

CONTROL OF WHITE AND GRAY MOLD ON SNAP BEANS 2005

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In 2005, five trials were conducted at the Geneva Experiment Station looking at white and gray mold control on snap beans (variety Gold Mine). All trials were irrigated, inoculated and shaded.

Field 48c Chemical Trial (planted June 27) The processor imposed threshold for rejection of beans at the processing plant ranges from 3 to 6% pods with mold. Disease pressure was low due to hot dry weather. For white mold incidence, all treatments were significantly better than the control, except for Headline. There were significant differences in marketable and total yield among the treatments, but treatments did not differ from the untreated control. The presence of viruses in the plots may have negatively impacted yield. No phytotoxicity was observed.

Treatment and rate/A	Gray mold (%)	White mold (%)	Marketable yield (t/A)	Total yield (t/A)
Control.....	2.20 a*	2.4 a	2.6 abc	2.7 abc
Ronilan 50DF 1.0 lb, A, B**	0.23 de	0.1 c	2.0 abc	2.0 abc
Endura 70WDG 5.9 oz, A, B	0.19 de	0.0 c	2.6 abc	2.6 abc
Endura 70WDG 5.9 oz, A	0.56 dc	1.0 b	1.9 abc	1.9 abc
Endura 70WDG 8 oz, A, B	0.07 de	0.2 c	2.0 abc	2.0 abc
Endura 70WDG 8 oz, A	0.36 de	0.2 c	2.8 ab	2.8 ab
Endura 70WDG 5.9 oz + Topsin M 4.5FL 14 fl oz, A, B.....	0.15 de	0.0 c	2.6 abc	2.6 abc
V10135 20WP 2.5 lb, A, B	0.40 de	0.5 bc	2.6 abc	2.6 abc
V10135 20WP 3.75 lb, A, B	0.29 de	0.1 c	2.4 abc	2.4 abc
Rovral 4F 2 pt + Topsin 4.5FL 14 fl oz, A, B	0.22 de	0.1 c	1.7 c	1.7 c
Headline EC 9 fl oz, A, B.....	1.57 b	2.4 a	2.9 a	3.0 a
Topsin M 4.5FL 20 fl oz, A, B.....	0.99 c	0.0 c	2.7 abc	2.7 abc
Switch 62.5WG 14 oz, A, B.....	0.19 de	0.3 bc	1.9 abc	1.9 abc
Bravo WS 3 pt + Topsin M 4.5FL 14 fl oz, A, B...	0.05 e	0.0 c	1.8 bc	1.8 bc
LSD ($P \leq 0.05$)	0.46	0.7	1.1	1.1

*Means in the same column with different letters differ significantly according to Fisher's Protected LSD ($P \leq 0.05$).

** Chemical application dates: A=64% bloom, 2 Aug; B=100% bloom + pins, 7 Aug.

Field 49 Chemical Trial (planted July 5). Disease pressure was low due to the hot dry weather. Rovral, Endura sprayed twice, Endura + Topsin, and Rovral + Topsin reduced gray mold to below the 3% threshold and significantly reduced gray mold incidence on pods compared to the control. Only Bravo + Topsin was significantly better than the control for white mold pod incidence. All treatments containing Topsin were numerically better than the control. Severe virus symptoms adversely affected yields. There were no significant differences in marketable or total yield among the treatments. No phytotoxicity was observed.

Treatment and rate/A	Gray mold (%)	White mold (%)	Marketable yield (t/A)	Total yield (t/A)
Control.....	4.9 a*	1.0 ab	1.6 a	1.7 a
Rovral 4F 2 pt, A,B**	2.5 bc	1.3 a	1.4 a	1.5 a
Endura 70WDG 8.0 oz, A,B	0.6 c	0.4 abc	1.8 a	1.8 a
Endura 70WDG 8.0 oz, A	2.7 abc	0.7 abc	1.7 a	1.8 a
Endura 70WDG 8.0 oz + Topsin M 4.5FL 20 fl oz, A,B..	1.1 c	0.2 bc	1.6 a	1.6 a

Rovral 4F 2 pt + Topsin M 4.5FL 20 fl oz, A,B	2.0 bc	0.1 bc	1.3 a	1.4 a
Topsin M 4.5FL 20 fl oz, A,B	4.0 ab	0.1 bc	1.4 a	1.5 a
Bravo WS 3.0 pt + Topsin M 4.5FL 20 fl oz, A,B	4.2 ab	0.0 c	1.7 a	1.7 a
LSD ($P \leq 0.05$)	2.3	0.9	NS	NS

*Means in the same column with different letters differ significantly according to Fisher's Protected LSD ($P \leq 0.05$).

**Chemical application dates: A=45% bloom, 13 Aug; B=100% bloom + pins, 18 Aug.

Field 48c Biopesticide Trial (planted June 27) All treatments were below the threshold. There was very little disease due to hot dry weather. Ronilan, Kaligreen + Endura at 5.9 oz + Cohere, Trilogy + Topsin, Trilogy + Endura at 5.9 oz, Ballad + Topsin + Biotune, Ballad + Endura at 3 oz + Biotune, and Bravo + Topsin significantly reduce gray mold incidence on pods compared to the control. Ronilan, Kaligreen + Topsin + Cohere, Trilogy + Topsin, Trilogy + Endura at 5.9 oz, and Bravo + Topsin were significantly better than the control for white mold incidence on the pods. Yields were low possibly due to the presence of viruses in the plots. There were no significant differences in marketable or total yield among the treatments. There was no phytotoxicity observed.

Treatment and rate/A	Gray mold (%)	White mold (%)	Marketable yield (t/A)	Total yield (t/A)
Control	1.44 ab*	0.65 ab	1.6 a	1.6 a
Ronilan 50DF 1.0 lb, A, B**	0.05 c	0.00 d	1.5 a	1.5 a
Endura 70WDG 5.9 oz, A, B	0.60 bc	0.12 bcd	2.1 a	2.1 a
Kaligreen 3.0 lb + Topsin M 4.5FL 14.0 fl oz + Cohere 4.0 fl oz, A, B	0.63 bc	0.05 cd	1.8 a	1.8 a
Kaligreen 3.0 lb + Endura 70WDG 5.9 oz + Cohere 4.0 fl oz, A, B	0.11 c	0.17 bcd	2.0 a	2.0 a
Trilogy 5.4 pt + Topsin M 4.5FL 14 fl oz, A, B	0.43 c	0.00 d	1.8 a	1.8 a
Trilogy 5.4 pt + Endura 70WDG 5.9 oz, A, B	0.26 c	0.08 cd	2.1 a	2.1 a
Trilogy 5.4 pt, A; Kaligreen 3.0 lb, B	1.53 a	0.21 bcd	1.5 a	1.5 a
Oxidate 5.4 pt, A; Trilogy 5.4 pt + Kaligreen 3.0 lb + Cohere 4.0 fl oz, B	0.89 abc	0.91 a	1.9 a	2.0 a
Contans WG 2.0 lb, A, B	0.70 abc	0.66 ab	1.6 a	1.6 a
Ballad 3.0 qt + Biotune 1.1 pt, A, B	0.93 abc	0.59 abc	1.7 a	1.7 a
Ballad 3.0 qt + Topsin M 4.5 FL 14.0 fl oz + Biotune 1.1 pt, A, B	0.38 c	0.20 bcd	1.3 a	1.3 a
Ballad 3.0 qt + Endura 70WDG 3.0 oz + Biotune 1.1 pt, A, B ..	0.05 c	0.11 bcd	1.6 a	1.6 a
Bravo WS 3.0 pt + Topsin M 4.5FL 14 fl oz, A, B	0.33 c	0.08 cd	2.0 a	2.0 a
LSD ($P \leq 0.05$)	0.89	0.55	NS	NS

*Means in the same column with different letters differ significantly according to Fisher's Protected LSD ($P \leq 0.05$).

** Chemical application dates: A=70% bloom, 2 Aug; B=100% bloom + pins, 7 Aug.

Field 48a Fungicide Trial (planted May 23) Disease pressure was low for gray mold incidence (3.8%) due to the hot dry weather. White mold did not develop on the pods in any treatment except for V10135 at 2.5 lb. All treatments significantly reduced gray mold incidence on pods compared to the control. All treatments were below the 3% rejection threshold, except for Endura at 8 oz sprayed once. Yields were very low possibly due to early season severe root rot. There were no significant differences in total or marketable yield among the treatments. No phytotoxicity was observed.

Treatment and rate/A	Gray mold (%)	White mold (%)	Marketable yield (t/A)	Total yield (t/A)
Control	3.8 a*	0.0 b	1.0 a	1.1 a
Ronilan 50DF 1.0 lb, A, B**	0.3 bc	0.0 b	0.5 a	0.5 a
Endura 70WDG 5.9 oz, A, B	0.4 bc	0.0 b	0.8 a	0.8 a
Endura 70WDG 5.9 oz, A	0.0 c	0.0 b	0.6 a	0.6 a
Endura 70WDG 8.0 oz, A, B	0.6 bc	0.0 b	0.7 a	0.7 a

Endura 70WDG 8.0 oz, A	2.3 ab	0.0 b	0.7 a	0.7 a
Endura 70WDG 5.9 oz + Topsin M 4.5FL 14 fl oz, A, B.....	0.6 bc	0.0 b	0.8 a	0.8 a
V10135 20WP 2.5 lb, A, B	0.5 bc	0.2 a	1.0 a	1.0 a
V10135 20WP 3.75 lb, A, B	0.3 bc	0.0 b	0.7 a	0.7 a
Rovral 4F 2 pt + Topsin M 4.5FL 14 fl oz, A, B	0.4 bc	0.0 b	0.7 a	0.7 a
Headline EC 9 fl oz, A, B.....	0.7 bc	0.0 b	0.5 a	0.5 a
Topsin 4.5FL 20 fl oz, A, B	1.2 bc	0.0 b	0.8 a	0.8 a
Switch 62.5WG 14 oz, A, B.....	0.6 bc	0.0 b	0.8 a	0.8 a
Bravo WS 3.0 pt + Topsin M 4.5FL 14 fl oz, A, B.....	0.5 bc	0.0 b	0.9 a	0.9 a
LSD ($P \leq 0.05$)	2.1	0.1	NS	NS

*Means in the same column with different letters differ significantly according to Fisher's Protected LSD ($P \leq 0.05$).

** Chemical application dates: A=48% bloom, 6 Jul; B=100% bloom + pins, 11 Jul.

Field 48b Biopesticide Trial (planted June 6) Disease pressure was very low (1.34%) for gray mold incidence and very low (0.30%) for white mold incidence on the pods in the inoculated check treatments. For gray mold incidence, no treatments provided statistically better disease control than the control treatment. White mold incidence was not sufficiently high to separate the treatment means from the control. Marketable and total yields were not significantly different from the control and were low. The presence of severe early season root rot may have negatively impacted yield. No phytotoxicity was seen.

Treatment and rate/A	Gray mold (%)	White mold (%)	Marketable yield (t/A)	Total yield (t/A)
Control	1.34 ab*	0.30 a	1.5 ab	1.5 ab
Ronilan 50DF 1.0 lb, A, B**	0.00 b	0.00 a	2.0 a	2.0 a
Endura 70WDG 5.9 oz, A, B.....	0.42 b	0.00 a	1.7 ab	1.7 ab
Kaligreen 3.0 lb + Topsin M 4.5FL 14.0 fl oz + Cohere 4.0 fl oz, A, B	0.57 b	0.42 a	1.9 ab	2.0 a
Kaligreen 3.0 lb + Endura 70WDG 5.9 oz + Cohere 4.0 fl oz, A, B.....	0.00 b	0.00 a	1.0 b	1.0 b
Trilogy 5.4 pt + Topsin M 4.5FL 14 fl oz, A, B.....	0.57 b	0.00 a	1.5 ab	1.6 ab
Trilogy 5.4 pt + Endura 70WDG 5.9 oz, A, B	0.00 b	0.00 a	2.1 a	2.1 a
Trilogy 5.4 pt, A; Kaligreen 3.0 lb, B	0.30 b	0.51 a	2.1 a	2.1 a
Oxidate 5.4 pt, A; Trilogy 5.4 pt + Kaligreen 3.0 lb + Cohere 4.0 fl oz, B...	0.93 ab	0.23 a	1.9 ab	2.0 a
Contans WG 2.0 lb, A, B.....	2.14 a	0.18 a	2.2 a	2.3 a
Ballad 3.0 qt + Biotune 1.1 pt, A, B.....	0.00 b	0.24 a	1.6 ab	1.7 ab
Ballad 3.0 qt + Topsin M 4.5FL 14.0 fl oz + Biotune 1.1 pt, A, B.....	0.66 ab	0.00 a	1.7 ab	1.8 ab
Ballad 3.0 qt + Endura 70WDG 3.0 oz + Biotune 1.1 pt, A, B	0.00 b	0.00 a	1.8 ab	1.8 ab
Ballad 3.0 qt + Champion WP 2.0 lb + Biotune 1.1 pt, A, B	1.04 ab	0.13 a	1.6 ab	1.6 ab
LSD ($P \leq 0.05$)	1.53	NS	0.9	0.9

*Means in the same column with different letters differ significantly according to Fisher's Protected LSD ($P \leq 0.05$).

**Chemical application dates: A=averaged 45% bloom, but variable, 18 Jul; B=100% bloom to pin, 21 Jul. Percent bloom is calculated by summing the number of plants with one or more open blossoms from 10 consecutive plants from 10 areas of the plot, and averaging the result.

Pails containing pods from each treatment (a single replication) from the 48c chemical trial were “incubated” in the cold room at 45F for 25 days to see the efficacy of the treatment over time. Although no statistical analysis could be performed, some trends were evident. Gray mold incidence (% of pods with gray mold) was 3.6% and white mold incidence (% of pods with white mold) was 60% for the (field) inoculated check treatments. For percent of the pods with gray mold, few differences from the control were apparent. For percent of the pods with white mold, Ronilan, Endura at 5.9 oz sprayed twice and at 8 oz applied once, V10135 at the 3.75 lb rate, Topsin M alone or in various combinations, and Switch. had low percent of pods with white mold. In contrast, the other Endura treatments for no obvious reason were not as effective: the percent of pods with white mold were higher.

Treatment	Percent of pods	Percent of pods with
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	with gray mold	white mold
Control.....	3.6	60.0
Ronilan 50DF 1.0 lb, A, B**	2.7	6.7
Endura 70WDG 5.9 oz, A, B.....	0.0	5.9
Endura 70WDG 5.9 oz, A	3.4	26.6
Endura 70WDG 8 oz, A, B.....	0.0	49.8
Endura 70WDG 8 oz, A	0.0	3.6
Endura 70WDG 5.9 oz + Topsin 4.5FL 14 fl oz, A, B ...	0.8	0.0
V10135 20WP 2.5 lb, A, B	1.0	17.4
V10135 20WP 3.75 lb, A, B	0.0	0.0
Rovral 4F 2 pt + Topsin 4.5FL 14 fl oz, A, B	2.0	0.0
Headline EC 9 fl oz, A, B.....	4.3	70.1
Topsin M 4.5FL 20 fl oz, A, B	8.9	0
Switch 62.5WG 14 oz, A, B	1.0	0
Bravo WS 3 pt + Topsin 4.5FL 14 fl oz, A, B	7.0	8.8

GROWER TRIALS A trial was conducted by a grower comparing four treatments (untreated, Topsin (1 lb/A) + Endura (5.75 oz/A), Topsin (1 lb/A) + Bravo (3 pt/A), or Topsin + Rovral (1.5 pt) and we evaluated the trial for mold. The Topsin + Rovral treatment had significantly more gray mold than the other treatments or the check, but was not a problem at harvest. We also scouted 9 other fields for disease, but disease was negligible. This was not surprising considering the hot, dry weather.

Efficacy of various chemicals in field trials (generally sprayed twice at about 30% bloom and 100%+pins) 1997-2005 The first column contains pesticide treatment and rate, the second is percent of the times tested where the treatment was statistically better than the check for gray mold control and provided good to excellent control, the third column is the percent of the times the chemical provided greater control for white mold than the check and provided good to excellent control, and the fourth column represents the number of times the chemical was tested as a gauge of confidence in the results. Be aware some promising combinations were only tested once or twice. Each time a chemical appeared in a trial was counted.

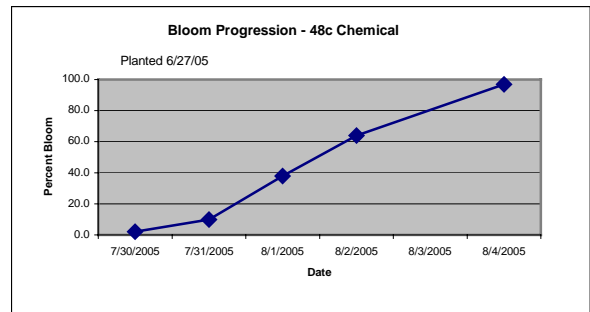
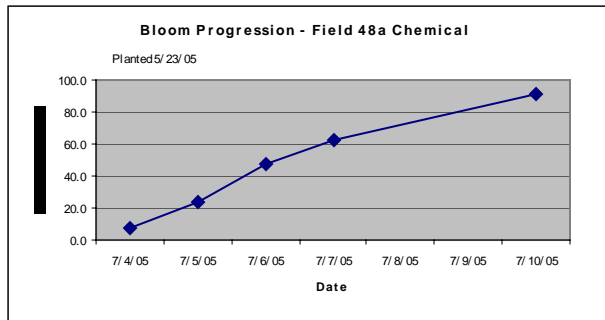
Treatment and rate/acre	% of times with effective gray mold control	% of times with effective white mold control	Number of times chemical was tested
Ronilan 1 lb	88	87	15
Endura (BAS510) 70WG, various	92	52	21
Topsin M 1.4 lb	14	92	13
Endura 5.5 or 5.9oz +Top M 0.7 lb	100	75	4
Rovral 4F 2 pt	73	86	14
Rovral 4F 1-2 pt + Topsin M 0.7 lb	55	90	10
Bravo WS 1.5 pt + Rovral 1 pt	100	100	1
Bravo WS 1.5-3.0 pt+Top M 0.7 lb	67	100	5
Elevate WDG 1.5 lb	50	50	2
Quadris 15.4 fl oz/Amistar 5 oz	36	18	11
Omega 500F 8 fl oz	50	50	2
Kaligreen+Top M+sticker	50	100	2
Switch (11 or 14 oz)	82	50	10

MANAGEMENT STRATEGIES TO CONTROL WHITE AND GRAY MOLD

- Plant snap beans in fields with well drained soils and good air movement.
- Avoid narrow row spacing to facilitate good airflow and drying of foliage.
- Avoid plant injuries (insect feeding, mechanical injury from tractor tires or implements). Injuries provide nutrients for ingress of fungi.
- Avoid over fertilization and frequent irrigation that keeps the canopy wet.
- Control weeds because weeds provide additional sites for sporulation and a favorable microclimate for infection.
- Rotate fields with grains, corn and sorghum.
- Incorporate debris immediately following harvest so microorganisms have the opportunity to feed on the survival structures called sclerotia.
- When applying fungicides, complete coverage of unopened and opened blossoms is essential.

Use of percent bloom to time pesticide applications.

Percent bloom is calculated by summing the number of plants with one or more open blossoms from 10 consecutive plants from 10 areas of the plot, and averaging the result. In 2005 in our 5 trials using the variety Gold Mine, percent bloom increased by an average of 18% per day (values from 14 to 21%) over the range of >0 to <100% bloom. This indicates one must keep close track of percent bloom in order to meet the goal of accurate pesticide application at 10 to 40% bloom



Year	Percent bloom increase per day
2003	36
2004	16
2005	18

Field	Percent bloom increase/day
48a	14
48b	21
48c Chemical	19
48c Biopesticide	18
49	18

EFFECTIVE USE OF ENDURA – BASF’S REPLACEMENT FOR RONILAN

- Although Endura is BASF’s replacement for Ronilan, the application strategy for Endura is very different from Ronilan. Endura needs to be used as a protectant, (applied before you see disease), since Endura is only a “limited curative” and has a different mode of action from Ronilan. Apply twice, first at 10 to 40% bloom, and the second application according to weather conditions.

GUIDELINES FOR CHEMICAL CONTROL OF WHITE AND GRAY MOLD

- There are no perfect “silver-bullet” fungicides in the current toolbox!
- If weather is conducive to disease, fungicides will need to be applied **twice**: first at about 10-40% bloom since % bloom increases by about 18% per day, and varies according to weather conditions and label limitations (note the 14 dth for Topsin M). Your first spray will include open blossoms, buds, and blossom initials. Do not wait too long to apply the first spray! It is better to err on the side of spraying too early.
- Topsin M provides excellent white mold control. Endura has provided excellent gray mold control in our research trials. A tank mix of Endura + Topsin should provide control of both white and gray molds. The combinations we used in our trials this year were: Endura (5.9 or 8 oz) + Topsin M 4.5F (14 or 20 fl oz). The combination must be applied twice. NOTE: 8 oz Endura and 20 fl oz Topsin M are lowest labeled rates.
- A possibly less expensive tank mix that we used in our trials this year was: Rovral (2 pt) + Topsin M 4.5F (14 fl oz). The combination must be applied twice.
- Topsin (14-20 oz) + Bravo (3 pt) applied twice has provided good control of white and gray molds in 4 out of 6 trials over a 3 year period. This combination is a less expensive alternative.

For long-term reduction of white mold (does not work on gray mold), destroy the overwintering structures (sclerotia) by applying Contans (a biopesticide) at 1 lb/acre in the fall on infested crop residue where sclerotia are visible, followed by immediate incorporation. Apply to infested fields in the spring at 2 lb/acre to prepared soil and shallow incorporate. Repeat when a susceptible crop is grown.

Some of the tested chemicals are not registered for white and gray mold control at this time, and only registered products can be used on snap beans. Use only materials registered on the crop and for an approved use; follow the label including days to harvest for all products used.

This research was supported in part by the NY Vegetable Research Council and Association, the PA Vegetable Marketing and Research Program and PA Vegetable Growers Association, and by the IR-4 project under a cooperative agreement with the U.S. EPA.