FINAL REPORT TO THE PENNSYLVANIA VEGETABLE MARKETING AND RESEARCH PROGRAM

PROJECT TITLE:
White and Gray Mold Control in Snap Beans

PERSONNEL:
Helene R. Dillard, Professor; Joi Strauss, Technician; Carol Bowden, Temporary Technician
Cornell University, Department of Plant Pathology and Plant Microbe Biology, Geneva, NY 14456, hrd1@cornell.edu, 315-787-2469

OBJECTIVE:
Conduct a comprehensive field trial to compare efficacy of registered and non-registered new fungicides for control of white mold caused by *Sclerotinia sclerotiorum* and gray mold caused by *Botrytis cinerea* on snap beans.

BACKGROUND:
White and gray molds are the two primary reasons that growers apply fungicides to snap bean crops. Between the two diseases, white mold is by far the most damaging disease. White mold on snap beans is caused by the fungus *Sclerotinia sclerotiorum*. This fungus is difficult to control and is known to attack over 400 plant species that includes horticultural crops, weeds, trees, and vines (I recently purchased table grapes and found white mold in the bunch!). *S. sclerotiorum* is most active when the soil and plants are wet. The fungus produces small black survival structures called sclerotia, which can survive in soil for several years. The sclerotia germinate to produce small mushroom-like structures called apothecia, and the apothecia produce ascospores that are forcibly discharged into the air. When the spores land on host tissue, they germinate and infect the plant. Gray mold is caused by the fungus *Botrytis cinerea*. This fungus also has a wide host range. It produces gray to brown colored spores directly on the infected tissue.

Snap bean blossoms are the preferred food source for both pathogens, which means that protecting the blossoms from infection is a top priority. Fungicide applications must coincide with the opening of the bean blossoms in order to be most effective. And the chemical applied must provide control over an extended time period, because not all bean blossoms open at once. For many years, the industry standard was Ronilan, and our goal has been to identify a fungicide replacement of equal efficacy. This year we conducted a trial where we compared 15 treatments for control of white mold in snap beans.

RESULTS:
The trial was conducted at the Agricultural Experiment Station in Geneva, NY, in a Honeoye silt loam soil with a pH of 6.6. The first planting of beans had poor emergence and the field had to be abandoned. Unusually wet spring weather further delayed our second attempt to plant the snap beans. Finally, on June 25, snap beans (variety = Gold Mine) were seeded using a Monosem planter at 8.7 seeds per ft with 30-in. row spacing. Fertilizer (10-10-10 with supplemental manganese and zinc) was banded during planting (300 lb/A). Dual Magnum (1 pt/A) was applied post-plant.

The fungicide treatments were arranged in a randomized complete block design with four replications. The treatments consisted of single row plots that were 30 ft long with 5 ft of untreated beans as a buffer zone between blocks. The fungicides were applied using a CO_2 hip mounted single-row sprayer calibrated to deliver 68 gal/A at 50 psi with three 8002 flat fan nozzles. The sprayer was configured with one nozzle over the top of the row and a 9-in. drop nozzle on each side of the row angled into the canopy. Fungicide sprays were applied on August 5 at 40% bloom and August 12 at 100% bloom to pin pod stage. The same CO_2 sprayer configuration was used to apply spores of white and gray molds (*Sclerotinia sclerotiorum* and *Botrytis cinerea*) on August 6 and August 13. Following the spore applications, Aluminet (double-faced aluminum-coated shade cloth with a 40% shade factor) was placed over the entire plot until harvest. The shade cloth was used to keep the plants cool and maintain moisture in the plant canopy to encourage disease development.

Snap bean pods in 10 ft of row were hand harvested and evaluated September 11-13. Pods were categorized as healthy, infected with gray mold or white mold, counted and weighed. Disease incidence and yield were calculated. Mean monthly minimum and maximum temperatures (°F) were 57 and 74 in June, 63 and 81 in July, 58 and 77 in August, and 55 and 76 in September. Total monthly rainfall (in inches) was 5.8, 4.7, 4.0 and 2.0 for June, July, August and September, respectively. To enhance disease development, irrigation was applied on August 16 and 23, and September 9.

Disease incidence was moderate for white mold (13.0%) and low for gray mold (1.9%) on the pods in the inoculated control. White mold incidence was statistically less in the Topsin + Rovral, Topsin XTR, Propulse, Luna Tranquility, Endura, Topsin, Rovral and Proline treatments when compared to the inoculated control. The Topsin + Rovral and Topsin XTR treatments achieved excellent control (less than 2% incidence) of white mold on pods. None of the treatments resulted in statistically less gray mold incidence. Statistically greater marketable yields were achieved in the Topsin + Rovral, Luna Tranquility, Rovral and Topsin treatments. Higher total yield was achieved in the Topsin + Rovral, Luna Tranquility, Topsin, Rovral and Bravo treatments when compared to the untreated control. No phytotoxicity was observed in any of the treatments.

Treatment, rate/A	White mold on pods(%)	Gray mold on pods(%)	Marketable yield (t/A)	Total yield (t/A)
Untreated Control	13.0bcd [z]	1.9cde	5.0de	5.3ef
Topsin 4.5FL, 20 fl oz	4.1ef	5.8b	6.1abc	6.4abc
Endura 70 WDG, 11 oz + 0.125 v/v NIS	3.6ef	0.4e	5.8abcd	6.0abcde
Proline 480 SC, 5.7 fl oz + 0.125 v/v NIS	5.8ef	3.5c	5.1de	5.4def
Propulse FL, 8.6 fl oz + 0.125 v/v NIS	2.5f	2.0cde	5.3cde	5.4def
Cannonball WP, 7 oz	8.2def	2.3cd	5.5bcde	5.8bcde
Fontelis SC, 30 fl oz	20.3a	1.2de	4.8ef	5.3ef
Quash WDG 4 oz	19.0ab	1.9cde	4.1f	4.6f
Rovral 4F, 2 pt	5.5ef	1.3de	6.2abc	6.4abc
Bravo WS, 3 pt	16.5abc	1.6de	5.8abcd	6.3abcd
Switch WDG, 14 oz	13.8abcd	1.5de	5.1de	5.5de
Luna Tranquility SC, 11.2 fl oz	2.7f	1.9cde	6.3ab	6.5ab
Aproach SC, 12 fl oz + 0.125 v/v NIS (1x)	10.4cde	2.7cd	5.1de	5.4def

Aproach SC, 12 fl oz + 0.125 v/v NIS (2x)	16.0abc	2.6cd	5.1de	5.6cde
Topsin XTR FL, 30 fl oz	1.8f	8.7a	5.5bcde	5.8bcde
Topsin 4.5FL, 20 fl oz + Rovral 4F, 2 pt	1.7f	5.8b	6.5a	6.8a
LSD ($P \leq 0.05$)	7.0	1.8	0.9	0.9

[z] Means in the same column with different letters differ significantly according to LSD ($P \leq 0.05$).

IN CONCLUSION:

Eight treatments (Topsin + Rovral, Topsin XTR, Propulse, Luna Tranquility, Endura, Topsin, Rovral and Proline) provided very good white mold control in this trial. The Topsin + Rovral and Topsin XTR treatments achieved excellent control (less than 2% incidence) of white mold on pods. These results are consistent with the experiment we conducted last year, and add to our data base for developing disease control recommendations.

We very much appreciate the funding we have received from the Pennsylvania Vegetable Marketing and Research Program in support of this research.