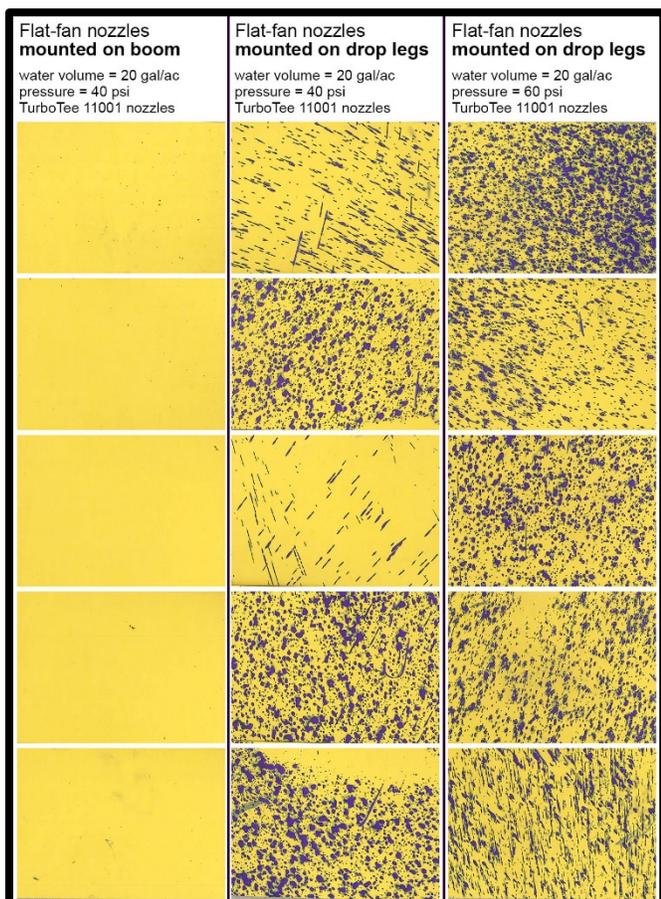


# Optimizing Fungicide Application Strategies for Management of Sclerotinia in Dry Edible Beans

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The Carrington Research Extension Center initiated two new studies in 2015 with the goal of optimizing the use of fungicides for management of Sclerotinia stem rot (white mold) in dry edible beans. Fungicide application timing was assessed, and the use of drop nozzles was tested as a means for improving fungicide coverage. Trials were conducted primarily on pinto beans, but some testing was also conducted on navy beans.

When applying fungicides for control of Sclerotinia on dry edible beans, some producers make applications at bloom initiation while others wait until the first short pin-shaped pods have developed in the canopy, and it isn't clear which practice is optimal. Seed yield and quality data are still being assessed, but there may be considerable flexibility for applying fungicides from early bloom through initial pin-pod development (Tables 1 and 2). More rigorous conclusions will be possible once seed yield and quality is assessed. All testing in 2015 was conducted with two sequential fungicide applications, but many producers in central North Dakota typically make only one application. In 2016, fungicide application timing testing will be expanded to evaluate optimal timing when a single fungicide application is made.



Fungicide coverage utilizing flat-fan nozzles mounted directly on a high-clearance boom or mounted on drop nozzles. Pictured are water-sensitive cards attached to the front of sunflower heads; black denotes fungicide deposition.

**Table 1.** Sclerotinia disease development in pinto beans seeded to narrow and wide rows relative to the timing of fungicide applications and relative to supplemental irrigation; Carrington, ND (2015). In all treatments, irrigation was applied as necessary to keep the top 0.5 inches of the soil moist for the first 2 weeks of July. During bloom and pod-fill, irrigation was either not applied or was applied as necessary to keep the top 0.5 inches of the soil moist from July 23-31 or from Aug. 8-18. Within-column means followed by different letters are significantly different ( $P < 0.05$ ).

Dry bean development at initial fungicide application					Percent of the canopy with Sclerotinia   Aug. 26-27, R7 growth stage (striping)						
					Irrigated July 23-31 (R2-R3)		Irrigated Aug. 8-18 (R4-R6)		Not irrigated		
Fungicide treatment (dates)	Growth stage	Pod length	Canopy closure, 14-inch rows	Canopy closure, 28-inch rows	14-inch row spacing	28-inch row spacing	14-inch row spacing	28-inch row spacing	14-inch row spacing	28-inch row spacing	
<b>'Lariat' pinto beans</b>											
Non-treated					55 c	59 c	41 a	41 c	41 a	36 a	
Non-treated					52 c	51 c	31 a	36 bc	34 a	37 a	
Endura 8 oz/ac (July 16, July 30)	73% with an open blossom	no pods	93-99% (ave. 97%)	80-97% (ave. 89%)	38 ab	29 a	27 a	16 ab	20 a	21 a	
Endura 8 oz/ac (July 20, Aug. 3)	100% with an open blossom	pin pods 1 cm long	90-99% (ave. 92%)	80-97% (ave. 92%)	31 a	32 ab	28 a	27 abc	25 a	23 a	
Endura 8 oz/ac (July 23, Aug. 5)		pin pods 1.5 cm long	90-100% (ave. 97%)	85-100% (ave. 97%)	47 bc	46 abc	25 a	15 a	32 a	30 a	
Endura 8 oz/ac (Aug. 3)	R4 growth stage	50% at maximum length	100%	100%	50 bc	49 bc	32 a	35 bc	32 a	32 a	
					CV:	14.2	20.6	29.1	35.6	36.7	38.1
<b>'Windbreaker' pinto beans</b>											
Non-treated					51 c	57 c	31 a	34 a	36 a	41 b	
Non-treated					42 bc	55 c	25 a	23 a	25 a	27 ab	
Endura 8 oz/ac (July 16, July 30)	99% with an open blossom	pin pods 1-1.5 cm long	90-99% (ave. 97%)	70-90% (ave. 80%)	25 a	31 ab	13 a	20 a	17 a	23 a	
Endura 8 oz/ac (July 20, Aug. 3)	100% with an open blossom	longest pods 3-5 cm long	96-99% (ave. 98%)	80-98% (ave. 88%)	27 ab	25 a	18 a	25 a	23 a	26 ab	
Endura 8 oz/ac (July 23, Aug. 5)	100% with an open blossom		92-100% (ave. 98%)	85-98% (ave. 93%)	28 ab	31 ab	18 a	25 a	24 a	23 a	
Endura 8 oz/ac (Aug. 3)	R4 growth stage	50% at maximum length	100%	100%	39 abc	48 bc	25 a	27 a	26 a	31 ab	
					CV:	21.0	25.3	41.7	44.2	39.4	27.1

**Table 2.** Sclerotinia disease development in pinto and navy beans seeded to narrow and wide rows relative to the timing of fungicide applications; Carrington, ND (2015). In all treatments, irrigation was applied as necessary to keep the top 0.5 inches of the soil moist from bloom initiation until August 15 (R5 growth stage). Within-column means followed by different letters are significantly different ( $P < 0.05$ ).

Fungicide treatment (dates)	Drybean development at initial fungicide application				Percent of the canopy with Sclerotinia	
	Growth stage	Pod length	Canopy closure, 14-inch rows	Canopy closure, 28-inch rows	14-inch row spacing	28-inch row spacing
<b>'Lariat' pinto beans</b>						
Non-treated					6 a	6 a
Endura 8 oz/ac (July 16, 30)	79% with an open blossom	Pods < 0.5 cm long	80-96% (ave. 92%)	60-85% (ave. 73%)	1 a	3 a
Endura 8 oz/ac (July 20, Aug. 3)	100% with an open blossom	Pods 0.5 to 1.5 cm long	95-99 (ave. 97%)	80-85% (ave. 83%)	1 a	5 a
Endura 8 oz/ac (July 23, Aug. 5)	100% with an open blossom	Pods 3 to 4 cm long	95-100% (ave. 97%)	80-96% (ave. 91%)	3 a	5 a
					CV: 122.1	99.1
<b>'Windbreaker' pinto beans</b>						
Non-treated					7 b	9 b
Endura 8 oz/ac (July 16, 30)	50% with an open blossom	no pods	85-95% (ave. 89%)	60-90% (ave. 83%)	2 ab	3 a
Endura 8 oz/ac (July 20, Aug. 3)	69% with an open blossom	Pods < 0.5 cm long	85-96 (ave. 94%)	75-98 (ave. 90%)	1 a	2 a
Endura 8 oz/ac (July 23, Aug. 5)	93% with an open blossom	Pods 1 to 1.5 cm long	95-96% (ave. 95%)	85-99% (ave. 95%)	4 ab	3 a
					CV: 82.2	65.7
<b>'Navigator' navy beans</b>						
Non-treated					0 a	2 a
Endura 8 oz/ac (July 16, 30)	39% with an open blossom	no pods	60-90% (ave. 80%)	45-70% (ave. 56%)	0 a	0 a
Endura 8 oz/ac (July 20, Aug. 3)	76% with an open blossom	Pods < 0.5 cm long	65-85% (ave. 78%)	50-70% (ave. 62%)	0 a	0 a
Endura 8 oz/ac (July 23, Aug. 5)	96% with an open blossom	Pods 1 to 1.5 cm long	70-95% (ave. 82%)	65-80% (ave. 73%)	0 a	0 a
					CV: 186.0	335.3
<b>'Medalist' navy beans</b>						
Non-treated					1 b	0 a
Endura 8 oz/ac (July 16, 30)	48% with an open blossom	no pods	85-98% (ave. 93%)	50-85% (ave. 69%)	0 a	0 a
Endura 8 oz/ac (July 20, Aug. 3)	88% with an open blossom	Pods < 0.5 cm long	92-97% (ave. 94%)	60-85% (ave. 74%)	0 a	1 a
Endura 8 oz/ac (July 23, Aug. 5)	97% with an open blossom	Pods 1 to 1.5 cm long	90-99% (ave. 95%)	65-95% (ave. 85%)	0 ab	0 a

Even with optimally-timed fungicide applications, however, fungicides often only reduce Sclerotinia by approximately 50 percent relative to a non-treated check in dry beans and other crops, resulting in unsatisfactory disease control under high Sclerotinia pressure. The difficulty of achieving good fungicide coverage to the lower half of the canopy, where most Sclerotinia infections begin, is likely responsible for the poor disease control.

A new, robust drop nozzle and canopy opener manufactured by the 360 Yield Center was tested on 'Lariat' and 'Windbreaker' pintos in 2015. Disease pressure was low, and robust conclusions could not be reached relative to impacts on disease control and grain yield, but use of the drop nozzles resulted in sharply increased deposition of fungicides to the lower stem and lower canopy. Additional testing of the drop nozzles is planned for 2016, and grants will be written to conduct trials in Carrington and Oakes, ND.