



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

Carrington, ND (2013) ■ 14- and 28-inch row spacing

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## KEY FINDINGS:

- **Rotational strategies with Topsin (40 fl oz/ac) and Endura (8 oz/ac) were more effective than two sequential applications of Endura (8 oz/ac).**
- **When applied as two sequential applications 14 days apart, Omega (0.85 pt/ac), Endura (8 oz/ac), and ProPulse (10.3 fl oz/ac) performed similarly.**
- **When applied as two sequential applications 14 days apart, Rovral (2 pt/ac), Switch (14 oz/ac), Proline (5.7 fl oz/ac), Quash (2.5 oz/ac), and Aproach (12 fl oz/ac) were less effective than Omega (0.85 pt/ac), Endura (8 oz/ac), and ProPulse (10.3 fl oz/ac).** Rovral, Switch, and Proline were more effective than Quash, Aproach, and the non-treated control.
- **Under high Sclerotinia disease pressure, pinto bean yields were optimized in narrow (14-inch) row spacing relative to wide (28-inch) row spacing.** Sclerotinia severity was lower in the wide (28-inch) row spacing relative to the narrow (14-inch) row spacing, but the lower disease levels were not enough to overcome the yield penalty associated with planting pinto beans to wide rows.
- **The relative efficacy of the different fungicide treatments was similar across the narrow (14-inch) and wide (28-inch) row spacing.** Row spacing did not have an effect on fungicide efficacy in this trial.

## Concentrations of active ingredients in products evaluated in this trial:

- Aproach = 250 grams picoxystrobin per liter
- Cannonball = 500 grams fludioxonil per kilogram
- Endura = 700 grams boscalid per kilogram
- Omega = 500 grams fluazinam per liter
- Topsin = 540 grams thiophanate-methyl per liter
- Priaxor = 333 grams pyraclostrobin plus 167 grams fluxapyroxad per liter.
- Proline = 480 grams prothioconazole per liter
- ProPulse = 200 grams prothioconazole + 200 grams fluopyram per liter
- Quash = 500 grams metconazole per kilogram
- Rovral = 480 grams iprodione per liter
- Switch = 250 grams fludioxonil + 375 grams cyprodinil per kilogram

## FUNDING:

This project was funded by the **Northarvest Bean Growers Association.**

## 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 this report.
- 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.



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## METHODS:

- **Location of trial:** NDSU Carrington Research Extension Center, Carrington, ND.  
**GPS coordinates of research trial location:** 47° 30.501', -99° 7.792'
- **Tillage:** Disked once and cultivated twice (once deep and once shallow) on May 28, 2013.
- **Fertility:** 80 lbs/ac of Nitrogen were applied as urea (46-0-0) on May 28 and incorporated to 2 inches deep.
- **Maintenance herbicide applications:** On June 26 (at 8:00 to 9:00 pm) when the dry beans had 1 to 2 trifoliolate leaves, Raptor (2 fl oz/ac; 12.1% ammonium salt of imazamox, 1 lb ai/gal; BASF Corp.), Rezult B (16 fl oz/ac; sodium salt of bentazon, 53% and 5 lbs ai/gal; BASF Corp.), Assure II (10 fl oz/ac; quizalofop p-ethyl, 10.3%; 0.88 lb ai/gallon; DuPont Corp.), 1.5 gallons/100 gallons methylated seed oil (Drexel MES 100, 100% methylated seed oil; Drexel Chemical Company, Memphis, TN), and 2.5 gallons per 100 gallons liquid ammonium sulfate (28-0-0) were applied in 12.9 gallons of water/ac to control red-root pigweed, wild buckwheat, lambsquarters, foxtail barley, and other weeds. On July 5 when the beans had three trifoliolate leaves, Raptor (2 fl oz/ac; ammonium salt of imazamox, 12.1%, 1 lb ai/gal; BASF Corp.), Rezult B (24 fl oz/ac; sodium salt of bentazon, 53% and 5 lbs ai/gal; BASF Corp.), 1.5% (v/v) methylated seed oil (Drexel MES 100, 100% methylated seed oil; Drexel Chemical Company, Memphis, TN), and 2% v/v ammonium sulfate (28-0-0) were applied in 20 gallons of water/ac to control red-root pigweed, mustard, and other small broadleaf weeds.
- **Variety:** 'Lariat' (pinto bean)
- **Experimental design:** randomized complete block with a split-plot arrangement      **Replicates:** 6  
**Main factor:** row spacing (14 inches or 28 inches)      **Sub-factor:** fungicide treatment
- **Seeded plot size:** 5 ft (center-to-center) x 25 ft long      **Harvested plot size:** 5 ft (center-to-center) x approx. 21 ft long
- **Untreated buffer plots were established between treatment plots.**
- **Number of rows per plot:** Treatment plots contained 4 rows spaced 14 inches apart or 2 rows spaced 28 inches apart. Buffer and guard plots contained 4 rows spaced 14 inches apart.
- **Previous crop:** soybeans
- **Planting date:** May 28, 2013
- **Seeding rate:** 91,950 pure live seeds/ac (target plant population = 80,000 plants/ac; presumed seedling mortality = 13%)
- **Fungicide application A:** August 5 at 7:00 to 9:30 pm; no Sclerotinia stem rot present; dry beans at late R2 to early R3 growth stage (many, but not all, plants with a full-length pod); 1 to 2 days after canopy closure in the dry beans seeded to 14-inch rows, canopy varied from completely open to partially closed in the dry beans seeded to 21-inch rows; temperature = 61.6 to 77.5°F, relative humidity = 36 to 75%, wind = 0 to 2.2 mph out of the west.
- **Fungicide application B:** August 19 at 9:15 to 11:30 am; Sclerotinia stem rot present in buffer plots and some treatment plots; dry beans at R5; temperature = 77.3 to 86.7°F, relative humidity = 49.3 to 68.9%, wind = 3.8 to 4.5 mph out of the west.
- **Fungicide application details:** Fungicides were applied with a 57-inch hand boom equipped with four equally spaced Spraying Systems TeeJet XR 8001VS flat-fan nozzles at a spray volume of 15 gal water/A operated at 35 psi.
- **Disease establishment:** The trial was established on a site with a previous history of Sclerotinia epidemics. In addition, sclerotia of Sclerotinia sclerotiorum obtained from a sunflower processing plant were applied to plots on June 14 and July 15. On June 14, two to three sclerotia were placed approx. 0.5 inches deep in each of six locations per plot; on July 15, approx. 1.25 grams of sclerotia were placed approx. 0.25 inches deep in each of eight locations per plot. Prior to placement in the field, the sclerotia were artificially vernalized by alternating them between a freezer (-20°C for at least 12 hours) and room temperature (20 to 25°C for at least 8 hours) a minimum of eight times. To facilitate disease development, overhead irrigation was applied to this trial through microsprinklers established on a 20 ft x 20 ft grid.
- **Sclerotinia disease assessment:** Sclerotinia disease incidence and severity were assessed on Sept. 3-6 at the R7 growth stage (at least one pod per plant changed color / striped; physiological maturity). In each plot, 40 plants (10 plants in each of four locations per plot) were evaluated individually for the percent of the canopy exhibiting Sclerotinia stem rot disease symptoms.
- **Harvest date:** The beans were manually pulled on October 4 at maturity and harvested October 24; cool, wet weather delayed harvest.
- **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. All data met model assumptions. Customized F-tests were constructed for the main effect using replicate by treatment interaction for the error term. Analyses were conducted with replicate, main factor, main factor by replicate interaction, sub-factor, and sub-factor by main-factor interaction in the model. Single-degree-of-freedom contrasts of treatments were performed for all pairwise comparisons of treatments; to control the Type I error rate at the level of the experiment, the Fisher's protected least significant difference multiple comparison procedure was employed. Analyses were implemented in PROC GLM of SAS (version 9.2; SAS Institute, Cary, NC).