



## LABORATORY STUDIES ON THE USE OF A NEMATODE *PHASMARHABDITIS HERMAPHRODITA* (SCHNEIDER) IN SLUG CONTROL

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ABSTRACT: Slugs *Deroceras reticulatum* (O. F. Müll.), *Deroceras laeve* (O. F. Müll.) and *Lehmannia valentiana* (Fér.) were tested for their susceptibility to infection with a nematode *Phasmarhabditis hermaphrodita* (Schneider). *D. reticulatum* was the most susceptible, *D. laeve* much less so, while *L. valentiana* was not attacked by the parasite. *Ph. hermaphrodita* may be used for slug control, but not all slug species are equally susceptible.

KEY WORDS: pests, slugs, slug control, nematodes, *Phasmarhabditis hermaphrodita*

### INTRODUCTION

Slugs are among serious pests of greenhouse and field crops. Their mass occurrence may lead to complete destruction of plants, all parts of which get damaged. Slug control is difficult and there are practically no effective control means (DANKOWSKA 1991, 1996, DANKOWSKA & BARANOWSKI 1998).

One way of biological plant protection is using a parasitic nematode *Phasmarhabditis hermaphrodita* (Nematoda: Rhabditidae) – vector of mutualistic gram-negative bacteria *Moraxella osloensis* (TAN & GREWAL 2001) which are deleterious to slugs. Invasive forms of the nematode penetrate the slug body

through its natural orifices, the bacteria are released, quickly multiply and cause a slow death of the gastropod. Three to five days from the nematode invasion the slugs stop feeding, and in one or two weeks they die. The nematodes, which have multiplied inside the slug, leave its body and actively seek a new host. The first characteristic symptom of nematode invasion is swelling of the slug mantle (WILSON et al. 1993, 1994; BLANKE 1995, DANKOWSKA 1998).

This study was aimed at testing, in laboratory experiments, the susceptibility of three slug species to infection with *Phasmarhabditis hermaphrodita*.

### MATERIAL AND METHODS

Laboratory experiments aimed at testing the nematode *Phasmarhabditis hermaphrodita* (Schneider) as a means of slug control were conducted in the Chair of Plant Protection Methods, Agricultural University, Poznań. They consisted of two stages. In both a British biopreparation NemaSlug was used, containing invasive forms of *Phasmarhabditis hermaphrodita* in a special medium.

In the first experiment the slugs were kept in Petri dishes of 10 cm diameter, lined with a few layers of fil-

ter paper. The slugs used were *Deroceras laeve* (O. F. Müller, 1774), *Deroceras reticulatum* (O. F. Müller, 1774) and *Lehmannia valentiana* (Férussac, 1823). The experiment was run in five replicates, using separately five slugs for each replicate. One gram of NemaSlug was dissolved in 200 ml distilled water, resulting in a uniform suspension of nematodes. Five ml of the suspension (ca. 8,000 nematodes) were taken and 1 ml was dripped directly on each slug. In the control only distilled water was dripped onto the slugs.

The second experiment was to test if the nematodes could actively find and infest the slugs. It was conducted in plastic containers (15 × 8 × 7 cm), filled with a 1 cm layer of humid soil. The experiment was run in five replicates. The soil in each container, prior to placing the slugs on it, was sprinkled with 5 ml nematode suspension, and then 5 slugs *Deroceras reticulatum*, *Deroceras laeve* and *Lehmannia valentiana* were placed there separately. Only distilled water was used

in control containers. After five days the slugs were transferred to Petri dishes, 10 cm diameter, lined with a few layers of humid filter paper.

In both experiments the slugs were fed oat flakes. The experiments lasted two weeks during which behaviour and appearance of the slugs were recorded, dead slugs counted, and then mortality for each species was calculated.

## RESULTS AND DISCUSSION

The results of the first experiment (direct placing of the nematodes on the slug bodies) are presented in Fig. 1. *D. reticulatum* was the most susceptible to infection with *Phasmarhabditis hermaphrodita* (60% mortality). *D. laeve* was also killed by the nematodes, but the mortality was much lower (16%). *L. valentiana* was not susceptible to the nematode invasion.

The results of the second experiment are presented in Fig. 2. The nematodes released in the soil were capable of finding the slugs and killing them.

Like in experiment I, *D. reticulatum* was the most susceptible, and *L. valentiana* was not attacked.

In both experiments slugs infected with *Ph. hermaphrodita* stopped feeding after three days, and characteristic swellings appeared on their mantles. In a week the slugs started dying.

The parasitic nematode *Ph. hermaphrodita* may be useful as a means of slug control, but not all slug species are equally susceptible to its invasion. Other slugs should be studied in this respect.

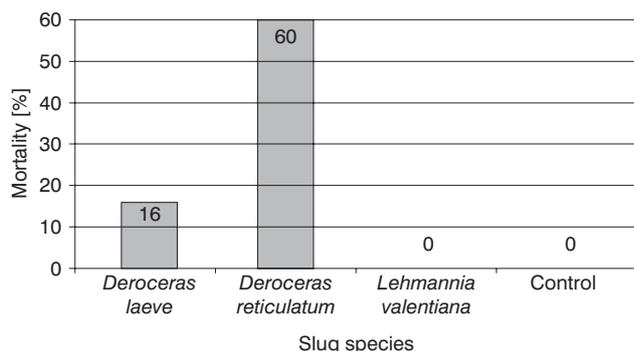


Fig. 1. The effect of *Phasmarhabditis hermaphrodita* applied directly (experiment I) on the slug mortality

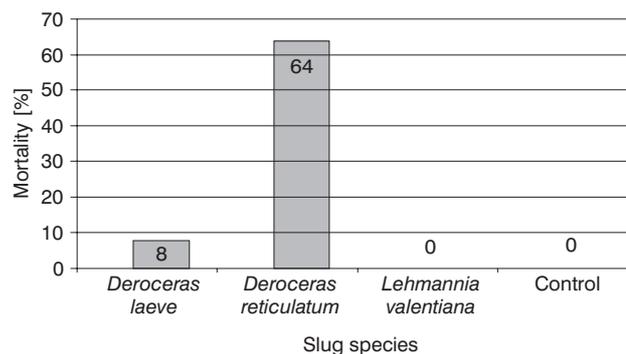


Fig. 2. The effect of *Phasmarhabditis hermaphrodita* applied to the soil (experiment II) on the slug mortality

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