Optimization of application techniques and dosages of *Heterorhabditis bacteriophora* for biologically controlling the larvae of western corn rootworm

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What do we know?

The most validated application technique

Good experiences with fluid application of nematodes into the soil together with sowing

For example: MONOSEM NG Plus – sowing machine
The most validated application technique

Fluid application into soil with sowing

- Application of nematodes after pressure wheel and before soil closing wheels

Advantages:
- Exact dosage possible
- Application on large fields possible
- Easy to connect
Dose efficacy trials in 2012
Material and methods

Dose efficacy trials in 2012

Treatments

*Heterorhabditis bacteriophora* (Dianem TM Wurzelbohrer)
1, 2, 3, 4, 5 Billion per ha (270 l H$_2$O)

= 75,000, 150,000, 230,000, 300,000, 380,000 / row meter

Tefluthrin (Force 1.5G)
13.3 Kg / ha

Seed coating with Clothianidin (Poncho) simple rate

Untreated control
Material and methods

Dose efficacy trials in 2012

Setup
2 fields in southern Hungary
4 plots per treatment per field
Artificial infestation with 300 *Diabrotica* eggs / plant
Applications into sowing row during sowing
Material and methods

Dose efficacy trials in 2012

Data
Assessment of *Diabrotica* density
Assessement of root damage (node injury scale, IOWA scale)
Assessment of yields
Results

**Diabrotica levels in trials**

- Less beetles emerged than in other years due to extrem drought and heat.

- More beetles emerged from untreated infested controls than from treatments.

- Some nematode treatments had comparable results as insecticides.
Results

Dose efficacy response at reducing *Diabrotica*

- The dose of *H. bacteriophora* treatments influenced the extent to which *D. v. virgifera* was reduced;
- but no clear pattern was found for high doses
Results

Damage levels in trials

- According to the IOWA scale, average efficacies at preventing damage, including slight damage, were generally low;

- but comparable between Clothianidin seed coating, Tefluthrin-based insecticide granules and medium or high doses of *H. bacteriophora* fluids
Results

Damage levels in trials

- The root damage rating with the node injury scale revealed that most treatments prevented heavy root damage.

- However, heavy damage was generally rare in the investigated locations and year even in the untreated infested plots.
Results

Dose efficacy response at preventing root damage

• The average efficacy of H. bacteriophora at preventing damage increased with doses;

• but no clear regression curves can be drawn due to high variability of data and due to the generally low damage caused by the pest larvae.
Results

Yield levels in trials

- Yield losses due to Diabrotica was big in 2012

- Most treatments did not lead to significantly proven increases in yield;

- except with few of the treatments with *Heterorhabditis bacteriophora* fluids
Dose efficacy response at preventing yield loss

- High variability and little yield gain, which is however typical for efficacy field trials
Summary

• Efficacy data were highly variable, particularly at high doses; replicate numbers were not enough

• It is preliminarily suggested that the optimal doses of nematodes is at least 2 or 3 billion per hectare which is a medium dose.

Outlook

• Therefore a repetition of the experiment is needed prior concluding the optimal dose for fluid application of this nematode into the soil, i.e. having a satisfactory degree of efficacy at an acceptable level of costs.
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Supplementary materials
Few application problems
When pooling 2010 and 2012 trials of Hungary
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