

EFFICIENCY OF ENTOMOPATHOGENIC NEMATODES ON THE PEACH ROOT BORER, *Capnodis carbonaria* (KLUG.) (COLEOPTERA: BUPRISTIDAE)

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ABSTRACTS

The efficiency of entomopathogenic nematodes on the adults of root peach borer, *Capnodis carbonaria* (Klug.) was studied in the laboratory and under semi-field conditions. In the first experiment, the percentage of mortalities were recorded when three nematode species, i.e., *Heterorhabditis bacteriophora*, *Steinernema carpocapsae* and *Steinernema feltiae* were used. The percentage of mortalities after two and three days were 88, 100, 76 and 92, 100 and 88% for the three nematode species, respectively. In the second experiment *S. carpocapsae* was tested against adults of *C. carbonaria* under semi-field conditions. The results obtained for % mortalities were 5, 0, 16, 50 and 20 when the nematode suspension used at 1000, 2000, 4000 and 8000 juveniles / ml, two days after treatment, respectively. The respective percentage of mortality after four days were 9.5, 11, 25, 75 and 9%. The percentages of adult exit two and four days after treatment were 60, 56.7, 60, 60, 83.3; 70, 60, 66.7, 66.7 and 83.3 for the four used nematode concentrations, respectively.

Keywords: *Capnodis carbonaria*, Entomopathogenic nematodes.

INTRODUCTION

Peach is one of the most important and widely distributed fruit trees in North Sinai Governorate. The flat headed *Capnodis* spp. (*Capnodis tenebrionis* (L.) and *Capnodis carbonaria* (Klug.)) are serious pests of cultivated stone fruits (*Prunus* sp.) in all Mediterranean countries, where larvae colonize in the roots and kill the trees. Ben Yahuda et al. (2001) in Israel, Dicenta et al. (2001) in Spain, Kantn and Aleksseev (2002) in Russia recorded *C. carbonaria* when they surveyed Family Bupristidae adults. These adults are found from February until early November. Pairing begins in April. A period of feeding appeared necessary for maturation of the female ovaries. Garrido-Vivas (1984) recorded the eggs of *Capnodis* spp. were laid either on the trees or on the soil beneath them. The newly hatched larvae bored into the trunks or the roots. Later instars tunneled extensively between the wood and the bark. Larvae were found throughout the year. Pre-pupae and pupae were found from July to mid- September Malagon et al. (1990) found that the optimum temperature for *C. tenebrionis* oviposition was 30°C. Soil humidity had a significant effect and females didn't lay eggs on soil with a moisture contents > 6%. Mourikis et al. (1998) observed *C. tenebrionis* in roots of non-irrigated trees. Lobaton et al. (1998) evaluated a strain of *Steinernema carpocapsae* for its ability to control *C. tenebrionis*.

In Egypt, the peach root borer, *C. carbonaria* infests the roots of peach trees in North Sinai. The pest has one generation / year and two

seasonal activity peaks (Girgis & Batt, 1998; Okil (2001) recorded *C. carbonaria* on peach in North Sinai in

El Arish, El Sheikh Zowayed and Rafah with respective infestation rates 9, 17 and 36%. This insect attacked healthy peach trees, but severe infestation was noticed in weak and old trees.

The aim of this study is to find a safe method to control this harm pest by using nematodes.

MATERIAL AND METHODS

The effects of some entomopathogenic nematodes (*Heterorhbditis bacteriophora*, *Steinernema carpocapsae* (S2) and *Steinernema feltiae*) were used on the adults of *Capnodis carbonaria*.

Adults of *C. carbonaria* were collected by hand from peach orchards in El- sheikh Zowayed district, North Sinai Governorate. Two experiments were carried out.

In the first experiment, 60 adults were used. Every three adults were placed in a plastic cup (100 cc) containing 70 gm of fine sand wetted with 10ml water and one ml of nematode suspension of one concentration (6000 nematodes/ ml). This experiment was replicated 5 times in each species of nematodes. Another 5 cups received only water used as control. The dead adults were dissected and mortality ratios were recorded after two and three days.

In the second experiment, Semi-field technique was applied in which 15 plastic containers (each 40 cm in depth and 20 cm in diameter). In each container 10 *Capnodis* adults were placed and filled with fine sand until 5 cm before its edge. The sand was wetted with 150 ml water and then 10 ml of S2 nematode suspension was well distributed on the sand surface, four concentrations (1000, 2000, 4000 and 8000 jovinoids/ ml) and control, were used and three containers were used for each concentration and three were treated with water only as control. Each container was covered with fitted plastic cover. After 3 and 5 days, the emerged adults were removed and kept in glass jar provided with soft peach shoots for feeding until death, the dead adults were counted and dissected.

RESULTS AND DISCUSSION

In the first experiment, *Capnodis carbonaria* adults treated with *Heterorhbditis bacteriophora*, *Steinernema carpocapsae*, *Steinernema feltiae* and control gave 88%, 100%, 76% and 20% mortality after two days from treatment, respectively (Table1). The respective percentage of mortality obtained after three days of treatment were 92, 100, 88 and 20 respectively.

In the second experiment, however, the *Capnodis* adults were used under a semi-field condition to study the effect of entomopathogenic nematodes on these adults and their ability to penetrate the soil after their emergence from the pupa.

The results obtained in Table (2) show that the percentage of mortality of *C. carbonaria* adults were 5, 0, 16, 50 and 5 when *S. carpocapsae* was used at concentrations of 1000, 2000, 4000, 8000 jovinoids /ml and control, respectively after two days. The respective % mortality obtained after four days of treatments were 9.5, 11, 25, 75 and 9.1% respectively. The number of adults emerged from soil surface treated with *S. carpocapsae* at concentrations of 1000, 2000, 4000, 8000 jovinoids / ml and control were 18, 17, 18, 18 and 20 after two days from treatment, respectively. The respective number of adult emerged obtained after four days from treatment were 21, 18, 20, 20 and 22 respectively. The respective percentage of emergence of adults from the soil surface treated with *S. carpocapsae* at concentrations of 1000, 2000, 4000, 8000 jovinoids / ml were 60, 56.7, 60, 60 and 86.7% after two days from treatment respectively. The respective percentage of mortality emergence obtained after four days of treatment were 70, 60, 66.7, 66.7 and 86.7% (Table 3).

The majority of research papers about peach root pests related to family Buprestidae concentrated on the biology, ecology, harms caused by these pests and the use of chemical pesticides for their control. Lobaton et al (1998) evaluated a strain of *S. carpocapsae* for its potential to control larvae and pupae of *C. tenebrionis* in Spain. They obtained 100% mortality on immature individuals.

Table (1) The percentage of mortality of *C. carbonaria* adults after two and three days when treated with *H. bacteriophora*, *S. carpocapsae* and *S. feltiae* in the laboratory

Nematodes	Days after treatments	
	Two days	Three days
<i>H. bacteriophora</i>	88	92
<i>S. carpocapsae</i>	100	100
<i>S. feltiae</i>	76	88
control	20	20

Table (2): Number of adult emergence and the percentage of mortality of *C. carbonaria* after been treated with *S. carpocapsae* in semi-field trial.

Concentration	After two days		After four days	
	Number of adult emergence	%Mortality	Number of adult emergence	% Mortality
1000	18	5.6	21	9.5
2000	17	0	18	11.1
4000	18	16.7	20	25
8000	18	50	20	75
Control	20	5	22	9.1

Table (3): Number of adult emergence and the percentage of mortality of *C. carbonaria* in semi-field trial.

Concentration	After two days		After four days	
	Number of adult emergence	% Mortality	Number of adult emergence	% Mortality
1000	18	60	21	70
2000	17	56.7	18	60
4000	18	60	20	66.7
8000	18	60	20	66.7
Control	26	86.7	26	86.7

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تأثير النيما تودا الممرضة للحشرات علي حفار جذور الخوخ كبنوديس كاربوناريا
(عائله بيريسدي رتبه غمديه الاجنحه)
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تم دراسة تأثير النيما تودا الممرضة للحشرات علي الحشرات الكاملة لحفار جذور الخوخ في المعمل وتحت ظروف الشبه حقلية . في التجربة الأولى قدرت نسبة الموت بعد استخدام ثلاث أنواع من النيما تودا هي هيتيرو بديتس باكتيروفورا ، شتينيرنيما كاربوكاسي و شتينيرنيما فليثيا وكانت نسبة الموت بعد يومين من المعاملة ٨٨ ، ١٠٠ ، ٧٦ علي التوالي ، وبعد ثلاث أيام ٩٢ ، ١٠٠ ، ٨٨ علي التوالي.

وفي التجربة الثانية تم معاملة الحشرات الكاملة بالانوع شتينيرنيما كاربوكاسي تحت ظروف شبه حقلية وكانت النتائج المتحصل عليها للنسبة المؤيه للموت هي ٥ ، صفر ، ١٦ ، ٥٠ ، ٢٠ ، عند استخدام تركيزات النيما تودا الاتيه: ١٠٠٠ ، ٢٠٠٠ ، ٤٠٠٠ ، ٨٠٠٠ طور معدي/ مل بعد يومين من المعاملة بينما كانت ٩،٥ ، ١١ ، ٢٥ ، ٧٥ ، ٩ بعد أربعة أيام من المعاملة. وكانت النسبة المؤيه لخروج الحشرات الكاملة من التربة ٦٠ ، ٥٦،٧ ، ٦٠ ، ٦٠ ، ٨٣،٣ وذلك بعد يومين من المعاملة بينما كانت النسبة ٧٠ ، ٦٠ ، ٦٦،٧ ، ٦٦،٧ ، ٨٣،٣ علي التوالي بعد أربعة أيام.