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

Carrington, ND (2010) ■ 15-inch row spacing

Michael Wunsch, plant pathologist
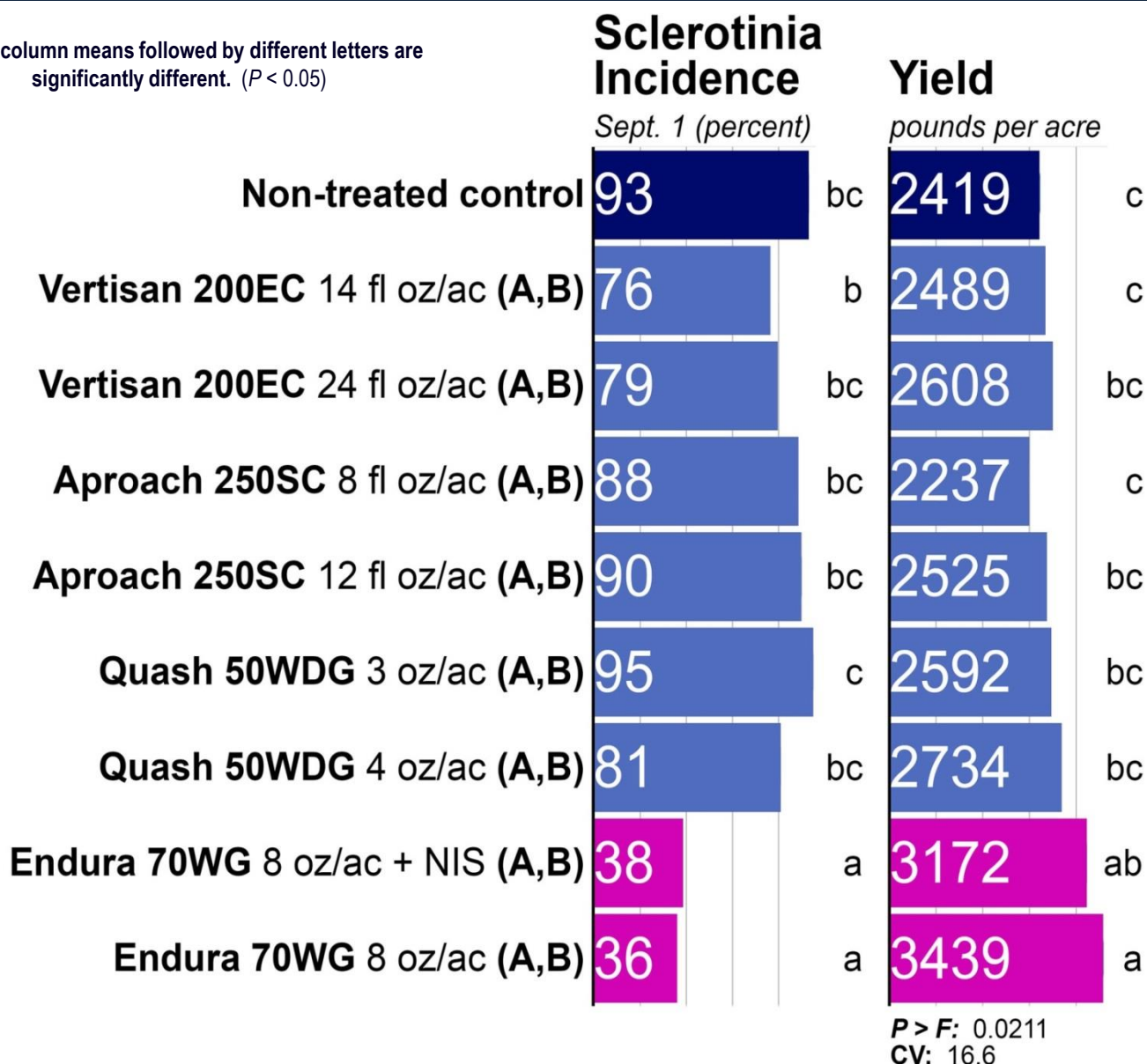**Blaine Schatz,** director and agronomist
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KEY FINDINGS:

- **Endura (8 oz/ac) was more effective against Sclerotinia than Aproach (8 or 12 fl oz/ac) , Quash (3 or 4 oz/ac) or Vertisan (14 or 24 fl oz/ac) in this trial.** Endura contains 700 grams of boscalid per kilogram of product; Aproach contains 250 grams of picoxystrobin per liter of product, Quash contains 500 grams of metconazole per kilogram of product, and Vertisan contains 200 grams of penthiopyrad per liter of product.

SUMMARY OF KEY RESULTS:

Within-column means followed by different letters are significantly different. ($P < 0.05$)

	Sclerotinia Incidence Sept. 1 (percent)		Yield pounds per acre	
Non-treated control	93	bc	2419	c
Vertisan 200EC 14 fl oz/ac (A,B)	76	b	2489	c
Vertisan 200EC 24 fl oz/ac (A,B)	79	bc	2608	bc
Aproach 250SC 8 fl oz/ac (A,B)	88	bc	2237	c
Aproach 250SC 12 fl oz/ac (A,B)	90	bc	2525	bc
Quash 50WDG 3 oz/ac (A,B)	95	c	2592	bc
Quash 50WDG 4 oz/ac (A,B)	81	bc	2734	bc
Endura 70WG 8 oz/ac + NIS (A,B)	38	a	3172	ab
Endura 70WG 8 oz/ac (A,B)	36	a	3439	a

P > F: 0.0211
CV: 16.6

Fungicide application timing:
- **A –** July 15 (approx. 75% of plants with an open blossom)
- **B –** July 26 (full flower, pods up to 1.5 to 2 inches long).

Fungicide application details:
- Aproach, Vertisan, and one of two Endura treatments were applied with a non-ionic surfactant (0.25% v/v)
- Fungicides were applied in 17.5 gallons of water/ac at 35 psi using 80015 flat-fan nozzles.

NOTE: The fungicide Quash (metconazole; Valent Corp.) is not currently registered for use on dry beans in the United States and should not be used. Results are provided for reference in the event that it is registered in the future.

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METHODS:

Experiment design, seeding, planting, and harvest: The experiment was a randomized complete block design with four replicates. Plots were seeded May 26 and harvested September 27. Pinto bean cultivar 'Lariat' was seeded in 16-inch rows at a seeding rate of 89,000 seeds/acre. Plots consisted of four rows, each 25 ft long (plot dimensions = 5.33 ft. by 25 ft.), and buffer plots were established between treatment plots in order to minimize spray drift between treatments. A misting system was established for the plots on a 20 ft grid using 'Nelson' R-10 rotators, P-2 9-degree red plate, and #40 nozzles and 40 PSI water pressure. The misting system was turned off during rain events and fungicide applications and kept off for a short period thereafter (approx. 9 to 12 hrs. for fungicide applications); otherwise, misting was conducted for 3 minutes every 30 minutes from shortly before inititiation of flowering until plants began approaching physical maturity. Beans were harvested for yield from 12 feet of each of the two center rows of each treatment plot.

Fungicide applications: Application A was made at R1 (about 75% of plants with an open flower) on July 15 at 10:00 am, and application B was made at full bloom (with most mature pods 1.5 to 2 inches long) on July 26 at 10:30 am. A 60-in. hand boom with four equally spaced TeeJet 80015nozzles was used. Applications were made with 17.5 gal./ac. water and 35 PSI pressure.

Inoculation: The experiment was inoculated with laboratory produced ascospores of *Sclerotinia sclerotiorum* July 18 at 11:30 pm (approx. 890,000 spores/square meter); the temperature at the time of inoculation was approx. 24 C. A 60-inch hand boom with four equally spaced TeeJet 8002 nozzles was used for applications. Spores were applied in 73.5 gal./ac. of water with 35 PSI pressure.

Disease assessment: Disease ratings were conducted August 10 and September 1. In each plot, 25 plants were assessed for disease severity; plants in the middle two rows of each plot were assessed, and no plants sampled at plot edges. The1-9 scale developed by CIAT (1987) was used: 1 = no visible symptoms, 2 = very light symptoms (< 5% of plant affected), 3 = light symptoms (5-10% of plant affected), 4 = visible and conspicuous symptoms (10-20% of plant affected), 5 = visible and conspicuous symptoms (20-30% of plant affected), 6 = visible and conspicuous symptoms (30-40% of plant affected), 7 = severe symptoms (40-60% of plant affected), 8 = severe symptoms (60-80% of plant affected), and 9 = very severe symptoms (80-100% of plant affected; plant dead).

Statistical analysis (1): Disease severity index, disease severity, and disease incidence were evaluated with cumulative, cumulative, and binary logistic regression, respectively (Hosmer and Lemeshow, 2000). and single-degree-of-freedom contrasts of all possible pairwise combinations of treatments were conducted with Wald chi-square tests. Replicate and treatment were included in the model as main effects, and replicate-by-treatment interaction was included in the model. Pairwise treatment contrasts were conducted on the full model (main effects plus interaction) for the Sept. 3 disease severity index and Sept. 3 disease severity analyses but on a reduced model with only the main effects (no interaction term) for the other analyses, for which the Wald chi-square tests could not be properly implemented using the full model. Analyses were implemented in PROC GENMOD of SAS (version 9.2; SAS Institute, Cary, NC), and the Bonferroni multiple comparison procedure was used to control the Type I error rate at the level of the experiment across the 66 pair-wise contrasts of treatments.

Statistical analysis (2): Analysis of variance was conducted on the plot-level yield and test weight data. Seed moisture levels were evaluated for each sample, and yields were adjusted to 13.0% moisture. The assumptions of constant variance and normality were assessed by plotting residuals against predicted values and evaluating their variance and by plotting residuals against their ranks and examining their linearity. The assumptions were met, and no transformations were applied to the data. Single-degree-of-freedom contrasts were performed for all pairwise combinations of isolates; to control the Type I error rate at alpha = 0.01 the level of the experiment, the Tukey multiple comparison procedure (Neter et al. 1996) was employed. Analyses were conducted controlling for the effect of experimental replicate and replicate by treatment interaction and were implemented in PROC GLM of SAS (version 9.2; SAS Institute, Cary, NC).

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 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.