OPVC FINAL PROJECT REPORT: *YEAR (2016)* **PROJECT YEAR**: *(2016)*

1. OPVC REPORT COVER PAGE (1 page)

Project Title: Evaluation of combined fungicide and genetic resistance to control white mold in green beans, 2016

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TOTAL BUDGET REQUEST (all years): Year 1: $2,727 **Year 2**: $2,775
Budget History:

Item	Year 1:	Year 2:
Salaries		
Benefits		
Student Wages	2,432	2432
OPE @ 10%	195	243
Equipment		
Supplies	100	100
Travel		
Plot Fees		
Other		
Total	2,727	2,775

2. EXECUTIVE SUMMARY (ABSTRACT, maximum 300 words):

The resistance to white mold obtained so far in snap beans has been derived from NY 6020, which provides partial physiological resistance. Under light disease pressure, plants will show few if any symptoms, while under heavy pressure, the plants may show a moderate level of infection (whereas susceptible BBL types will be 100% molded). Cultivars with this form of resistance would not need any supplemental control with fungicides, whereas under heavy pressure, fungicides might be required, but at a reduced frequency or quantity. The objective of this study was to determine whether OR6771 would benefit from an integrated mold control approach that included fungicides typically used in snap production, Topsin M and Rovral tankmixed.

White mold pressure was extremely high in this field with as much as 100% of the plants infected with mold in some plots and an average of 61% of plants infected in OR91G and OSU5630 plots. The varieties OSU5630 and OR91G had the greatest white mold ratings, and the application of Topsin+Rovral fungicides reduced white mold incidence in these varieties significantly and increased yield slightly. In contrast to OSU5630 and OR91G, fungicides had no effect on pod yield of OSU6771, number of plants infected, and mold severity ratings, even though plant density and biomass was similar to the other lines. This suggests that indeed the resistance of OSU6771 to white mold should reduce the amount and/or frequency of fungicidal controls needed for production of this variety. However, the full monetary benefit of resistance in OSU6771 was not fully realized in this study because pod yield of OSU6771 was lower than that of OSU5630 and OR91G.

FULL REPORT

3.A BACKGROUND

The resistance to white mold obtained so far in snap beans has been derived from NY 6020, which provides partial physiological resistance. Under light disease pressure, plants will show few if any symptoms, while under heavy pressure, the plants may show a moderate level of infection (whereas susceptible BBL types will be 100% molded). As such, cultivars with this form of resistance would not need any supplemental control with fungicides, whereas under heavy pressure, fungicides might be required, but at a reduced frequency or quantity. While we have been able to demonstrate reduced disease incidence and severity using our rating scales, how these translate into increased yield for the grower and percent moldy pods at the processing plant is not known.

Previously, Stone and Myers examined the effects of resistant green bean lines combined with the biological control agent Contans on white mold disease incidence (Figure 1 next page). We observed that both resistance alone and biological control alone significantly reduced disease, and when used in combination, brought levels of disease incidence down to levels that would be acceptable to the cannery. In this particular experiment, percent moldy pods was reduced from about 24% to 4%. We would expect to see a similar additive effect using resistance in combination with fungicides.

We have developed several advanced lines that have the NY 6020 resistance in a BBL background. We proposed to compare two of these lines with susceptible checks with and without fungicidal control of white mold in our white mold nursery.

This experiment lays the groundwork for cultural recommendations for control of white mold disease using a combination of genetic resistance and fungicides. Farmers will benefit from the deployment of

this technology package with reduced production costs. Processors will benefit by receiving green beans of higher quality that will require fewer resources at the plant to prepare for canning and freezing.

3.B OBJECTIVES

Determine yield, pod quality and $/A as well as disease incidence and severity on plants and pods of partially resistant and susceptible green bean cultivars when grown under white mold pressure.

3.C SIGNIFICANT RESULTS

- The varieties OSU5630 and OR91G had the greatest white mold ratings, and the application of Topsin+Rovral fungicides reduced white mold incidence in these varieties significantly and increased yield slightly.
- In contrast to OSU5630 and OR91G, fungicides had no effect on pod yield of OSU6771, number of plants infected, and mold severity ratings, even though plant density and biomass was similar to the other lines.
- This suggests that indeed the resistance of OSU6771 to white mold should reduce the amount and/or frequency of fungicidal controls needed for production of this variety.
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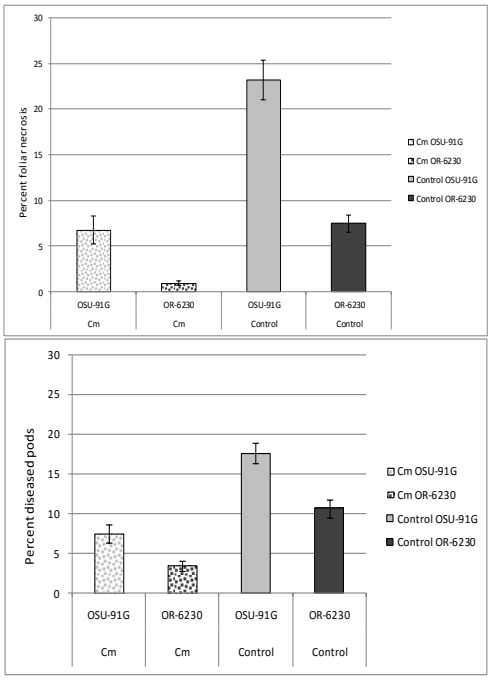

Figure 1. Effect of *Coniothyrium minitans* (Contans) application and plant resistance on foliar white mold severity and pod white mold incidence.

3.D METHODS (2016)

A randomized complete block design with 20-foot plots, 2 rows per plot, and four replicates was established in our white mold nursery. Four cultivars were planted on July 11, 2016 consisting of OSU5630, OR91G (susceptible) and OSU6771 and NY-6020 (partially resistant). NY-6020, the original source of white mold resistance, was substituted for the partially resistant experimental line OSU6774 because of limited availability of seeds. Plots were planted on 21-Jul so that harvest occurred in the fall, when environmental conditions favored white mold disease. Plots were seeded at a density equivalent to 174,000 plants/A on 30 inch rows. Topsin M + Rovral (22 oz + 1.5 pt/A) were applied on 25-Aug and 9-Sept to the four varieties with an untreated reference for each variety. Fungicides were applied with two drop nozzles positioned at a 45 deg angle on each side of the row in 40 GPA water. Percent bloom at the time of first application was estimated at: 34% for OSU5630; 40% for OR91-G; 7% for OSU6771; and 0% for NY-6020. The second application was applied 2 weeks. Beginning at bloom, plots received 30 minute irrigations each evening to extend the leaf wetness period. At harvest (15-Sept), all of the plants in 5 ft sections of row were pulled and each plant rated for disease incidence (% plants infected) and severity (rated on a scale of 0-9). Pods were removed and rated for mold incidence. Pods from plots of the same treatment were composited before they were graded.

3.E RESULTS (2016)

White mold pressure was extremely high in this field with as much as 100% of the plants infected with mold in some plots and an average of 61% of plants infected in OR91G and OSU5630 plots. Two applications of Topsin and Rovral significantly reduced the percentage of plants infected with white mold.

The varieties OSU5630 and OR91G had very high white mold ratings when not treated with fungicide; fungicides reduced white mold incidence in these varieties significantly and increased yield slightly, but with less consequence to the net value. NY-6020 had a low rate of infection even though plant biomass was similar to the other varieties.

In contrast to last year, fungicides had no effect on pod yield of OSU6771, number of plants infected, and mold severity ratings, even though plant density and biomass was similar to the other lines. This suggests that indeed the resistance of OSU6771 to white mold should reduce the amount and/or frequency of fungicidal controls needed for production of this variety. The benefit of resistance in OSU6771 was not fully realized in this study because pod yield of OSU6771 was lower than that of OSU5630 and OR91G.

An interesting observation not related to mold control but to the direct effect of the fungicides on the bean plants. The Topsin+Rovral fungicide combination caused leaves of NY-6020 to bronze and this was not noted in any other variety. Perhaps new lines should be screened for tolerance to these fungicides before release, since the industry is completely dependent on fungicides to control white and gray mold.

Table 1. Effect of variety and fungicide treatment on bean yield and value, Corvallis, 2016.

Var	Fung	Plants harvested	Plant biomass	Pod Yield	Plants infected	White Mold Severity	Moldy pods	Grade	$ Net Value
		no/5 ft	*t/a*	*t/A*	*%*	*0-9 scale (cumulative rating of 10 plants)*	*%*	*% 1-4*	*$/A*
NY-6020	Top+Rov2x [a]	53	20.7	1.6	3	1	0.0	66	$ 287
NY-6020	Untreated	48	19.3	1.4	10	2	0.1	63	$ 255
OR91G	Top+Rov 2x	54	26.2	9.0	38	4	0.0	49	$ 1,526
OR91G	Untreated	58	22.6	8.4	55	21	1.3	61	$ 1,512
OSU5630	Top+Rov 2x	60	25.3	9.8	8	4	0.1	64	$ 1,772
OSU5630	Untreated	59	21.5	8.4	68	31	1.3	73	$ 1,578
OSU6771	Top+Rov 2x	59	24.4	5.4	18	4	0.0	65	$ 991
OSU6771	Untreated	52	22.3	5.6	15	4	0.4	70	$ 1,044
Anova	Var	0.08	0.003	<.0001	0.016	0.011	0.376		
	Fung	0.35	0.002	0.24	0.031	0.004	0.026		
	Var*Fung	0.39	0.632	0.53	0.100	0.033	0.480		

[a] Topsin and Rovral applied twice. [b] $210/ton for 1-4 sieve pods; $130/ton for 5-7 sieve pods