

Considerations and combinations to improve control of pupating western flower thrips in chrysanthemums



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Introduction

The value of Canadian floriculture

- \$1.44 billion in farm gate sales
- \$5.29 billion total economic impact
- 43,245 full and part-time employees
- 1,900 growers, 2,170 acres

Western flower thrips a priority pest

- > 90% of management costs for thrips control
- Resistance is a significant issue
- Biological control – the only sustainable solution



Pesticide Paradigm

We are historically burdened by the pesticide paradigm: one spray provides effective control. In biocontrol, though, the use of a single biocontrol agent rarely provides the desired level of control. Rather, successful Integrated Pest Management (IPM) programs depend on the strategic selection and use of several biocontrol (and other compatible) agents, combined with innovative approaches to enhance their effectiveness in a production system. We need to consider:

- Functional compatibility (vs toxicity testing)
- Whether the addition of one or more agents leads to increased efficacy
- Whether the resulting program is cost-effective

Objectives

Thrips spend part of their life in the foliage and part of the time in the soil.

There is a range of biocontrol agents available for use in the two environments.

In this project we focused on control of soil-dwelling stages using the Met52 granular biopesticide and *Steinernema feltiae*.

Project Goals

1. Ensure the functional compatibility of Met52™ granular and *S. feltiae* (Nemasys)
2. Determine whether the combined use of the two biocontrol agents improves the overall performance of the control strategy

Materials & Methods

Compatibility

Treatments

Treatment	Details
1. Growing medium only	Sunshine Mix #1
2. Medium + chrysanthemum	var. Brighton (Syngenta)
3. Medium + Nemasys	50m/100m ² to wk 6
4. Medium + chrysanthemum + Nemasys	50m/100m ²
5. Medium + Met52	1,500g/m ³
6. Medium + chrysanthemum + Met52	1,500g/m ³
7. Medium + chrysanthemum + Nemasys + Met52	50m/100m ² ; 1,500g/m ³

Measures

Met52 granules were bulk-mixed with the growing medium at 1500 g/m³.

Nemasys was applied at a rate equivalent to 50 m nematodes/100 m² at time 0 and again after 2, 3, 4, 5 and 6 weeks.

To assess compatibility, every pot was sampled on a bi-weekly basis (i.e. weeks 0, 2, 4, 6, and 8). Living nematodes were extracted from media samples using a modified Baermann technique. Using this technique, living nematodes 'swim' into the water; *S. feltiae* and free-living nematodes were enumerated after 24h. Metarhizium CFUs were estimated using a soil-dilution plating technique onto a selective medium.

Efficacy

Treatments

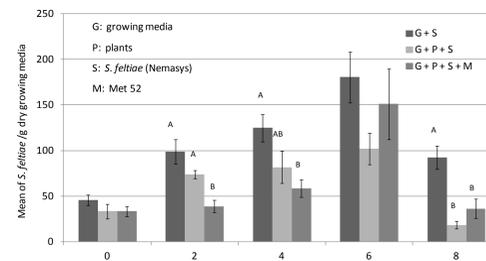
Treatment	Details
1. Untreated (control)	
2. Met52 'High rate'	1,500g/m ³ growing medium
3. Met52 'Low rate'	500g/m ³ growing medium
4. Nemasys	50m/200m ² ; every 7d to wk 6
5. Met52 'Low' + Nemasys	500g/m ³ ; 50m/200m ² to wk 6

Measures

- Pots destructively sampled
 - @ wk 2 and 4 (6 reps/treatment)
 - @ wk 8 (12 reps/treatment)
- Plant washing technique used to assess WFT foliar populations

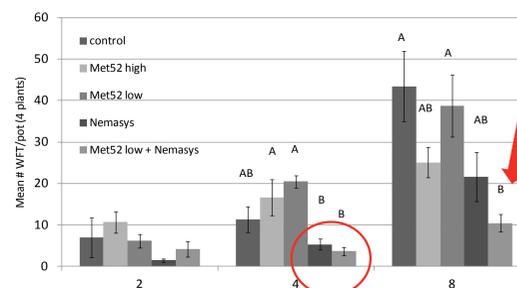
Results & Discussion

Compatibility



- No significant effect of the fungus on *S. feltiae* numbers except at wk 2
- Highest soil populations when nematodes were applied to bare soil
- Probably due to interference of the plant foliage which prevented movement of some nematodes into the soil at application
- Little variation in Metarhizium CFUs at all sample times
- Use of Met52 compatible with *S. feltiae*
- Free-living nematodes always highest in Met52 treatments

Efficacy



- By week 4, Nemasys and the combination treatment clearly had a suppressive effect on thrips
- By week 8, the Met high treatment had an effect, not the Met low
- Two weeks after the final nematode application, WFT populations increased in the nematode-only treatment
- In the combination treatment, <10/pot (ca. 2/plant) even by wk 8

While Nemasys is effective against WFT (1), there is often a lack of consistency in efficacy, particularly under heavy pest pressure (2). Inclusion of additional natural enemies enhances the durability and reliability of a biocontrol program, allowing WFT to be managed at levels on par with conventional pesticides. Met52 can play a pivotal role in this capacity, complementing the activity of *S. feltiae* against soil-dwelling stages. It has the potential to form a foundational component for an integrated control system. Further, the approach is compatible with other biocontrol agents such as predatory mites (3). *N. cucumeris* mini-sachets are commonly used in Ontario and would complement soil treatments by controlling foliar stages of WFT.

References

- (1) Ebssa, L., Borgemeister, C., Berndt, O. & Poehling, H.-M. 2001. *Biocontrol Sci. Technol.* 11: 515-525.
 (2) Arthurs, S. & Heinz, K.M. 2006. *Biocontrol Sci. Technology* 16: 141-155. (3) Ebssa, L., Borgemeister, C. & Poehling, H.-M. 2006. *Biol. Control* 39: 66-74.

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