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The Cunaxid Mite *Neocunaxoides andrei* (Baker & Hoffmann) as a Biological Control Agent of the Root-Knot Nematode *Meloidogyne javanica* Chitwood

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ABSTRACT

Feeding capacity of the cunaxid mite *Neocunaxoides andrei* (Baker & Hoffmann) and its feeding capability on the root-knot nematode *Meloilogyne javanica* Chitwood, under laboratory or semi field conditions were studied. Results showed that, a female of *N. andrei* consumed an average of 177.2 second juvenile stage (j2s) of *M. javanica* within five days under the laboratory conditions of 26 ± 1°C and 70 ± 5% R.H. Data also indicated that, the presence of 20, 40 and 60 newly emerged *N. andrei* females together with 500 j2s *M. javanica* in pots planted with tomato seedlings 15 days old caused a reduction of about 59 %, 74 % and 86 % of *M. javanica* reached adult females after 30 days.

Key Words: Cunaxid mite, *Neocunaxoides andrei*, Root-knot nematode, *Meloilogyne javanica,* Biological control, Feeding capacity.

INTRODUCTION

The root-knot nematodes, *Meloidogyne* species are major yield- limiting pathogens in many crop production areas allover the world. Genus *Meloilogyne* is considered of a major economic importance (Karssen and Hoenselaar, 1998). In Egypt, the root-knot nematodes are recognized as major agricultural pests of a wide range of crops including, vegetables, fruits and ornamental crops (Oteifa, 1964; Oteifa and Tarjan, 1965). The *Meloidgyne* species as *M. incognita* Chitwood*, M. javanica* Chitwood and *M. arenaria* Chitwood are widely distributed in northern Egypt (El-Saedy *et al.,* 1993 and Ibrahim *et al*., 1994). The geographical distribution of the root-knot nematode *M. javanica* is most abundant in sand soil and newly reclaimed land such as Nubaria, Tahrir province and Salhia districts followed by *M. incognita* (El-Gindi *et al*., 1980; Mahrous 1991 and El-Shawadfy, 1997).

Some predacious mites were recorded as a biological control agent of nematodes. Taha *et al*., (1988) studied the effect of feeding *N. andrei* on the nematode *Panagrolimaus rigidus* Schneider on its developmental time and fecundity under laboratory conditions of 30°C and 70% R.H.. Walter and Kaplan (1991) found that *Coloscerius simplex* (Ewing) colonized greenhouse pot cultures of the root- knot nematodes (*Meloilogyne spp*.) when it fed on vermiform nematode and other soil arthropods. They also studied feeding behavior of Cunaxid mites. Mostafa *et al*., (1997) reported that *Lasioseius dentatus* Fox could develop on egg masses of *M. javanica* under laboratory conditions.

El-Khateeb (1998) reared *Coloscerius aegyptiacus* Gomaa & El-Khateeb on the free-living nematode, *Rhabiditella miscicola,* while Sholla (2000) reared *Coloscerius buratus* Den Heyer on the free-living nematode, *R. miscicola* at 26°C and 70% R.H.

El-Hady and El-Naggar (2001) studied the possibility of using both predacious laelapid mites *Hyoaspis bregetovae* (Shereef & Afifi) and *H. sardoa* Berlese as biological control agents of the Root-Knot nematode on sunflower plants. On the other hand, Maareg *et al., (*2005) reported seven predacious mites species from sugar beet field. These mites were evaluated for their predacious activity on immature stages of *M. incognita*. The results revealed that all tested soil mites except *Cunaxa sp.* fed on immature stage of nematode.

However, the aim of the present work is to study the effect of the predatory mite *Neocunaxoides andrei* (Baker & Hoffmann) as a biological control agent on the root-knot nematode *M. javanica* under laboratory and semi field conditions.

MATERIALS AND METHODS

Rearing cells technique:

Rearing cells made of a closed round transparent plastic containers measuring 5 cm in diameter and 2 cm height filled up to 0.5 cm with plaster of Paris and charcoal of (9:1 w/w) and closed tightly. The rearing cells were maintained at incubator at 26 ± 1°Cand 70 ± 5% R.H.

Preparation of pure culture of the predacious mite *N. andrei*:

Females of *N. andrei* collected from soil samples were transferred singly to rearing cells supplied daily with enough numbers of juvenile stages (j2s)

root- Knot nematode *M. javanica* as a food source. The deposited eggs of the mite were left to develop and the resulted females were mounted for identification.

Root- knot stock culture:

The original inoculum of the root-knot nematode *M. javanica* was obtained from galled roots of tomato grown in the field of Faculty of Agriculture, Suez Canal University. Nematode egg masses were collected from nematode galls and introduced to tomato roots. Newly hatched juvenile stages were obtained by incubating egg masses on modified Baermann units.

Semi-field condition:

Tomato seeds were sown in small plastic pots (15-cm in diameter) containing 500 g steam sterilized sandy-peat soil (1:1 v/v) under greenhouse condition about 31.5°C ranged from 30°C to 34°C. After 15 days, the tomato seedlings were inoculated with 500 j2s *M. javanica*/pot around the root. Adult 20, 40 and 60 newly emerged adult cunaxid females were added/pot as soon as the nematode inoculation was conducted. Another pot of tomato plant was inoculated with nematodes only as a control check. The reduction of nematode caused by mites was assessed after 30 days. Water was added carefully when needed. The plants were uprooted and the population of the female nematodes was determined in roots following the method used by Franklin (1949). The experiment was conducted using a complete randomized design with three replicates.

Laboratory condition:

For food consumption of *N. andrei* on the root-knot nematode *M. javanica,* about 100 j2s were added daily during five days. The consumed j2s were removed and counted.

Statistical analysis: Data obtained were statistically analyzed by using Costat software programs, Two-way ANOVA for significant differences between means.

RESULTS AND DISCUSSION

Data given in table (1) indicated that the majority of nematode j2s penetrated the tomato roots within 5 days. Mean number of j2s consumed by *N. andrei* under laboratory condition ranged from 30.8 ± 6.3 to 35.8 ± 4.16 five days before the nematode injected the roots (Table 2).

Results given in table (3) show that the average number of female nematode decreased significantly as the number of the cunaxid mite increased. The caused reduction reached 86.2%, 74% and 59.3%, when the cunaxid mites per pot were 60, 40 and 20 females, respectively. The average number of nematode females was 122.6 individuals per control pots.

The average number of galls decreased significantly as the number of the cunaxid mite increased. The caused reduction reached 84.9% %, 70.2 % and 57.4 %, when the cunaxid mites per pot were 60, 40 and 20 females, respectively. The average number of galls was 124.5 individuals per control pots.

The average number of nematodes per 500g soil decreased significantly as the number of the cunaxid mite increased. The reduction reached 81.1%, 80.0% and 76.9% when the cunaxid mites per pot were 60, 40 and 20 females, respectively. The average number of nematodes per 500g soil was 2166.5±53.2 individuals per control pots.

The present results agree with that recorded by Taha *et al*., (1988) who studied the effect of different prey on the development and fecundity of the predacious mite *N. andrei* and found that when mites fed on *Panagroliaimus rigidus* (Schneider) nematode, the immatures developed faster and adult females laid a greater numbers of eggs than those fed on acarid mites.

Also obtained data agree with that found by Mostafa, *et al*. (1997) who studied the biological control of *M. javanica* infecting tomato, using the laelapid predaceous mite *Lasiosieus dentatus* (Fox). Aldicarb treatment and *L. dentatus* applied either at the same time or 40 days after, showed remarkable improvement on tomato growth.

On the other hand, Amin *et al*. (1999) found that the highest reduction in total number of the nematodes occurred when the mite *L. athiasae* was applied four days before nematode inoculation compared with adding mites one day and two days before nematode inoculation.

Also El-Hady and El-Naggar (2001) studied the possibility of the control of egg masses of the root-knot nematode *M. incognita* on sunflower plants by certain predaceous mites. Mites were added to the soil one to three days before inoculation of nematode on roots of sunflower plants. This resulted in reduction of the total number of nematodes. Highest reduction in total nematodes occurred when the mites were applied 3 days before nematode

Table (1): Daily average number of a live *Meloilogyne javanica* juvenile injected in 500 gm soil within 5 days under 26 ±1^{0}C and 70% R.H.

Average No. Juvenile	Days					Mean of total
	1st	2nd	3rd	4th	5th	
Min. No.	420	290	180	40	5	
Max. No.	470	420	230	90	20	
Means ± S.D	448±19.2	366±50.29	202±19.2	68±19.2	11±5.47	219±17.28

Table (2): Daily average number of consumed *Meloilogyne javanica* by *Neocunaxoides andrei* under laboratory condition (26 ±1^{0}C and 70% R.H) with in 5 days.

	No. consumed juvenile *M. javanica*		
Days	Minimum	Maximum	Average ± S.D
1st	22	40	30.8 ± 6.33
2nd	30	45	37.8 ± 5.03
3rd	24	42	33.8 ± 7.14
4th	36	48	40.5 ± 4.41
5th	29	40	35.8 ± 4.16
Mean			177.2 ± 7.8

Table (3): Number of the root-knot nematode *Meloilogyne javanica* affected by different rates of the cunaxid mite *Neocunaxoides andrei*.

Parameter	No. cunaxid mites/pot			Control (free of mites)
	20 mites	40 mites	60 mites	
Avg. No. nematode females	50 ± 0.8 b	32 ± 0.8 c	17 ± 0.5 d	122.6 ±50.1a
Avg. No. of nematode galls	53 ± 6 b	37.3 ±10.2 c	18.7 ± 6.7 d	124.s ±12.4 a
Avg. No .of nematode female/galls	3 ± 1	2 ± 1	2 ±1	4 ± 1
Avg. No.Nematodes/500gm soil	500 ± 20 b	433. ± 11.5c	408.5 ± 55.7c	2166.5 ±53.2 a

Means followed by the same letter do not differ significantly (p≤ 0.05).

inoculation.

Maareg et *al.,* (2005) recorded seven predacious mites *Proprioseiopsis messer* (Wainstein), *Cheyletus malaccensis* (Oudemans), *Cunaxa sp., Glycyphagus domesticus* (De Geer), *Macrochelus monchasolska* (B&K), *Platyeseus major* (Halbert) and *Uropoda misella* (Berlese) from sugar beet field. These mites were evaluated for their predacious activity on immature stages of *M. incognita*. The results revealed that the afore-mentioned soil mites except *Cunaxa* sp. fed on immature stages of nematode. On the other hand, Sholla, 2007 reported that numbers of egg masses of *M. javanica* were reduced by adding *N. andrei* to soil planted with cowpea and egg plant.

As a result, it could be concluded that the cunaxid mite *N. andrei* is considered an active biological control agent of the root-knot nematode *M. javanica.*

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