

SOIL MITES AS BIOCONTROL AGENTS AGAINST LAND SNAIL, *Monacha cartusiana* (MULLER) INHABITING SOIL AT SHARKIA GOVERNORATE

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ABSTRACT

Mites inhabiting soil heavy infested with the land snail , *Monacha cartusiana* (Muller) in Abou-Kabeer district, Sharkia Governorate, Egypt were surveyed during two successive years (Nov. to June: 2009 – 10 & 2010-11). The collected mites were 17 species belonging to 16 genera, 10 families and 2 sub order of the sub-class Acari. Of the collected mites, *Uroobovella (Fascuopoda) marginata* (Koch) (Uropodidae: Gamasida) inhabits the snail leading to the snail death within about 2 weeks also, the mite *Galumna flabillifera* Hammer (Galumnidae: Oribatida) penetrate the eggs of the same snail leading to a secondary infection with some pathogenic fungi which rapidly developed and finally leads to the death of those eggs.

Keywords: Mites, land snail, *Monacha cartusiana* (Muller).

INTRODUCTION

Mites are small in size, they are particularly minute generally inaccessible to meso- and macroinvertebrates, and to adopt a parasitic mode of life. Molluscs are utilized by mites in several families. A single member of Urodirychidae (Gamasida) has been recorded as predaceous on terrestrial gastropod. The Actinedida is more important which includes members belonging to some families are parasitic on either fresh water or terrestrial molluscs.

Terrestrial gastropod molluscs are parasitized by members of three different families of prostigmata. The best-known species of family Erenetidae is belonging to the genus *Riccardoella berlese*. The second family, Eupodidae is common in the damp soil, humus and moss. One species *Eupodes voxencollinus* Thor, originally described from plants in Norway, has been found in the pallial cavity of bulmid and helcid snails from Mexico.

The third family Trombiculidae is represented in gastropods by a species of *Schoenyastia (Endotrombiocula) Vercammon* Grandjean. Only the larvae are parasitic and they were found, in great number, deeply embedded in soft integument of the host from Sierra Leone (Fain, 2004).

The present work deals with the incidence of mites dwelling in soil where the land snail, *Monacha cartusiana* is highly occur in Abou-Kabber district, Sharkia Governorate, Egypt. Also, the relationship between that snail and the two mite species *Uroobovella (Fascuopoda) marginata* (Koch) (Uropodidae: Gamasida) and *Galumna flabillifera* Hammer (Galumnidae : Oribatida) were studied.

MATERIALS AND METHODS

Survey of mites inhabiting soil heavy infested with the land snail, *Monacha cartusiana* (Muller) was carried out during Nov. to Jun. ۲۰۰۹ -۱۱ in Abou-Kabber district, Sharkia Governorate, Egypt. The mites were isolated from soil sample on glass slides and were identified by the help of stereoscopic binocular microscope.

Snail individuals and their egg – clusters were collected by searching on the sites they occur (beneath bark, under shelter vegetation, soil cracks, etc.). Each of the collected snail individuals or egg- clusters were transported to the laboratory in plastic boxes (۱۶x ۱۱ x ۶ cm) lined with strike loam soil with a layer of moist cotton, kept under high soil moisture and a temperature of ۲۶ – ۲۸ °C. The plastic boxes containing the snail individuals were provided with fresh leaves of lettuce, one square inch every five days as food. Groups of the isolated mite were added to the plastic boxes containing the snail individuals or egg- clusters under the same conditions to notice the relation between those mites and the snail individuals or their eggs. The cultures of the snail individuals or the egg- clusters were examined twice daily. One species of mites, *Uroobovella (Fascuopoda) marginata* (Koch) showed a relation with the snail juveniles. Another mite; *Galumna flabillifera* Hammer infected the egg- clusters.

Twenty replicates of snail individuals were prepared in small plastic boxes (۸x ۶ x ۳ cm) under the previously mentioned conditions to notice the relation between the mites *Uroobovella (Fascuopoda) marginata* (Koch) and the snail juveniles. Also, small plastic boxes were provided with egg clusters of the snail where individuals of the mite *G. flabillifera* were added to notice the relation between them.

The damage caused by both mite species was recorded as photographs by the aid of stereoscopic trinocular microscope which was provided with a photo camera. The pathogenic fungi were identified at faculty of Science, Zagazig University, Egypt.

RESULTS AND DISCUSSION

A survey of mite dwelling in soil heavy infested with the land snail , *Monacha cartusiana* (Muller) in Abou-Kabber district, Sharkia Governorate , Egypt was done during two successive years (Nov. to Jun :۲۰۰۹ – ۲۰۱۰ & ۲۰۱۰ – ۲۰۱۱). The survey revealed the occurrence of ۱۸ species belonging to ۱۶ genera, ۱۶ families and ۳ suborders of the subclass Acari. Of the collected mite species only the mites *Uroobovella (Fascuopoda) marginata* (Koch) (Uropodidae : Gamasida) showed a relation with the snail juveniles, while the mite *Galumna flabillifera* Hammer (Galumnidae : Oribatida) infested the snail eggs. Synopsis of Mites Dwelling in Soil Heavy Infested with the Land Snail *Monacha cartusiana* (Muller):

I- Suborder Gamasida:

۱-Family Ascidae Voigts &Oudemans:

- a. *Proctolaelaps orientalis* Nasr : Zaher ۱۹۸۶ collected it from debris under *Lantana camara* , citrus and grapes; Giza and BeniSuef (Upper Egypt).

b. *P. aegyptiaca* Naser:

Zaher ١٩٨٦ recorded it from soil under potatoes and debris under guava, grapes; Giza, Sohag and Qena(Upper Egypt).

٢. Fam. Phytoseiidae Berlese:

a. *Typhlodromus tropicus* Chant:

Zaher ١٩٨٦ collected this species from guava Giza, El Sharkia and Marsa Matrouh (North Coast)

b. *T. mangiferus* Zaher and El Brollosy:

Zaher ١٩٨٦ recorded this species from mango and *Zizyphus* sp.; El Ismaelia, Giza and Marsa Matrouh.

٣. Fam. Laelapidae Berlese:

a. *Ololaelaps bregetovae* Shereef & Soliman:

Shereef & Soliman (١٩٨٠) described this species from organic manure; Giza soil of olive orchard, El Fayowm (Upper Egypt).

b. *Hypoaspis koseii* Hafez, El Badry & Nasr:

Hafez, El Badry & Nasr (١٩٨٢) described this species from soil under orange; Assiut (Upper Egypt).

٤. Fam. Uropodidae Berlese:

Urobovella (Fascuopoda) marginata (Koch) Zaher ١٩٨٦ stated that *Urobovella (Fascuopoda) krantzi* Zaher & Afifi was collected from organic manure; Giza. It was usually associated with housefly larvae and Coleopterous beetles, preying on the ١st instar larvae of the former. Also, this mite did not feed on acarid mites, collembolan, or fungi.

٥. Fam. Ameroseiidae Evans:

Ameroseius aegypticus El- Badry, Nasr & Hafez: El-Badry, Nasr & Hafez (١٩٧٩) described this species from debris, under *Lantana camara* and bermuda grass; Giza and Cairo.

II. Suborder Actinedida:

١- **Fam. Tarsonemidae Kramer :** *Steneotarsonemus sayedi* Zaher & Kandeel: Zaher ١٩٨٦ collected this species from soil under bamboo, Domiatta (Lower Egypt).

٢. **Fam. Pygmephoridae (Cross) Mahunka:** *Pygmephorus zeai* Yousef & Kandeel : Zaher (١٩٨٦) recorded this species from soil under maize ,Giza . Also, Ramaraju & Madanlar (١٩٧٧) described three new *Pygmephorus* Kramer mites on mushrooms in Turkey.

٣. **Fam. Cheyletidae Leach:** *Hemicheyletia congensis* (Cunliffe): Zaher (١٩٨٦) collected this species from soil, organic manure and on the ornamental plant silvia; Giza, El Fayoum, El Monofia and Tahreer Province.

٤. Fam. Stigmaeidae Oudemans:

***Stigmaeus zaheri* Goma & Hassan :** Zaher (١٩٨٦) collected this species from soil; El Fayoum (Middle Egypt).

٥. Fam. Tetranychidae

Petrobia tritici Kandeel; El- Naggat & Mohamed: Kandeel *et al.* (٢٠٠٧) described this species from wheat, barley, sorghum, sugar beet, clover, lupin, garlic and onion, Sharkeia Governorate, Egypt.

٦. Fam. Erythraeidae:

***Balaustium* sp. :** Newell (١٩٦٣) observed that the normally predaceous adults of *Balaustium* will bite man, causing a sharp stinging sensation

followed by it ching and development of lesions. The mite *B. murorum* (Hermann) feed on the leaves and pollen of plants, all of which indicates that *Balaustium* spp. are capable of phytophagy and haematophagy in addition to insect parasitism and predation. Also, Rack (1973) reports *B. murorum* as a common invader of buildings in Europe and North America and some of these invasions may involve attacks on man.

٧. Fam. Anystidae Oudemans:

***Anystis* sp.:**

Jeppson *et al.* (1970) stated that *Anystis baccharum* (L.) and other species of the genus are aerial predators of phytophagous insects and mites in Europe, Australia, Africa and North America, but their efficacy as control agents on economic crops may be offset by their slow rate of increase. Mostafa *et al.* (1970) declared that *A. agilis* (Banks), the common whirling mite, has been identified as a predator of citrus thrips in California.

٨. Fam. Bdellidae Duges:

***Cyta latirostris* (Hermann) :** Zaher (1986) collected this species from soil and debris, Giza and El Qualyobia.

III. Suborder Oribatida:

١. Fam. Oribatulidae Thor:

***Zygoribatula tritici* El - Badry & Nasr :**

El - Badry and Nasr (1974) described this species from soil filed crops; El Dakahlia , El Monofia and El Fayoum.

٢. Fam. Galumnidae Jacot:

***Galumna flabillifera* Hammer:**

Zaher (1986) collected this species from soil and debris, Giza, Egypt.

Relation between the collected mites and the land snail *Monacha cartusiana* :

Every species of the collected mites was introduced singly to the juveniles or the egg- clusters of the land snail, *Monacha cartusiana* (Muller) to evaluate the relation between them.

The mites *Uroobovella (Fascuopoda) marginata* (Koch) was parasitizing with the snail juveniles, while *Galumna flabillifera* Hammer penetrated the snail egg- clusters leading to a secondary infestation by pathogenicfungi.(Fig٢).

The remaining mite species showed no relation with the snail juveniles or the egg-clusters of the snail.

The mite *Uroobovella (Fascuopoda) marginata* (Koch) appeared to attack the shell surface of the snail juveniles. Mite individuals settle at certain locations on the juveniles shell and start attacking it. The action of the mite chelicerae results in destruction of the snail shell, which after a period about ١٥ days lead to formation of small breaks that become necrotic (Fig. : ١) A few days after these lesions appeared, the snail stopped feeding and became inactive.

f)

In nearly all cases the infested snail juveniles died within about 10 days proving that *Uroobovella (Fascuopoda) marginata* (Koch) is an effective biocontrol agent of *M. cartusiana*. Also, it was observed that mortality in *M. cartusiana* was related to the numbers of mites that infest the snail individuals under the previously mentioned conditions. Raut (1996) established that soil moisture and temperature were important factors in the predator-prey interaction.

The second species *G. flabillifera* showed no effect on the egg-clusters during the first week of the experiment when compared with control. Even after the 10th day, the mite penetrations of the eggs led to a secondary infestation by the pathogenic fungi namely, *Fusarium dimerum* Penzigin saccharods and *Humicola fuscoatra* Traaeh.

These fungi grown rapidly and led to unhitching the snail eggs. (Fig. 2).

The results obtained in the present study is similar to that of Graham *et al.* (1996). Those authors showed that if the mite *Riccardoella limacum* (Shrank), when present in large numbers, it would clearly have a profound effect on their host *Helix aspersa*.

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العلاقة بين الاكاروسات القاطنة فى التربة مع (بيض وقواقع البرسيم الزجاجى) موناكا كاتزثيانا

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اجري البحث لدراسة العلاقة بين الاكاروسات وبيض وقواقع البرسيم الزجاجى القاطنه فى التربة فى منطقة ابو كبير بمحافظة الشرقية خلال الفترة من 9 نوفمبر سنة 2009 الى شهر يونية سنة 2011 و تم حصر 18 نوع من الاكاروسات الموجودة فى التربة تتبع 16 جنس تنتمى الى 15 عائلة و تنتمى الى ثلاثة تحت رتبة.

و كانت العلاقة بين المفترس و الاكاروس *Uroobovella (Fascuropoda) marginata* (Koch) وقواقع البرسيم الزجاجى يودى الى موت بعض الافراد الغير بالغة (الصغيرة) بعد اسبوعين من وجودهما معا نتيجة تكسير حافة القواقع حديث التكوين وكانت العلاقة بين الاكاروس *Galumna flabillifora* تتم عن طريق اختراق بيض القواقع و نمو الفطريات الممرضة على بيض القواقع مما سؤدى الى موته بعد فترة عشرة الى خمسة عشرة يوما

قام بتحكيم البحث

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