Successful application of entomopathogenic nematodes using farm machinery for the biological control of western corn rootworm larvae

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Inundative biological control of *Diabrotica* larvae with nematodes
Collaborators

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What do we know?
Virulence of different nematode species/strains in the laboratories

What do we know?

Results

• *Heterorhabditis bacteriophora, H. megidis, Steinernemaeltiae, S. arenarium, and S. kraussei* are highly virulent
• *S. abassi* is intermediate
• Others, such as *S. carpocapsae*, or *S. glaseri* are less virulent


M & M: Screening experiments in Petri-dishes on filter paper or in sand, as well as bioassays in containers with sand or soil and maize from 2004 to 2007
What do we know?

Efficacy of different nematode species /strains in the field

Results

• *H. bacteriophora, H. megidis* are effective against *Diabrotica* larvae in the field (40 to 80% depending on dosage, field, hybrid)
• *S. feltiae* seems less effective

What do we know?

Instar susceptibility to nematodes

Results

- All larval instars and pupae are killed effectively by all nematodes
- Adults are less susceptible

Establishment and persistence of nematodes

Results

• Applied nematodes establish at low rates in the soil, but, they persist long enough to control *Diabrotica*
• Applied nematodes do not persist significantly for several years in maize

Which application technique at sowing is the best?

Two study fields in southern Hungary (2011)

- **Nematodes as fluid into soil** (2 x $10^9$ / ha)
- **Nematodes as microgranules into soil** (2 x $10^9$)
- **Nematodes coated seeds into soil** (2.5 x $10^9$)
- **Tefluthrin** (13.3 kg Force)
- **Clothianidin** (Simple conc. Poncho)
- **Untreated controls**

3 to 5 plots per treatment per field
Which application technique at sowing is the best?

- Nematode as fluid into soil

For example: MONOSEM NG Plus – sowing machine
Which application technique at sowing is the best?

- Nematode as microgranules into soil

For example:
Microsem applicator for granules
Which application technique at sowing is the best?

- Nematode coated seeds into soil
**Methods**

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Efficacy of nematodes at medium rates

$2 \times 10^9$ nematodes / ha  (500 *diabrotica* eggs / plant, 2 fields, HU 2011)
Efficacy of nematodes at medium rates

$2 \times 10^9$ nematodes / ha (500 eggs / plant, 2 fields, HU 2011)

Results
Summary

- Nematodes can reduce *Diabrotica* larval populations and high levels of root damage when applied by farmer machinery at field scale

- Different methods for applying nematodes are feasible

- In case no soil insecticides are permitted, then nematodes are an alternative control solution
We like to thank our collaborators and many others

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