage-point change
SCLEROTINIA INCIDENCE

bushels/acre change
SOYBEAN YIELD

percentage-point change
SCLEROTIA IN HARVESTED GRAIN

7- to 21-INCH ROWS: DECREASE | INCREASE   28-INCH ROWS: DECREASE | INCREASE

Endura often provides good control of Sclerotinia even when closed crop canopies make it difficult to achieve optimal fungicide deposition to the interior of the canopy where most Sclerotinia infections begin. The early to full R2 growth stage often coincides with canopy closure and the development of multiple dead blossoms on plants and, in most circumstances, is expected to coincide with the beginning of the period of maximum susceptibility to Sclerotinia stem rot. Delaying applications of Endura until the early to full R2 growth stage likely performs well because it ensures that the fungicide is applied preventatively and that the fungicide residual persists through the period of maximum susceptibility to Sclerotinia (generally the R2 and R3 growth stages).

Many of the other fungicides registered for managing Sclerotinia in soybeans appear to require much better fungicide deposition to the interior of the canopy in order to provide satisfactory disease control, and caution is advised before applying fungicides such as Aproach, Omega, Proline, or Topsin at the R2 growth stage unless good fungicide deposition to the lower canopy can be achieved. Rigorous fungicide application timing research targeting Sclerotinia has not been conducted with these other chemistries, but Aproach, Omega, Proline, and Topsin have generally performed best in field trials when applied at early to mid-R1 growth stage.