New pests and control strategies

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IPM specialist

Fargro Ltd.

Aphis fabae – Black bean aphid

- Many host plants
- Arrives late spring
- Very rapid reproduction
- Sexual phase in autumn
- Overwinters as eggs, Euonymus, Philadelphus and Viburnum are common winter host plants.

Aphiline: single species, or mixes.

+ good efficacy

++ high efficacy

+++ very high efficacy.

X laboratory & cage tests.

Blank = little to no activity.

Aphids/ parasitoids	*Aphidius colemani*	*Aphidius ervi*	*Aphidius matricariae*	*Aphelinus abdominalis*	*Ephedrus cerasicola*	*Praon volucre*
Aphis fabae	x		+	x		+
Aphis gossypii	+++		++	x	x	+
Aulacorthum circumflexum		+++	x	++	++	++
Aulacorthum solani	x	++	x	++	+++	++
Brachycaudus helichrysi	x	x	x	x	x	x
Macrosiphum euphorbiae	x	+++		+++		+++
Macrosiphum rosae	x	++		++		+++
Myzus ascalonicus			x	x	x	x
Myzus ornatus	++	x	++		x	+
Myzus persicae	+++	+	++	++	++	++

NAD

Sequoia – PCS 05915: protected ornamentals and named edible crops

- Rapid action for control of aphids and whitefly, active by contact and ingestion.

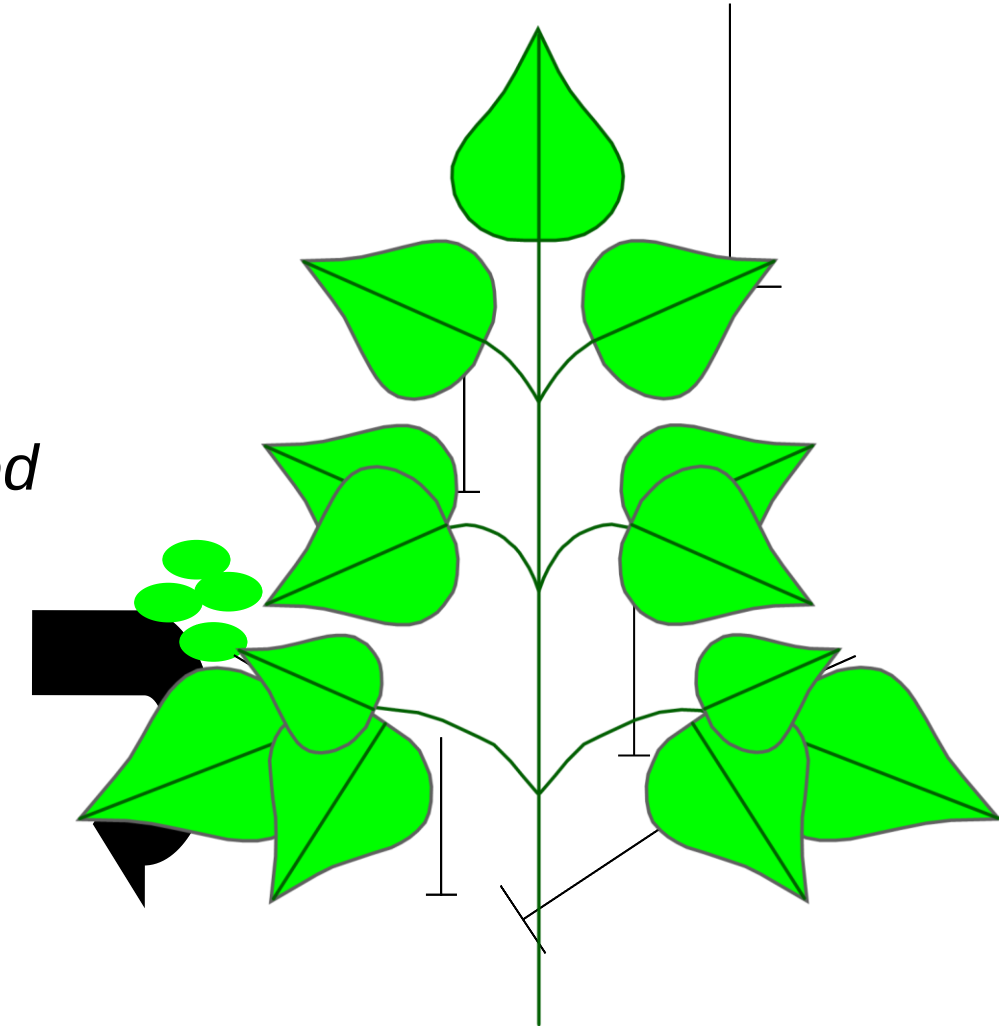
- New chemical class; IRAC 4C.

- Excellent addition to an IPM programme.

- Contact and ingestion.

Sequioa movement in the plant

- *Sequoia is readily absorbed by foliage*
- *Sequoia is translaminar, it reaches both sides of the leaves*
- *Sequoia is systemic and mainly transported upward, and to a certain extent, it is transported downwards*



HIGH FIT FOR FOLIAR TREATMENT

Sequoia - Environmental profile

-Sulfoxaflor degrades rapidly to metabolites that exhibit low toxicity to non-target organisms.

-Low persistence in the environment.

-Minimal effects on Honey bee (*Apis mellifera*) and Bumble bee (*Bombus terrestris*)

- Inherently low toxicity

- Dried residues cause no mortality

- No impact on feeding or brood behaviour

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Sequoia - environmental profile

- No significant impact on a range of predatory or parasitic arthropods:

-*Amblyseius* (*Neoseiulus*) *cucumeris* (HARMLESS) predatory mite

-*Amblyseius swirskii* (HARMLESS) predatory mite

-*Aphidius colemani* (HARMLESS) parasitic wasp

-*Chrysoperla carnea* (HARMLESS to larvae) lacewing

-*Encarsia formosa* (HARMLESS) whitefly parasitic wasp

-*Orius laevigatus* (HARMLESS) pirate bug

-*Phytoseiulus persimilis* (HARMLESS) predatory mite

-*Typhlodromus pyri* (HARMLESS) predatory mite

-Naturally occurring Lacewing, ladybirds, parasitic wasps and spiders.

- Parasitic wasps include Ichneumon spp. are members of the Hymenoptera order (the same as *Encarsia formosa* and *Aphidius colemani*) it is therefore reasonable to conclude that Isoclast will have little or no adverse effects.

Box caterpillar: *Cydalima*

Box moth control

- Specific pheromone to attract male moths.
- Indicates when to initiate control treatments.
- Parasitoid wasps.
- Biopesticides.
- Conventional pesticides.

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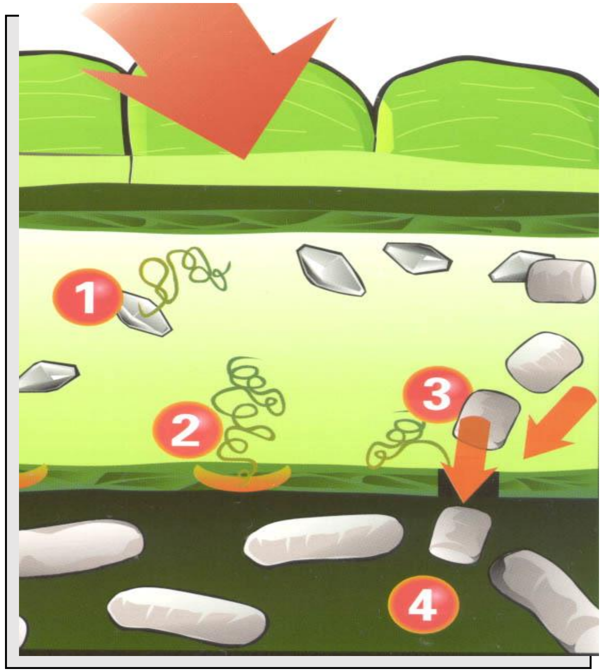
Tricholine: *Trichogramma brassicae*

- Parasitoid wasp of moth eggs.
- Minute adult attacks individual eggs.
- Parasitised eggs turn brown / black.

Lepinox Plus: *Bacillus thuringiensis*



Caterpillar must ingest sprayed *Bt* product … pest stops feeding within several minutes. Treated crop is protected, caterpillars die.

PCS: 05254 (protected edible crops only)

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Whitefly

Glasshouse whitefly
Trialeurodes vaporariorum

Cotton whitefly
Bemisia tabaci

Honeysuckle whitefly; *Alyerodes lonicerae*

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Ask the Specialists!

PCS: 04187
protected edible and ornamental crops

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Sequoia – PCS 05915: whitefly control

Aphid rate is 200 ml per ha, max 2 applications per structure.

Whitefly rate is 400 ml per ha max 1 application per structure.

Flower Thrips

Do NOT feed on pollen but damages flowers.

Pupates on plants but associated with compost.

Photo of adult *T. setosus* courtesy Rens van den Biggelaar, NVWA

Photo adult *T. setosus* leaf damage and excrement. Courtesy : Wietse den Hartog (NPPO of NL)

Echinothrips americanus
Heliothrips haemorrhoidalis

Thrips: virus transmission

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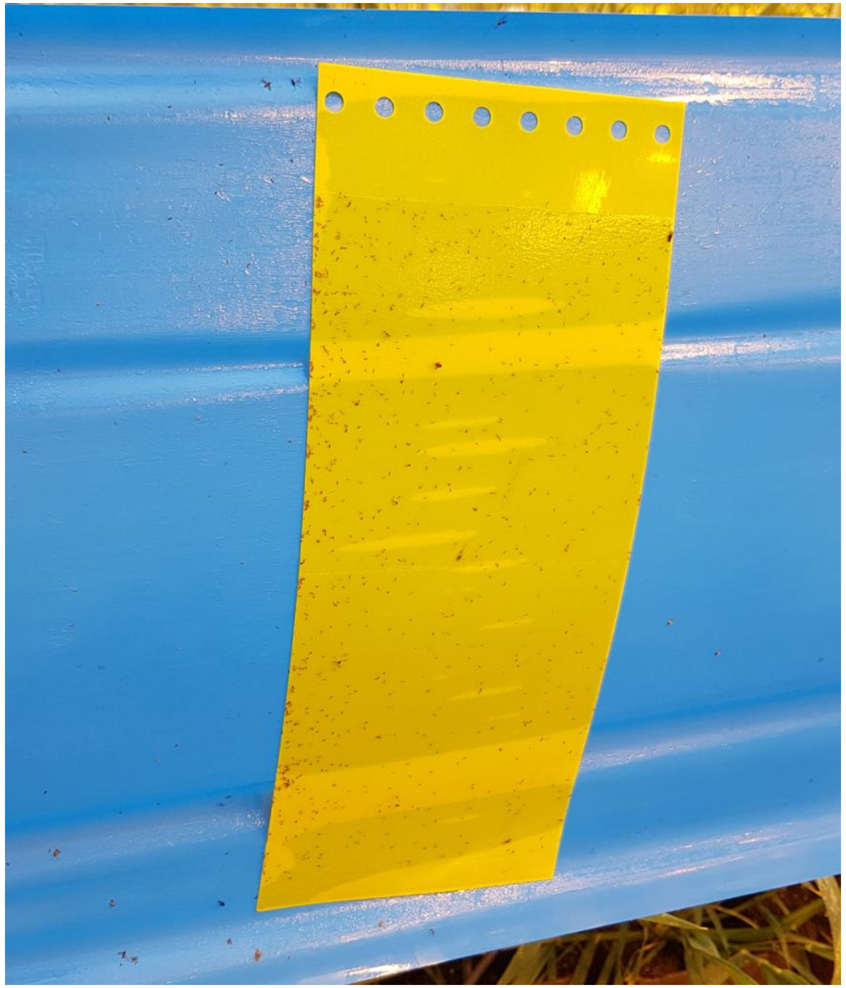
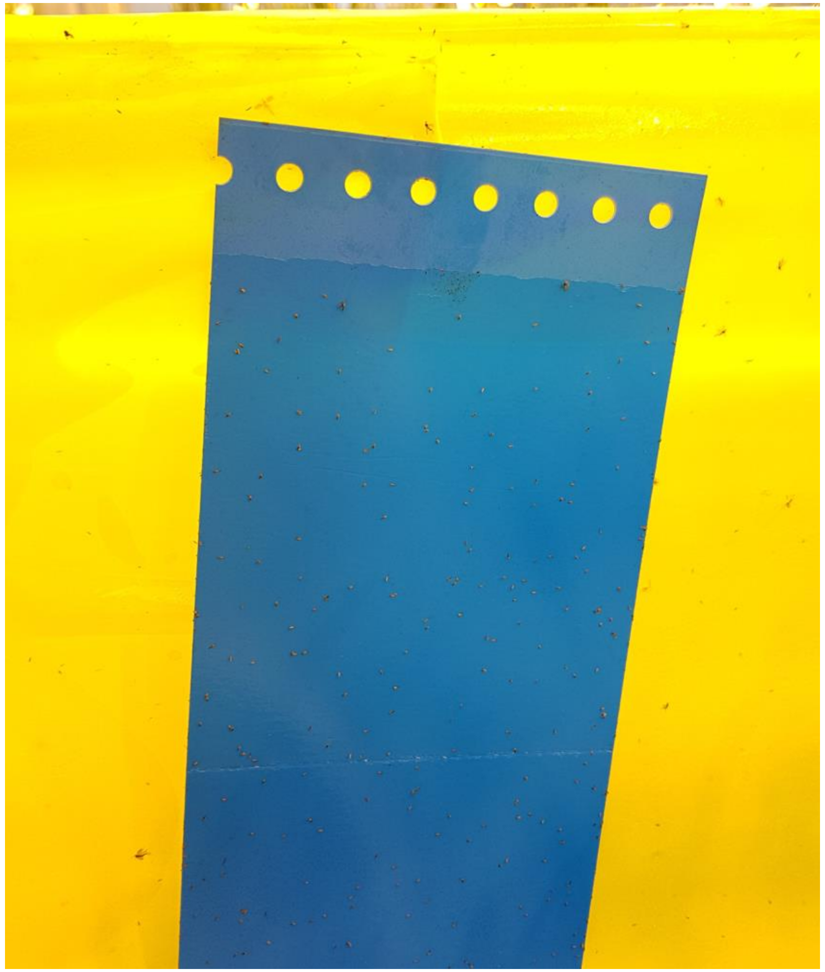
Contrasting colours attract more adult thrips





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Thrips control by predatory mites

Amblyline: ***Amblyseius*** spp.

- Attack young larval stage.
- Preventative, eat 1 - 2 first instar larvae .
- Can feed on other food sources; pollen, trichomes, extra floral nectaries.
- Prefer leaves with hairs for oviposition.
- CRS sachets; 6 to 8 week production.

sprinkle material.

Thrips control by predatory mites

- **Hypoline m:** ***Stratiolaelaps scimitus*** (previously ***Hypoaspis miles***) soil living predator eats larvae / pupae of Sciarid and other pests.

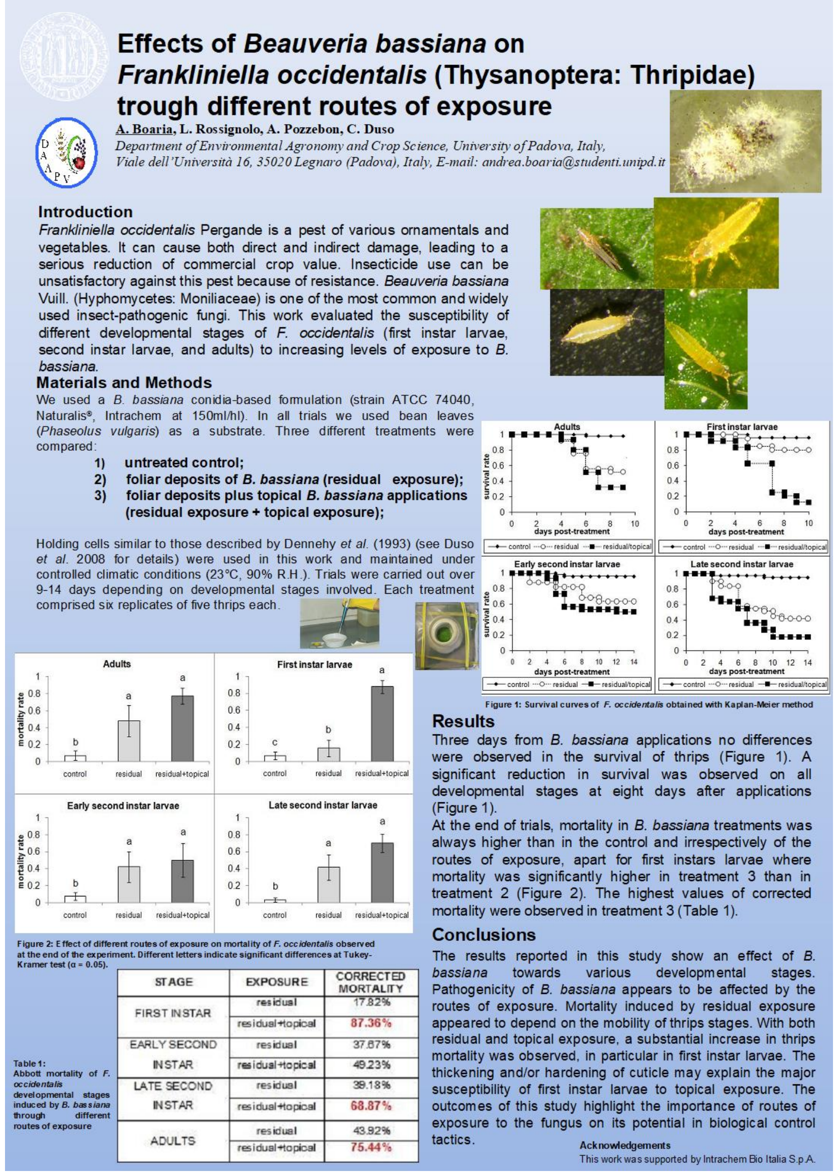
Naturalis-L: ***Beauveria bassiana***

- Infects and kills most life stages.
- Humidity and temperature dependant.

Nemasys: ***Steinernema feltiae***

Attacks mainly adult females and larvae / pupae in compost.

- Apply as wet spray.



Effects of *Beauveria bassiana* on *Frankliniella occidentalis* (Thysanoptera: Thripidae) trough different routes of exposure

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Introduction

Frankliniella occidentalis Pergande is a pest of various ornamentals and vegetables. It can cause both direct and indirect damage, leading to a serious reduction of commercial crop value. Insecticide use can be unsatisfactory against this pest because of resistance. *Beauveria bassiana* Vuill. (Hyphomycetes: Moniliaceae) is one of the most common and widely used insect-pathogenic fungi. This work evaluated the susceptibility of different developmental stages of *F. occidentalis* (first instar larvae, second instar larvae, and adults) to increasing levels of exposure to *B. bassiana*.

Materials and Methods

We used a *B. bassiana* conidia-based formulation (strain ATCC 74040, Naturalis®, Intrachem at 150ml/hl). In all trials we used bean leaves (*Phaseolus vulgaris*) as a substrate. Three different treatments were compared:

1) **untreated control;**
2) **foliar deposits of *B. bassiana* (residual exposure);**
3) **foliar deposits plus topical *B. bassiana* applications (residual exposure + topical exposure);**

Holding cells similar to those described by Dennehy *et al.* (1993) (see Duso *et al.* 2008 for details) were used in this work and maintained under controlled climatic conditions (23°C, 90% R.H.). Trials were carried out over 9-14 days depending on developmental stages involved. Each treatment comprised six replicates of five thrips each.

Figure 1: Survival curves of *F. occidentalis* obtained with Kaplan-Meier method

Figure 2: Effect of different routes of exposure on mortality of *F. occidentalis* observed at the end of the experiment. Different letters indicate significant differences at Tukey-Kramer test ($\alpha = 0.05$).

Table 1: Abbott mortality of *F. occidentalis* developmental stages induced by *B. bassiana* through different routes of exposure

STAGE	EXPOSURE	CORRECTED MORTALITY
FIRST INSTAR	residual	17.82%
	residual+topical	87.36%
EARLY SECOND INSTAR	residual	37.67%
	residual+topical	49.23%
LATE SECOND INSTAR	residual	39.18%
	residual+topical	68.87%
ADULTS	residual	43.92%
	residual+topical	75.44%

Results

Three days from *B. bassiana* applications no differences were observed in the survival of thrips (Figure 1). A significant reduction in survival was observed on all developmental stages at eight days after applications (Figure 1).
At the end of trials, mortality in *B. bassiana* treatments was always higher than in the control and irrespectively of the routes of exposure, apart for first instars larvae where mortality was significantly higher in treatment 3 than in treatment 2 (Figure 2). The highest values of corrected mortality were observed in treatment 3 (Table 1).

Conclusions

The results reported in this study show an effect of *B. bassiana* towards various developmental stages. Pathogenicity of *B. bassiana* appears to be affected by the routes of exposure. Mortality induced by residual exposure appeared to depend on the mobility of thrips stages. With both residual and topical exposure, a substantial increase in thrips mortality was observed, in particular in first instar larvae. The thickening and/or hardening of cuticle may explain the major susceptibility of first instar larvae to topical exposure. The outcomes of this study highlight the importance of routes of exposure to the fungus on its potential in biological control tactics.

Acknowledgements
This work was supported by Intrachem Bio Italia S.p.A.

Naturalis-L

PCS: 04187

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ACTIVE INGREDIENT	TRADE NAME	COMPATIBILITY'
***Ampelomyces quisqualis* isolate M-10**	AQ10	
AZOXYSTROBIN	QUADRIS	
***Bacillus subtilis* strain QST 713**	SERENADE	
BENALAXIL	GALBEN	
BITERTANOLE	PROCLAIM	-
BORDEAUX MIXTURE	many	
BOSCALID	CANTUS	
BUPIRIMATE	NIMROD	
CAPTAN	many	
CHLOROTHALONIL	DACONIL	
COPPER HYDROXIDE	KOCIDE/HELIOCUIVRE	
COPPER OXYCHLORIDE	many	
CYAZOFAMID	MILDICUT	-
CYMOXANIL	CURZATE	-
CYPROCONAZOLE	ATEMI/CADDY	
CYPRODINIL + FLUDIOXONIL	SWITCH	
DICHLORAN	many	-
DIFENOCONAZOLE	SCORE	-
DIMETHOMORPH	FORUM 50 WP	
FAMOXADONE	EQUATION PRO	
FENAMIDONE	ORACLE	
FENARIMOL	RUBIGAN	-
FENBUCONAZOLE	INDAR	-
FENHEXAMID	TELDOR	
FOLPET	many	-
FOSETYL-ALUMINIUM	ALIETTE 80%	
IPRODIONE	ROVRAL	
IPROVALICARB	MELODY COMPACT	
KRESOXIM METHYL	STROBY	
MANCOZEB	DITHANE DG	-

Environmental conditions for optimum activity of Naturalis-L

Temperatures

- Optimum temperature range: 20 to 27°C
- Good activity from 18 to 32°C
- Considerable reduction of viability of spores above 35°C
- Spore germination stops at temperatures below 10°C

Relative humidity

- Optimum R.H. range: > 60%
- Spore germination stops at RH levels below 15%
- The higher the RH, the more the fungus is likely to sporulate

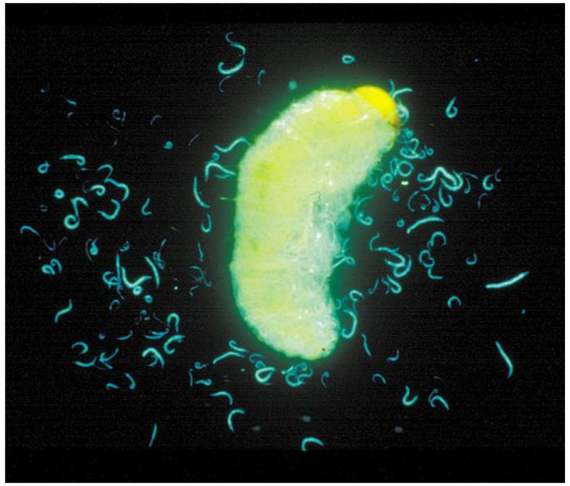
…nditions: temperature 22°C, RH $\geq$ 80%

Taxus or Vine weevil

- *Otiorhynchus armadillo, O. salicicola*
- Severe economic damage from *O. armadillo*
- *O. sacicicola* slightly larger




Vine weevil



- Met52 fungal pathogen long term control, min 14oC compost / soil temperature. PCS: 04811
- Nematodes
- natural enemies include ground beetles, birds, ect.

Nematop for adult vine weevil

- Wooden block with nematodes in gel, (*Steinernema carpocapsae*).
- Adults nocturnal, hide under block.
- Nematodes enter through joints, mouth etc.
- Killing process is the same as for larvae.

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