Laboratory and semi-field studies on the efficacy of *Beauveria bassiana* (strain ATCC 74040) against *Frankliniella occidentalis*

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Frankliniella occidentalis

- Thysanoptera Thripidae
- Flower thrips (feeding and breeding inside flowers)
- Major pest of protected crops
- Viruses (TSWV) transmission
- Life cycle with a cryptic phase in the soil
- Failure of chemical control measures
- Cross and multiple insecticide resistance

Alternatives to pesticides (Dir. 2009/128/CE)

- Biological control (predatory bugs and predatory mites) against actively feeding thrips
- Laelapid mites, nematodes and entomopathogens against cryptic stages in the soil
- Cultural methods
- Pheromones and mass trapping

A possible alternative: *Beauveria bassiana*

- ~700 insect species as hosts
- Mode of action: contact with cuticle and iphae penetration
- High RH values (>90%) favour infection
- MBCA for glasshouse pests: thrips, whitefly, spider mites
- Favourable toxicological and environmental profile

Laboratory studies

Effects of *B. bassiana* on *F. occidentalis* through different routes of exposure

Materials and methods

- *B. bassiana* strain ATCC74040
- Naturalis® (conidia suspension 2.3 x 10^7c./ml, 150 ml/hl)

Materials and methods

- Bean leaves and/or thrips were treated with *B. bassiana* (immersion for 30 s) following procedures described for *Tetranychus urticae*

- After pesticide application, thrips were reared in cages held in controlled climatic condition (25±1°C, 70±10% of R.H. and 16:8 L:D)

Materials and methods: routes of exposure

Treatments	Route of exposure	Leaves	*F. occidentalis*
Control		-	-
Treated leaves	Residual	+	-
Treated *F. occidentalis*	Topical	-	+
Treated leaves + Treated *F. occidentalis*	Residual+Topical	+	+

(+) pesticide application (-) distilled water application

Materials and Methods

The effects of *B. bassiana* were evaluated on four *F. occidentalis* life stages:

- First instar larvae
- Early second instar larvae
- Late second instar larvae
- Adult females

Materials and Methods

- Lethal effects evaluated after 3, 6 and 9 days
- Abbott mortality
- Effects on juvenile development

- Data analysed with factorial logistic regression models ($\alpha = 0.05$).

Results

The survival of first instar larvae, second instar larvae and adult survival was affected by both topical and residual exposures.

The effects of *B. bassiana* were detected faster on first and second instar larvae than on adults.

The exposure to *B. bassiana* residues had a major impact in mortality effects.

Laboratory studies

Effect of *B. bassiana* soil applications on soil-dwelling stages of *F. occidentalis*

Materials and methods

Three treatments were compared:

- **Water soil application**
- ***B. bassiana* soil application before larvae penetration in soil**
- ***B. bassiana* soil application after larvae penetration in soil**

Three doses of *B. bassiana* were tested: 3, 9, 27 L/ha

Results

Soil applications of *B. bassiana* were more effective on *F. occidentalis* after penetration in soil.

The best results were obtained with 27 L/ha but the optimal dose resulted 9 L/ha.

Semi-field experiments

1. Effect of soil application
2. Effect of soil and foliage applications

1. Materials and Methods

- Two treatments (4 replicates) were compared:
  - Control
  - Soil application (2 applications in 7 days)
- Host plant: cyclamen
- Dose: 9 l/ha
- Plants were infested with about 10 adults and 50 juveniles two weeks prior to the first application.
- Population density of *F. occidentalis* was evaluated on flowers and leaves until 35 days from the first application.

2. Materials and methods

- Three treatments (4 replicates) were compared:
  - Control
  - Foliar applications (two applications in 7 days)
  - Foliar + soil application (two applications in 7 days)

- Dose:
  - Foliar application (1.5 l/ha)
  - Soil application (9 l/ha)

- Host plant: Gerbera

- Plants were infested with about 20 late second instar larvae three days prior to the first application.

- Population density of *F. occidentalis* was evaluated on flowers and leaves until 21 days from the first application.

Results

The first experiment showed a reduction of about 50% of thrips densities after two soil applications of *B. bassiana.*

This effect attained 66% when canopy and soil applications were combined.

Conclusions

- *B. bassiana* (strain ATCC 74040) can affect the survival of different thrips stages through residual and topical exposures
- Residual exposure can decrease thrips developmental rate
- Soil applications reduced of about 50% thrips densities
- This effect attained 66% when soil and foliage applications were combined.
- The impact of *B. bassiana* on thrips and spider mites should be considered in IPM tactics on various crops