Biological control of white mold of snap bean with low rate Contans applications

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- **To determine whether Contans applications to flailed diseased crop residues left on the soil surface generate a "biocontrol epidemic" in western Oregon**
- **To evaluate efficacy of low rate (1-1.5lbs/A) at-bloom and after harvest Contans applications on white mold sclerotial survival in western Oregon**

Materials and Methods

Exp. 1. A 90A commercial fall cauliflower crop infested with white mold (causal agent *Sclerotinia sclerotiorum, Ss*) was flailed in November 2007; Contans (2 lbs/A) was applied to the decomposing residues. Lab-grown sterile sclerotia were placed in bags (15 per bag), fixed to the soil surface with flags 4 times over 10 mos, and removed 1-3 mos later; after removal, sclerotia were washed, surface-disinfected, and plated to determine viability and colonization by the biocontrol fungus *Coniothyrium minitans (C. minitans)* and other fungi (Fig. 1).

Exp. 2. Eight snap bean 91G fields were planted in June 2009, inoculated with *Ss*, and flailed but not incorporated at bean maturity. Native sclerotia were collected from the soil surface of all fields in October, bagged (15 per bag), and replaced in each field on the surface and at 5.1 cm depth. Contans was applied to 4 of the fields at approximately 1.5lbs/A in early November. Bags were removed on 6 dates over 2 yrs and sclerotia were plated. Sclerotia developed on 2010 snap beans were collected after flailing; sclerotia were bagged and placed in field on surface and at 5 cm. Bags were collected 3 times in 10 mos and sclerotia were plated.

Exp. 3. Four treatments were applied at bloom to 2 bean fields (one with and one without a history of Contans): 1) water, 2) 1 lb/A Contans, 2) Contans/low rate Topsin, and 4) high rate Topsin. White mold sclerotia were collected at harvest and evaluated for *Cm* colonization.

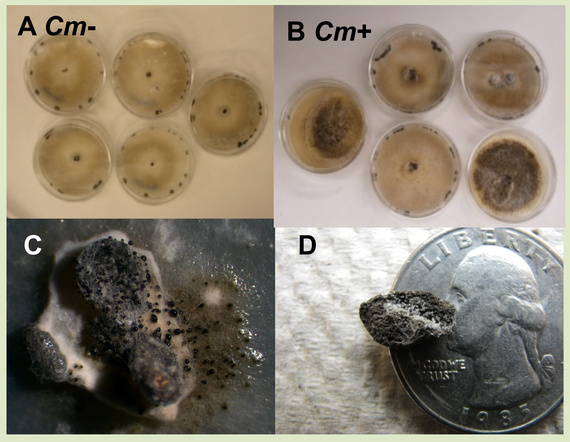


Fig. 1. (A) *Cm*- sclerotia on PDA plate, (B) *Cm*+ sclerotia on PDA plate, (C) *Cm* droplets oozing from pycnidia in *Ss* sclerotium, and (D) Dried *Cm* droplets on surface of *Ss* sclerotium collected from field.

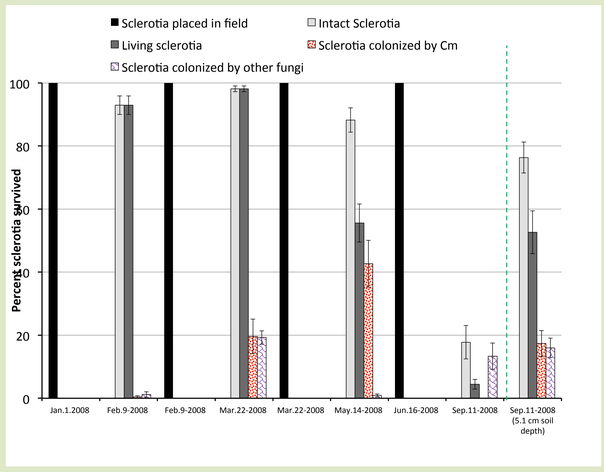
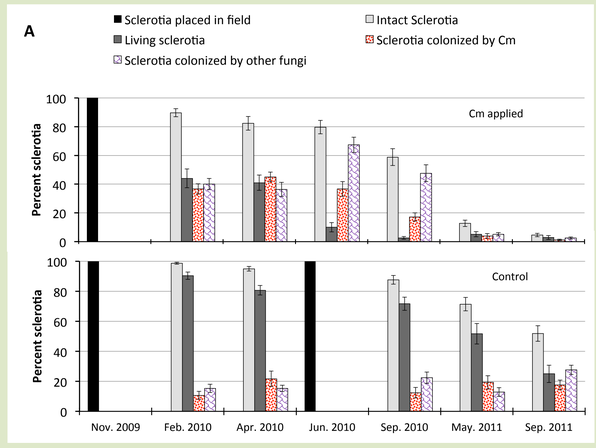


Fig. 2. Viability and colonization of sterile sclerotia incubated on the soil surface in an on-farm trial that received a fall 2007 Contans application to flailed diseased cauliflower residues.



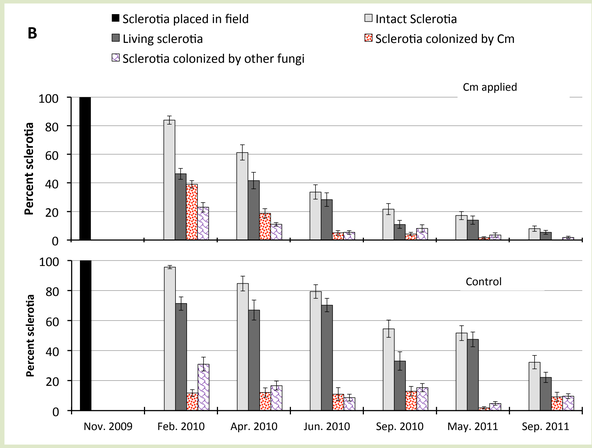


Fig. 3. Viability and colonization of native sclerotia incubated for 2 yrs in OSU field experiments with and w/o Contans application (A) on soil surface and (B) at 5.1 cm depth.

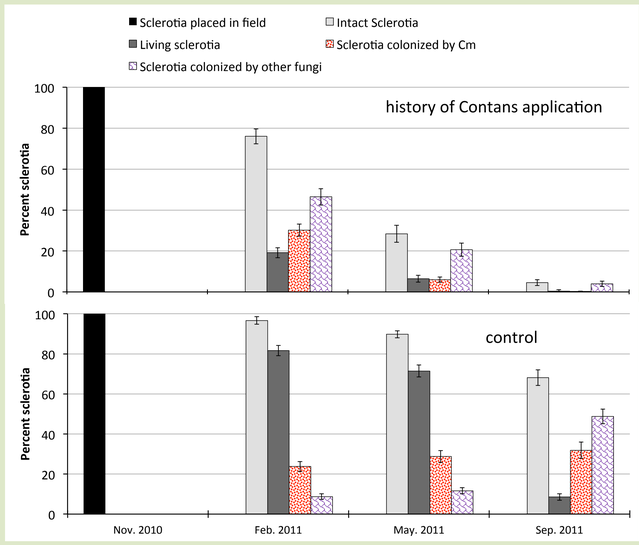


Fig. 4. Viability and colonization of native sclerotia produced on snap beans grown in plots in 2010 and flailed but not incorporated after harvest (with and w/o fall 2009 Contans application).

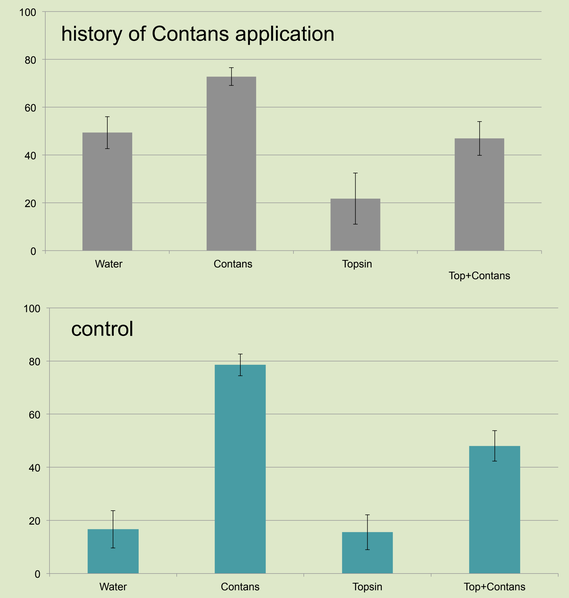


Fig. 5. Percent sclerotia colonized by Cm after harvest of beans to which treatments were applied twice during bloom in 2012 (with and w/o historic Contans application)

Results and Summary

Experiment One:

- Sterile sclerotia incubated on the soil surface in a flailed diseased cauliflower field to which Contans was applied in November were colonized by *Cm* throughout the year except when temperatures were above 7°C/45°F (Fig. 2).

Experiment Two:

In flailed diseased bean fields to which low rate fall Contans was applied:

- By spring the year after Contans application, 40% of Cm+ sclerotia (buried and surface) were viable compared to 67% of buried (80% of surface) in the control fields
- By spring 2 yrs after Contans application, 14% of buried (5% of surface) Cm+ sclerotia were viable vs 50% (buried and surface) of Cm- sclerotia
- By fall yr 3: surface - 3% vs 25%; buried – 6% vs 22%

In sclerotia developed on snap beans planted in the experimental fields in 2010 (in which Contans was or was not applied to flailed residues in 2009)

- The following May, viability in Cm+ and Cm- fields was 8.5 and 74%
- The following September, viability in Cm+ and Cm- fields was 5 and 22%.

Experiment Three:

Contans application resulted in the highest *C. minitans* colonization of sclerotia (75% colonized). High rate Topsin application resulted in the lowest *C. minitans* colonization (18%), and the Contans/half rate Topsin tank mix resulted in an intermediate level of *C. minitans* colonization (48%) (Fig. 5). The only significant difference between the two fields was that in the control plots, 17% of the sclerotia in the Cm- field were colonized as compared to 46% in the Cm+ field (Fig. 5). Contans application did not reduce white mold incidence (data not shown).

SUMMARY

- Contans applications are effective in destroying *Ss* sclerotia over time.
- Contans applications to sclerotia left on the soil surface 'grew up' *C. minitans* (biocontrol epidemic) and provided a long term reservoir of *C. minitans* in the field.
- Sclerotia that developed on beans grown in fields with a recent history of Contans application were colonized (and ultimately destroyed) by *C. minitans* even though Contans was not applied in that production season, due to the reservoir of sclerotia colonized by *C. minitans* in the field from historic bean crops and Contans applications.
- Contans applications during bean bloom were dramatically more effective in destroying sclerotia generated on the bean crop than applications to diseased residues after harvest; however, at-bloom applications are not currently a registered use of Contans.
- *C. minitans* destroys sclerotia more rapidly when introduced earlier in the process of white mold and sclerotia development on the plant.