



**Life Without Ronilan for  
Controlling Gray and  
White Mold**

**WHITE MOLD**  
*Sclerotinia sclerotiorum*



**GRAY MOLD**  
*Botrytis cinerea*

Sclerotinia has a wide host range of 360+ plants including important commercial crops such as dry beans, cabbage, potatoes, alfalfa, tomatoes, sunflower, and soybeans.

*Sclerotinia* produces black seedlike structures called **sclerotia** that reside in the soil, and are the overwintering and survival structures for the fungus.



If the soil conditions in a sclerotia-infested field are wet for about two weeks, the sclerotia can germinate to produce mushroom like structures which eject spores. If the spores land on susceptible tissue and have an energy source available such as bean blossoms, and the weather remains wet, plants may become infected with white mold.



*Botrytis* also has a very wide host range including many horticultural and greenhouse crops. It produces a different type of sclerotia that survives in the soil. On infected tissue the fungus produces huge numbers of gray-brown powdery masses of spores.

*Botrytis* colonizes dead material (detritus), and senescent blossoms, and from there moves quickly to the pin pod if the flower is still attached. From this base the fungus rapidly invades healthy pods, leaves, and stems. “*Botrytis* likes detritus”.

Crops are at high risk of *Botrytis* when there is decaying or wilted tissue or senescent leaves on the ground (ie. resulting from drought stress, hail, frost, or injury). Infection is faster with presence of aphid honeydew, pollen, and other nutrient sources. Succulent tissue is very susceptible.

Moisture is essential for production of spores of both fungi and dense canopies and moisture on the plants favors both molds. Research has shown that fungicide sprays to suppress disease need to be applied during bloom with good blossom coverage, if the soil and/or plants have been wet.

Ronilan has provided outstanding “silver bullet” control of both molds for many years, but the snap bean label is due to expire in 2005. Generally Ronilan is effective when sprayed any time during bloom with just a single application. We have been looking for effective and affordable alternatives.

*Alternatives to vinclozolin (Ronilan) for controlling gray and white mold on snap bean pods in New York*

Shah, D. A., Dillard, H. R., and Cobb, A. C. 2002. (Online) Plant Health Progress 9/23/02

Denis Shah, post doc with Helene Dillard and me, mathematically compared 3 years of our field research data on several fungicides as to effectiveness, yield, and cost. The objective was to identify fungicides which have controlled mold over variable weather conditions and several years.

With two sprays **Ronilan** provided the best control of both fungi and highest yields of healthy pods, as it has during many years of our research. One spray is usually effective.

**Flint, Rovral, and Switch** gave gray mold control comparable to Ronilan.

**Topsin M** controlled white mold as effectively as Ronilan. **Switch and Rovral** significantly reduced the incidence of white mold, but not as effectively as Ronilan. **Switch** was the best alternative to Ronilan for both molds. **Topsin M plus Rovral** was also effective as a Ronilan replacement. However, all mold control scenarios cost more than Ronilan.

**Per acre fungicide costs, NY, 1999-2001**

Fungicide	Rate/acre	Cost \$/Acre for 2 applications
Actigard	0.75 oz	68.85
Flint	2.0 oz	51.84
<b>Ronilan</b>	<b>1.0 lb</b>	<b>46.96</b>
Rovral	2.0 pt	74.40
Rovral + Topsin M	1 pt + 0.7 lb	61.87
Switch	11 oz	85.25
Topsin M	1.4 lb	49.34

**Assessment of financial return due to foliar fungicide use**

Fungicide	Fungicide cost (\$/acre)	Return on fungicide Investment (\$/acre)
Actigard	68.85	-65.26
Flint	51.84	28.98
<b>Ronilan</b>	<b>46.96</b>	<b>102.11</b>
Rovral	74.40	-22.31
Rovral+Topsin M	61.87	42.30
Switch	85.25	63.82
Topsin M	49.34	87.16

Generally costs are for two sprays, not including application cost. Marketable yield was also factored in at \$179.60/ton.

**Evaluation of foliar sprays for control of white and gray mold in snap beans in Geneva, NY, 2002.**

Will be published in *Fungicide and Nematicide Tests*.

Planting date of GoldMine beans, June 21, 2002.

Plots were sprayed with chemicals achieving good coverage of the blossoms, and then plants were inoculated with spores of *Botrytis* and *Sclerotinia*. After the second spray a row cover was applied over the entire plot.

Treatment and rate/A	Gray mold (%) on pods	White mold (%) on pods
Control	7.0 abcd	7.4 ab
Ronilan 50 DF 1 lb A,B	0.7 g	0.4 e
Topsin M 1.4 lb A,B	9.4 a	0.9 de
BAS510 70WG 8.0 oz A,B	0.9 g	1.9 de
BAS510 70WG 10.3 oz A,B	0.7 g	1.7 de
BAS516 38WG1.2 lb A,B	1.6 g	2.3 cde
Switch 11.0 oz A	5.5 cde	6.3 abc
Switch 14.0 oz A	6.3 bcd	7.8 ab
Switch 11.0 oz A,B	2.3 fg	4.1 bcde
Switch 14.0 oz A,B	2.5 fg	2.3 cde
Rovral 1 pt + Top M 0.7 lb A,B	2.5 fg	1.5 de
Rov 1pt+ Stylet oil 13.7 pt A,B	0.9 g	2.2 cde
Rovral 2.0 pt, A, B	1.0 g	1.3 de

Spray dates A = 40% bloom, July 29; B = 100% bloom + pins, Aug 2.

**Phytotoxicity-(weather hot with high humidity when chemicals applied)**

**BAS510, both rates**

**BAS516**

**Rovral+Stylet Oil**

**Caused burning of top leaves with no apparent yield effect**



**DISEASE TRIANGLE**

Susceptible Host



Environment

Pathogen

### Management Strategies to Control White and Gray Mold

- Maintain good air drainage by avoiding close proximity to hedge rows.
- Avoid narrow row spacing to facilitate good air flow and drying of foliage.
- Avoid plant injury which provides nutrients for ingress of fungi.
- Avoid over fertilization and frequent irrigation.
- Control weeds because weeds provide additional sites for sporulation and a favorable microclimate for infection.
- Rotate fields with grains and corn, nonhosts of *Sclerotinia*.
- Apply fungicides at flowering, and ensure good coverage of blossoms.
- Evenness of bloom makes spray timing and life easier.

### Efficacious Fungicides

- Determine which mold(s) are problematic so as to choose best fungicide(s).
- Ronilan is most effective and most forgiving to date for both molds (can spray at early bloom or 100%+).
- Topsin M is very effective at controlling white mold, but may be ineffective against gray mold due to resistance development (spray when 20-40% of plants have one or more open blossoms)
- Rovral has looked very effective against gray mold in many of our trials, and often against white mold.
- Topsin M+Rovral combined, each at half rate have looked quite good.

### Promising new chemicals: (none registered on beans yet)

- Switch (cyprodinil plus fludioxonil)
- Flint (trifloxystrobin)
- BAS 510
- BAS 516

The data provided here do not constitute a recommendation. Some of the tested chemicals are not registered at this time, and only registered products can be used on snap beans. Be careful to obey days to harvest for whatever chemicals used.

### CONTANS WG (Intercept)

*Coniothyrium minitans*  
Minimum of  $1 \times 10^9$  active spores/g

A commercial biological product which is a mycoparasite of *Sclerotinia* species that attacks and destroys sclerotia, the survival structures of *Sclerotinia*. Reducing the number of sclerotia in a field can reduce the amount of inoculum available to infect susceptible crops, and may decrease disease incidence and severity.

### Research Trials

Fields were plowed and fitted. Contans at 3 or 4 lb/acre was sprayed on the surface of the appropriate treatment and incorporated to about 4 inches. One liter (one quart) soil samples were collected, wet sieved through screens, and the sclerotia were separated from the debris, and counted using a binocular microscope. Soil was assayed for sclerotia before Contans application and after bean harvest.

### Number of sclerotia in soil (Research Trial)

Treatment	# sclerotia/liter Initial, 2001	# sclerotia/liter 4 months later, 2001	Sclerotia as % of control, 2002
Untreated Control	35.6	26.0	100
Contans 4 lb/acre	51.6	12.0 (rotten)	7

(The plots were artificially infested to get high levels of sclerotia in the soil in this trial.)

### Number of sclerotia in soil (Grower trial)

Treatment	# of sclerotia/liter (initial)	# of sclerotia/liter (at harvest)
Untreated control	0.15	0.2
Contans 3 lb/acre	0.3	0.17

### Our tentative recommendations for using Contans effectively:

- Accurately identify the disease as caused by *Sclerotinia* species.
- Apply Contans with excellent coverage, since it must be in contact with the sclerotia.
- Incorporate by mixing soil to about 4 inch depth.
- Do not turn the soil profile after application of product to avoid bringing up untreated soil with viable sclerotia.
- Contans needs about 2 to 3 months to effectively colonize and destroy sclerotia.
- Growers may need to reapply after plowing the following year.
- Spores can blow in from nearby fields, but in-field inoculum probably causes the most disease.

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