

Entomology

Effect of Entomoparasitic Nematodes *Steinernema feltiae* on Fern Scale (*Pinnaspis aspidistrae* Sign.)

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ABSTRACT. Interrelation between fern scale (*Pinnaspis aspidistrae* Sign.) and entomoparasitic nematodes (*Steinernema feltiae*) is studied under laboratory conditions. Susceptibility of fern scale worms to juvenile suspension is evaluated and time and percent of the worm mortality are determined. © 2012 Bull. Georg. Natl. Acad. Sci.

Key words: fern scale, entomoparasitic nematodes, *Steinernema feltiae*, plant protection.

Fern scale (*Pinnaspis aspidistrae* Sign.: *Coccidia*) damages greatly ornamental and house plants (Figs. 1,2). The pest dwells on the underside of the leaf and covers itself with thorax. In the case of thick habitation of pests the leaf turns yellow and falls. Fern scale is polyphage; it damages ornamental plants, such as house ferns (*Nephrolepis exaltata* Schott), dragon-tree (*Draecena draco* L.), brier (*Smilax exelsa* L.), etc. [1]. Fern scale propagates in West Asia, North and South America; it was detected in Europe and Georgia.

The objective of the work was to study the action of entomoparasitic nematodes (*S. feltiae*) on fern scale (*P. aspidistrae* Sign.) under laboratory conditions.

Entomoparasitic nematodes are harmless to humans, animals, plants; they present effective biological agents to control pests. Among them the nematode *S. feltiae* is used against different pests such as North American white worm (*Hypantria*

cunea), Colorado potato beetle (*Leptinotarsa decemlineata*), greenhouse whitefly (*Trialeurodes vaporariorum*) and others.

S. feltiae carries an associated bacterium (*Xenorhabdus* species). Their coaction causes mortality of insects. In the experiment a *S. feltiae* strain was used, produced by e~nema Co., Germany.

A pest's organism as a food source is an important medium to reproduce parasitic nematodes. Life cycle of the nematode *S. feltiae* includes the egg, four juvenile stages (J_1 - J_4) and the adult. After the second stage juveniles are covered with a protective film-cuticle, they leave the cadaver in search of a new host. Nematodes enter a pest's body via the mouth, anus or respiratory openings and starts to feed. In the body of the host nematodes release symbiotic bacteria which kill insects within 24-72 hours. In the intestines of a host nematodes produce an amphimictic generation (male and female nematodes).

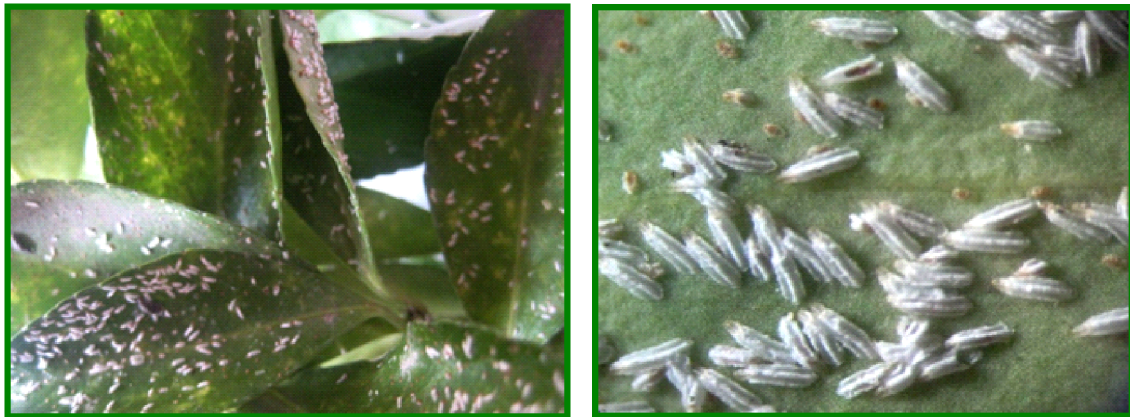


Fig. 1, 2. Colonies of fern scales (*Pinnaspis aspidistrae*) on the laurel leaves

Cultivation of *S. feltiae* at 24-25°C under laboratory conditions was conducted on late age worms of Honeycomb Moth (*Galleria mellonella*) [2].

Individuals of fern scale were collected in spring-summer at the Centre of Ornamental Gardening, Tbilisi, on laurel plants, where density of pest's habitation was 100-120 individuals per leaf on the average.

Laurel leaves inhabited by fern scales were placed into Petri dishes with wet filter paper on the bottom. Suspension of entomoparasitic nematode was used to infest scales with the following concentrations: 500, 1000 and 1500 IJs/ml. Experiments carried out were replicated 3-times. Laurel leaves in control Petri dishes were treated with distilled water (Fig.3). Records were made on the 3rd, 5th and 7th days. The percent of pests' mortality was determined by Abbott



Fig. 3. Infested worms of fern scales

formula [3]. Dead pests infested by nematodes were placed on special water-jacketed cuvette holders in small Petri dishes with filter papers. On the 12th day of pest invasion nematodes leave host body for cuvettes where nematode biomass was collected (Figs. 4,5).

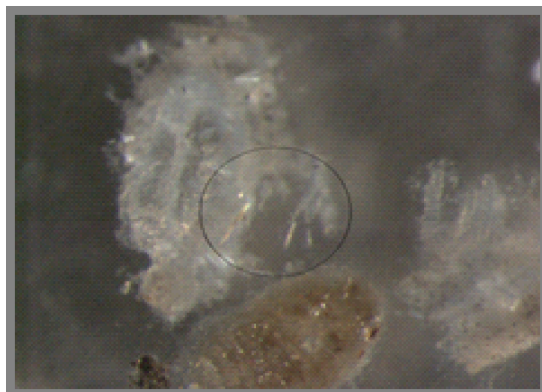


Fig. 4. Action of *S.feltiae* on fern scale worms

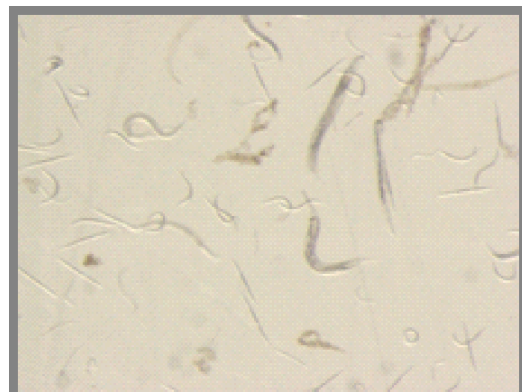


Fig. 5. Larvae of *S. feltiae* leaving the body of fern scale

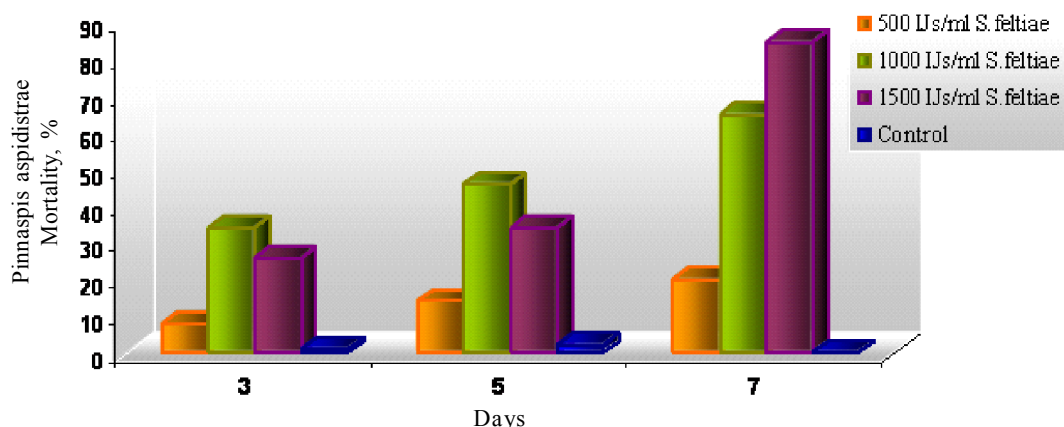


Fig. 6. Mortality of fern scale caused by entomoparasitic nematode *S. feltiae*, in %, at different concentrations of nematode suspension.

Suspension of *S. feltiae* was stored in the refrigerator at 4-6°C. Nematodes were acclimated at room temperature (21-23°C). The biomass obtained could be used in 6-10 hours.

Results of investigations of the interaction of fern scales and nematodes *S. feltiae* showed that worms of fern scale were resistant to nematode suspension 500 IJs/ml. Mortality of worms in 3 replications was insignificant. At the same time, among infested worms of fern scales live imagoes were detected. In the case of suspension concentration 1000 IJs/ml mortality of worms reached 65% in 3 replications. In the case of nematode

suspension concentration 1500 IJs/ml percent of the worm mortality on the 7th day after invasion reached 85% (Fig. 6).

Thus, it was established that against fern scales it is possible to use entomoparasitic nematodes *S. feltiae* in the form of high concentration suspension (1000-1500 IJs/ml) which, in our opinion, significantly decreases the number of fern scales in the ground and greenhouses.

It should be noted that we have not found any literature data on interrelation between fern scale (*Pinnaspis aspidistrae* Sign.) and entomoparasitic nematodes *S. feltiae*.

ენტომოლოგია

ენტომოპათოგენური ნემატოდა *Steinernema feltiae*-ს მოქმედება გვიმრის ფარიანაზე (*Pinnaspis aspidistrae* Sign.)

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ნაშრომში ლაბორატორიულ პირობებში შესწავლილია ენტომოპარაზიტული ნემატოდის (*S. feltiae*) მოქმედება გვიმრის ფარიანაზე (*P. aspidistrae*). შეფასებულია გვიმრის ფარიანას მატლების მიმღებობა სხვადასხვა კონცენტრაციის ნემატოდური სუსპენზიის მიმართ. პროცენტულად განსაზღვრულია ფარიანას მატლების სიკვდილიანობა.

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