

Volatile organic compounds released by barley roots attract wireworms

F. Barsics¹, R. Latine¹, M. Fiers², E. Haubrige¹, F. J. Verheggen¹
f.barsics@ulg.ac.be

1. Unit of Functional and Evolutionary Entomology, Gembloux Agro-Bio Tech, University of Liège. 2, Passage des Déportés, 5030 Gembloux.
2. Unit of Phytopathology, Gembloux Agro-Bio Tech, University of Liège. 2, Passage des Déportés, 5030 Gembloux.

INTRODUCTION

Wireworms, the soil dwelling larvae of click beetles, are pests of many crops worldwide. Alternatives to insecticide treatments are needed in order to develop integrated management strategies. Our work consists in elucidating the role of barley (*Hordeum vulgare* L.) root-emitted volatile organic compounds (VOCs) on the orientation behaviour of *Agriotes sordidus* wireworms (Fig. 1).

Using dual choice olfactometers (Fig. 2), we have evaluated the attractiveness of baits ranging from barley roots themselves to one isolated root-emitted volatile organic compound.



Fig. 1 : *A. sordidus* wireworm (Real size: 20mm)

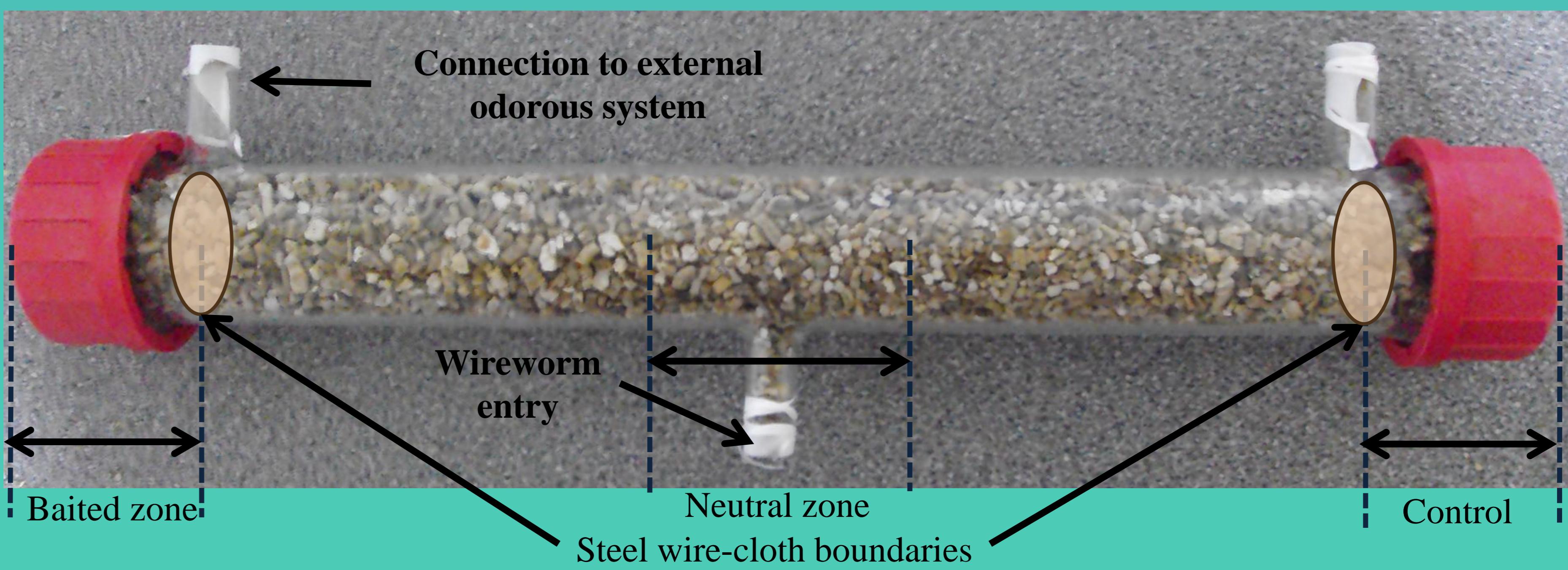


Fig. 2 : dual-choice olfactometer



MATERIALS AND METHODS

Wireworms were tested individually in olfactometric pipes filled with vermiculite (Fig. 2). The tested baits were

- 1) chopped roots,
- 2) entire healthy roots (Fig. 3),
- 3) roots infected with the phytopathogenic fungus *Cochliobolus sativus* (Fig. 4),

4) alginate beads (Fig. 5) loaded with 2-pentylfuran (a VOC emitted by barley roots). The beads were synthesized so that their emission rate would approach 1ng/h.

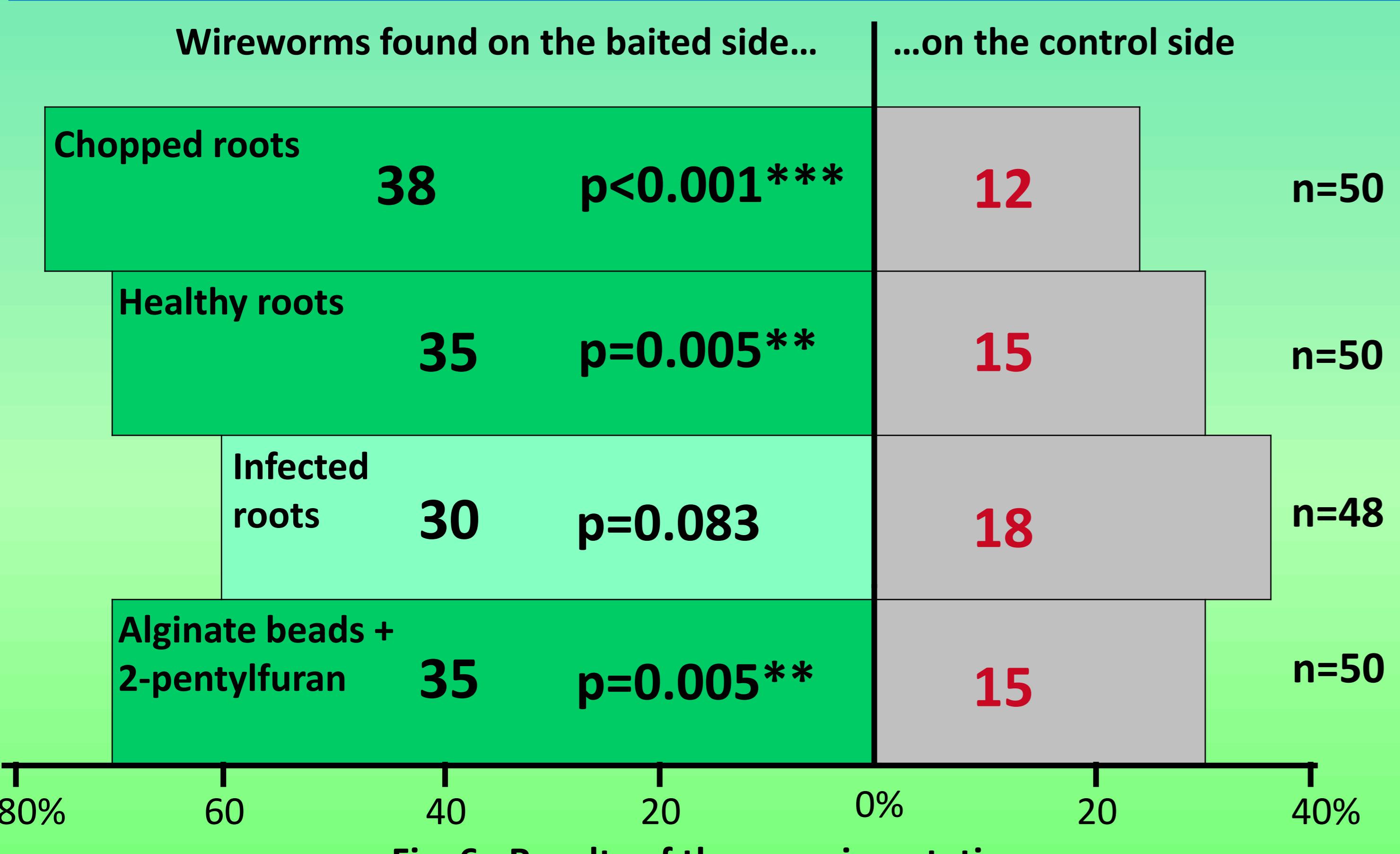
For each bait, individual tests were performed until we obtained 50 repetitions (48 for infected roots). Larvae found in the neutral zone were considered as non-responding. Observed frequencies related to the choice of wireworms in dual choice bioassays were compared to corresponding theoretical frequencies by using a χ^2 goodness-of-fit test, using Minitab® release 14.2.

RESULTS

The results are presented in Fig. 6. Almost all our experimentations showed the ability of the larvae to orientate towards a bait composed with a variety of VOCs emitted by barley roots. The infected roots bait doesn't seem to be significantly attractive. The 2-pentylfuran seems to have the same level of attractiveness than healthy roots.



Fig. 5 : Alginate beads. Real size : 1mm diameter



DISCUSSION

Our results indicate the adequacy of our device for the evaluation of wireworms' ability to orientate towards a source of VOCs.

The most interesting result lies in the attractiveness of 2-pentylfuran at an emission rate of 1ng/h. Increased emission doses should be tested.

Our results point out several trials to follow for subsequent tests. The outcomes of such experimentations might help improving crop protection through varietal selection, crop rotation and the development of trapping systems aiming at the reduction of wireworms populations.

Acknowledgments The authors would like to thank the University of Liège for making this work possible. Many thanks to Marie-Laure Fauconnier for coordinating the Rhizovol project in which this work is involved, and to the members of the project for their support.