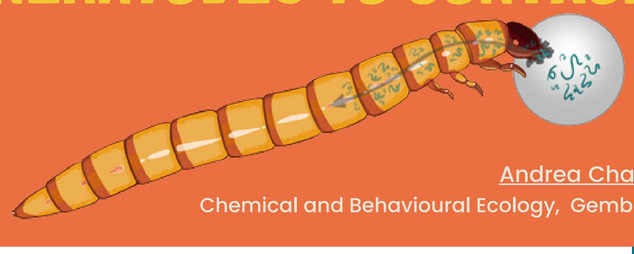
WAR IN THE DARKNESS:

THE USE OF VOLATILE ORGANIC COMPOUNDS AND ENTOMOPATHOGENIC NEMATODES TO CONTROL WIREWORMS



Authors

Andrea Chacon, Diana La Forgia, François Verheggen

Chemical and Behavioural Ecology, Gembloux Agro-BioTech, University of Liege, Belgium

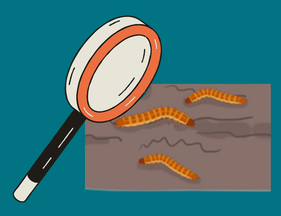
achacon@uliege.be

INTRODUCTION

Plant roots release in the soil Volatiles Organic Compounds (VOCs) that guide belowground phytophagous insects, such as wireworms (Coleoptera: Elateridae). Wireworms are generalist insect pests that can be found in many crops where they are responsible for high economical losses, killing the plants at early stages. Attract-and-kill strategies have great potential because wireworms are attracted by plant odors released from the rhizosphere and, later on, entomopathogenic nematodes (EPNs) have shown their great utility to control the larvae of various soil insect pests.

AIM

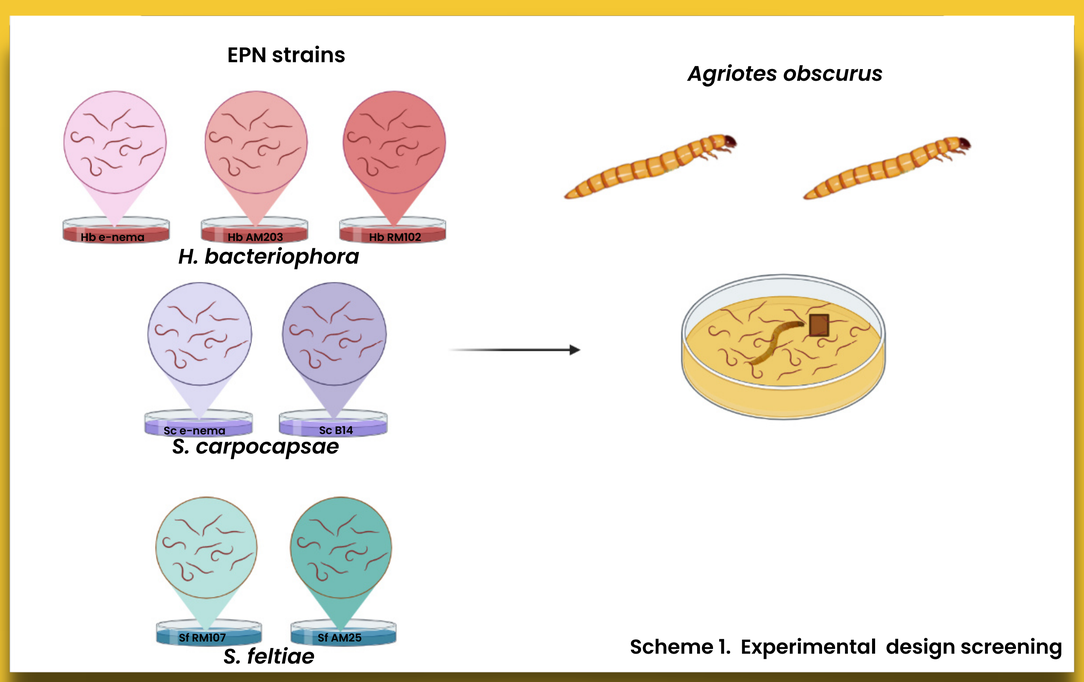
Develop an attract-and-kill strategy against wireworm larvae, based on the combined use of natural attractants and entomopathogenic nematodes.



EXPERIMENTAL DESING

1 Feeding and virulence screening of entomopathogenic nematodes (EPNs)

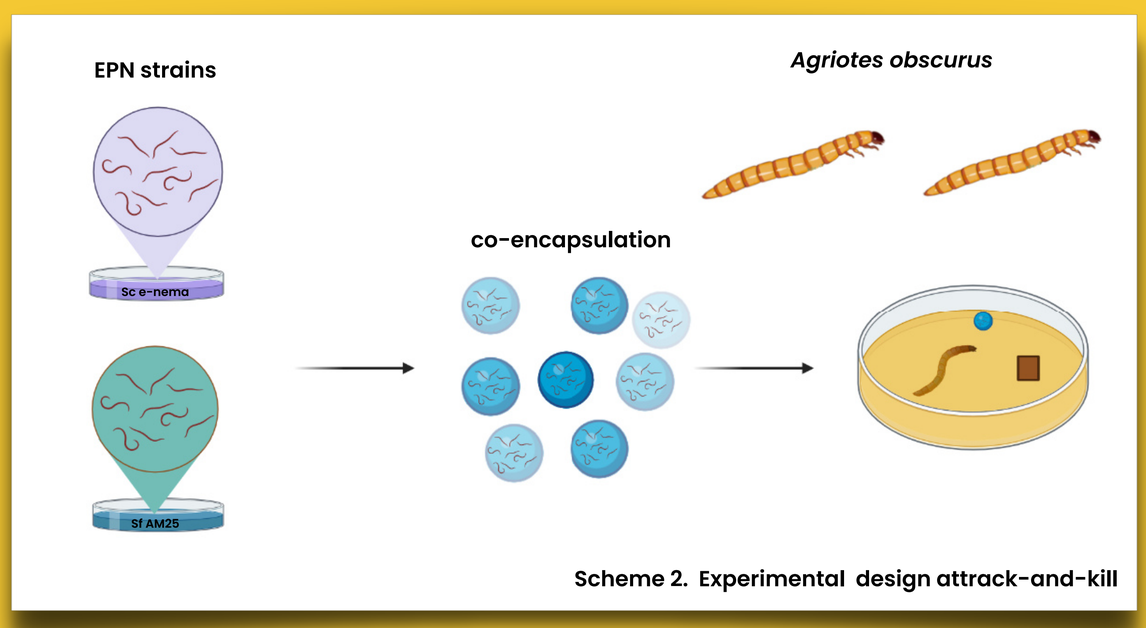
Seven commercial and non-commercial EPNs populations were tested: **three *Heterorabditis bacteriophora*, two *Steinernema carpocapsae* and two Steinernema *feltiae***. The larvae of *A. obscurus* were checked every week during eight weeks.



Scheme 1. Experimental design screening

2 Attract-and-kill experiment

The experiment evaluated four treatments: **(i)** alginate beads with EPNs and potato extract (n = 24), **(ii)** beads with EPNs only (n = 24), **(iii)** beads with extract only (n = 12), and **(iv)** control beads with water (n = 12). Larvae's feeding activity and vitality were checked once a week per eight weeks.



Scheme 2. Experimental design attrack-and-kill

REFERENCES

This research has been published in:

LA FORGIA, D., BRUNO, P., CAMPOS-HERRERA, R., TURLINGS, T. and VERHEGGEN, F., 2021. The lure of hidden death: development of an attract-and-kill strategy against Agriotes obscurus (Coleoptera: Elateridae) combining semiochemicals and entomopathogenic nematodes. Turkish Journal of Zoology, 45(SI-1), pp.347-355.

Read more here

RESULTS

1 Feeding and virulence screening of entomopathogenic nematodes (EPNs)

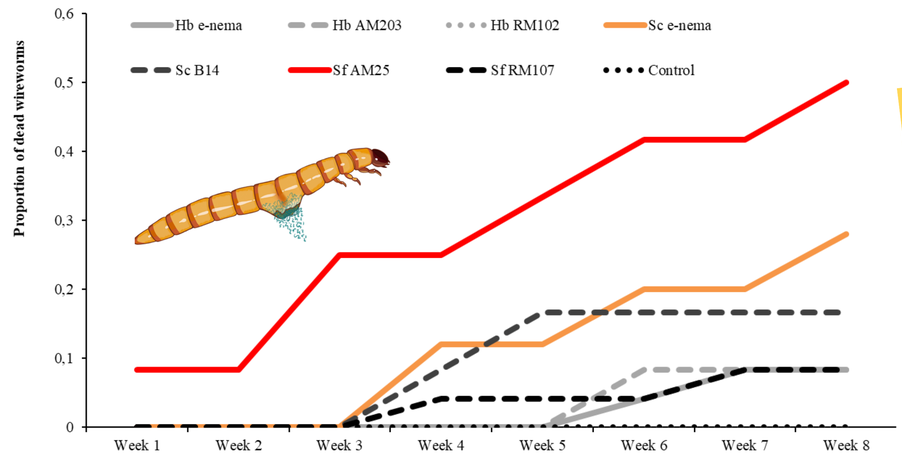


Figure 1. Proportion of dead wireworms over time after the application of different nematode strains (χ = 57.76, p < 0.001)

The populations *S. feltiae* AM25 and *S. carpocapsae* e-nema led to the highest mortality rate and feeding reduction.

2 Attracct-and-kill experiment

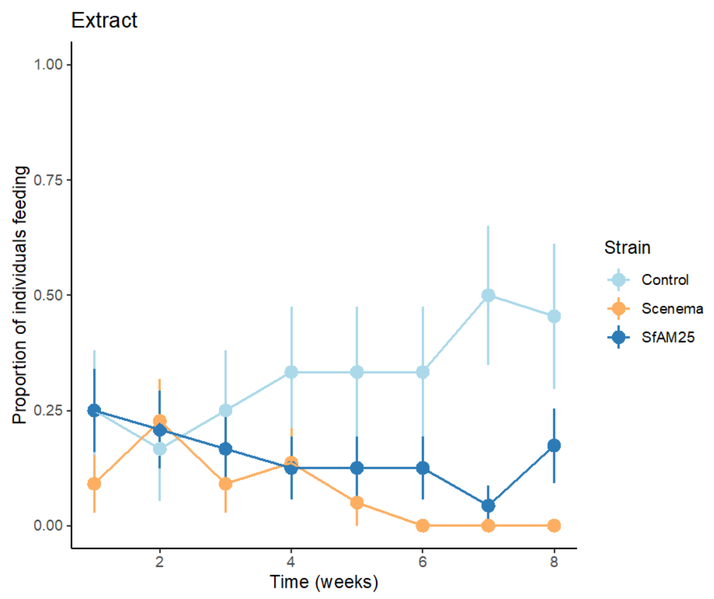


Figure 2. Proportion of eating wireworms over time after exposition to co-encapsulation with different nematode strains (χ2 = 56.77, p< 0.001). To the left the treatment without potato extract, and to the right the treatment with addition of potato extract. Error bars represent 95% confidence intervals.

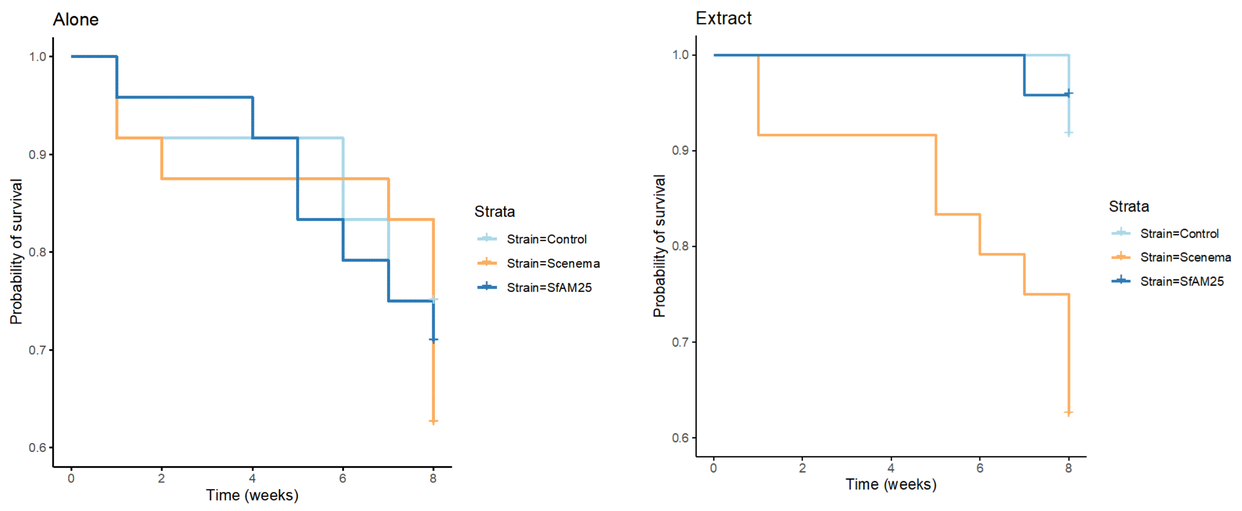
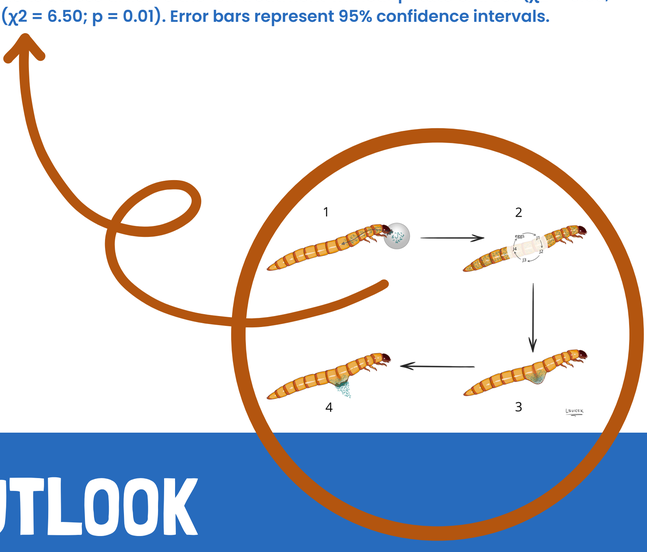


Figure 3. Proportion of dead wireworms according to nematode populations across time. To the left treatment without potato extract (χ2 = 0.96; p = 0.62), and to the right the treatment with addition of potato extract (χ2 = 6.50; p = 0.01). Error bars represent 95% confidence intervals.

EPNs reduced the percentage of feeding individuals, (p=0.001) *S. carpocapsae* e-nema has a stronger reduction effect (p=0.04)

EPNs and potato extract have an effect on the mortality (p=0.001).

Mortality was not influenced by EPNs (p=0.62)



CONCLUSION AND OUTLOOK

Using VOCs as attractants and EPNs as biological control agents represent a promising alternative to neonicotinoid pesticides.

This work is a first step in the development of the attract-and-kill method using EPNs. Optimisation of this method is still ongoing in our laboratory.

Acknowledgement

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