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ASSOCIATIONS OF THREE GAMASID MITE SPECIES WITH THE RED PALM WEEVIL, *RHYNCHOPHORUS FERRUGINEUS* (OLIV.) IN INFESTED DATE PALM FARMS IN BEHEIRA, EGYPT

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ABSTRACT: ***Three gamasid mite species associated with the prevalent adult males and females of Rhynchophorus ferrugineus (Oliv.) infested date palm trees at farms in Kafr EL-Dawar, Beheira governorate, were recorded for the first time in Egypt. The identified three mite species were the pachylaelapid, Pachylaelaps spectabilis Berlese, the Uropodid Leiodinychus krameri (Can.) and Urobovella varians Hirschman et Nicol. The individuals of the three mite species were observed on all parts of the weevil's body tagmata aggregating in larg numbers on the thoracic and abdominal terga and sterna; the head, the base of rostrum, antennal socket, articulation sites of coxa, tibia and tarsus and the lower surface of fore wings. The noticed relationships between the weevils and the three gamasid mite species were described and discussed.***

Key words: ***Parasitoid and Phoresy.***

INTRODUCTION

The red palm weevil (RPW), (Curculionidae: Coleoptera), is an economically important, tissueboring pest of date palm trees in many parts of the world. The insect was first described in India as a serious pest of coconut palm (Lefroy, 1906) and later on date palm (Lal, 1917 and Buxton, 1918). The weevil was recorded later in Seri Lanka, Indonesia, Burma, Punjab, and Pakistan (Laskshmanan *et al*.1972).

The red palm weevil has become the most important pest of the date palm trees in the world (Gomez and Ferry, 1999). The most important hosts of the red palm weevil are, coconut palm, date palm, Nigbong palm, oil palm,numerous ornamental palm, and other species of wild date palm. It also attacks *Agave americana* and *Saccharum officinarum*.This major insect-pest of date palm trees has been found in Australia, Asia (Bangladesh. Bahrain, China, India, Indonesia, Irak, Iran, Japan, Kuwait, Malaysia, Oman, Pakistan, Philippines, Saudi Arabia, Jordan, Sri Lanka, Taiwan, Thailand, Vietnam, U.A.E., etc) and in Mediterranean countries such as Spain, France, Greece,

Syria, Israel, Palestine, Greece, Egypt, Turkey and Cyprus. The cause of the high rate of spread of this pest is human intervention, by transporting infested palm trees of various sizes and offshoots from contaminated to unifested areas.

Currently, it is the utmost injurious insect-pest of date palm trees in some of the Arabian Gulf States including Saudi Arabia, United Arab Emirates, Sultanate of Oman, and Egypt (Cox, 1993; Abraham *et al.* 1998). The agroclimatic conditions prevalent in this region and the unique morphology of the crop, coupled with intensive modern date palm farming, have offered the pest an ideal ecological habitat (Abraham *et al.,* 1998).

According to Abraham *et al.* (1998) symptoms can be categorized by the presence of tunnels on the trunk and base of leaf petiole, oozing out of thick yellow brown fluid from the tunnels, appearance of frass in and around the openings of tunnels, fermented odor of the fluid inside the infested tunnel, appearance of a dried offshoot, production of a gnawing sound by the grubs, presence of cocoon /adults in the leaf axiles, and breaking of the stem or toppling of the crown when the palm is severely infested.

During the period of continuous performed weekly inspections of the tested traps in first season (February. 2006 – February. 2007), and identification of trapped adult males and females , the presence of copiously aggregating mites on all parts of the weevils body tagmata was detected . Whereas , most of these observed mites species were gathering in larg numbers on the cephalothoracic region of the body , i. e, on the head , the base of rostrum , antennal socket ; the thoracic legs ; on the articulation sites of the coxa , tibia and tarsus ; the thoracic and abdominal sterna , particularly in the sites of intersegmental membrane. These mite species were also observed aggregating in larg numbers on the abdominal terga and lower surface of the fore wings (Elytra).

Therefore, the present work was initiated to discriminate and identify the found mite species associating with the red palm weevil at date palm farms in Kafr EL-Dawar center, Beheira governorate.

MATERIALS AND METHODS

The weekly collected red palm adults were transferred to the laboratory, carefully, examined, and mite colonies associated with them were collected and identified. These mite species were noticed in great numbers associated with the alive adult on both dorsal and ventral sides. The mite individuals were transferred into small glass tubes containing 70% ethyl alcohol. A moistened brush was gently used for transferring the attaching mites to the glass tubes. Then the glass tube was closed and labeled. For classifying, the mites were cleared using lactic acid and mounted by transferring them to small quantity of Berlese's solution dropped in the center of clean slides. A cover slip was placed on each one and labeled. Slides were placed for three weeks to dry in an oven set at about 40 °C. Specimens were examined and

identified by Dr. S. E. Salem, Prof. of Acarology, Economic Entomology and Agricultural Zoology Department, Faculty of Agriculture, Shebin El-Kom, Menoufia University using the keys of Evans and Hyatt (1956), Gilyarov (1977) and Krantz (1978).

RESULTS AND DISCUSSIONS

As a result of investigation and observation three gamasid mite species were recorded for the first time in Egypt associated with adult males and females of the red palm weevils(Fig.1). These three gamasid mite species were *Pachylaelaps spectabilis* Berlese (Pachylaelapidae, Gamasida), *Leiodinychus krameri* (Can.) (Uropodidae, Gamasida) and *Urobovella varians* Hirschman *et* Nicol (Uropodidae, Gamasida).

Data presented in Tables 1 and 2 show the systematic positions and measurements of the red palm weevil as well as the three gamasid mite species, respectively.

Table 1: The systematic position of the red palm weevil and the associations three gamasid mite species

The red palm weevil	Mites
Class: Insecta	Class: Arachnida
Subclass: Pterygota	Subclass: Acari
Order: Coleoptera	Order: Parasitiformes
Suborder: Polyphaga	Suborder: Gamasida
Family: Curculionidae	Super-cohort: Monogynaspides
Subfamily: Rhynchophorinae	Cohort: Gamasina
Rhynchophorus ferrugineus (Olivier)	Super family: Eviphidoidea
	Family:Pachylaelapidae
	Pachylaelaps spectabilis Berlese
	Cohort: Uropodina
	Super family: Uropodoidea
	Family: Uropodidae
	Leiodinychus krameri (Can.)
	Urobovella varians Hirschman *et* Nicol

Table 2: Measurements of the red palm weevil and associating three gamasid mite species.

Species of insect or mite		Length *		Width	
		Range	Average	Range	Average
R. ferrugineus	Female	24 – 42 mm	34.8 mm	10 – 16 mm	13.2 mm
	Male	18 – 42 mm	29.9 mm	8 – 16 mm	12.0 mm
P. spectabilis		610 – 620 µ	615 µ	450 – 460 µ	455 µ
L. krameri		850 – 900 µ	870 µ	600 – 700 µ	640 µ
U. varians		670 – 730 µ	710 µ	590 – 650 µ	630 µ

*** Samples based on 10 individuals.**

It is of noteworthy to mention that, two types of relationships were noticed between the red palm weevils and the three gamasid mite species. The first asymbiotic one is the relationship between adult and immature stages of *P. spectabilis* as ectoparasitoid mite species attaches on the dorsal or ventral side of adults of the red palm weevils. The second symbiotic relationship is the phoretic transport of the adult and immature stages of both mite species, *L. krameri* and *U. varians* on the dorsal and ventral sides of the red palm weevil adults. In which, the attaching mites can be moved from one place to another. This movement is directional from one habitat to another and thus phoresy has been equated to migration.

Pachylaelaps spectabilis Berlese (Pachylaelapidae):

Data tabulated in Table 2 and illustrated in Figs. (1 and 2) show that the measurements of this mite species ranged from 610 to 620 µ with an average of 615 µ long and ranged from 450 to 460 µ and averaged 455 µ wide. It was oval in shape. As a matter of fact the individuals of this mite species were observed insert relatively their long chelicerae inside the inter-segmental membranes of the red palm weevils, therfore, this propably parasitic feeding behaviour indicates that this species of mite could be represented as an ectoparasitoid species.

A mite species may be phoretic in one life stage and predacious or parasitic in other life stages. However, phoretic associations occur among mite species that inhabit temporary, discontinuous habitats such as dung, carrion fungi or plant materials (decaying logs, dying trees, straw) (Southwood, 1962).

Fig. 1: Mites associated with the red palm weevil

Fig. 2: *Pachylaelaps spectabilis* (100X)

This mite species was collected from USSR, Southern China, Island and Israel. It was found on beetles (*Coprls* sp. and *Synapsis* sp.). Members of the Pachylaelapidae share the habits of the Macrochelidae preying on microfauna in organic substrates and often moving from place to place by means of phoretic attachment to arthropods primarily scarabid beetles (Evans and Hyatt, 1956 and Hirschmann and Krauss, 1965).

Great numbers of pachylaelapid species have been collected in the old and new world tropics, with many as yet undescribed. *Pachylaelaps* spp. are well represented in the temperate regions of Europe and North America (Krantz, 1978).

Mites associations with arthropods for dispersal or for parasitism are evolved in the following three suborders of the Acariformes (Acaridida, Orbatida and Actinedida), but in only the Gamasida (Mesostigmata) of the four suborders are of the Parasitiformes. Mite-arthropod associations evolved several times in the Gamasida, and there is a wide range in the methods of mite attachment and the types of associations. As indicated by Hunter and Rosario (1988) insects that make nests and/or live in colonies are primary hosts of phoretic mites. These insects live in temporary, discontinuous habitats, and the mites are dependent upon a host for transportation to a new habitat. Phoresy enables mites to colonize and take advantage of resources provided by unstable habitats.

Leiodinychus krameri (Can.) (Uropodidae):

The adult and immature stages of this mite species were observed on the rostrum, prothorax and with a great numbers on inter-segmental membranous and ventral part of all weevil body as a phoresy phenomenon. The mite individuals were collected and identified. As indicated in Table 2 and Fig. 3, the measurements of this mite species ranged from 850 to 900 µ, averaged 870 µ long and ranged from 600 – 700 µ with an average of 640 µ wide. It is broad oval in shape.

The Uropodoidea, or "higher Uropodines" (Evans, 1972) is a large cosmopolitan group consisting of fungivores (Radinovsky and Krantz, 1961), insect associates (Elzinga and Rettenmeyer, 1966 and Treat, 1975), nidicoles (Berlese, 1904 and Hughes, 1959) and occasional predators (Reid, 1957). Uropodoids often are referred to as "tortoise mites" due to the ability of most species to withdraw their appendages into ventrolateral cancavities or *Favae pedales*, or behind a protective lamellar ridge or scabellum. Most species are associated with insects during one or more instars (Krantz, 1978)

Urobovella varians Hirschman *et* Nicol (Uropodidae):

Generalized Uropodid nest and gallery dwellers (*Urobovella*) for example are considered to be scavengers, which probably feed on organic detritus and fungi. The mycetophagous habit apparently is shared by uropodid species, which inhabit stored products or animal wastes (Stone and Ogles, 1953).

The adult and immature stages of this mite species were observed in a great numbers on intersegmental membranes and ventral parts of all weevil body as a phoresy phenomenon. The mite individuals were collected and identified. As shown in Table 2 and illustrated in Fig. 4 the measurements of adult females of *U. varians ranged from* 670 to 730 µ with an average of 710 µ long; 590 – 650 µ with an average of 630 µ wide. It is round oval or ovate in shape. Uropodid mites live in fairly moist rotting substrata.

Duetonymphs of the family uropodidae often attach phoretically to the cuticle of insects and other animals by means of and pedicel leaving the carrier only after molting to the adult stage. Many uropodids occur commonly in forest litter and detritus, and others have been collected in soil, moss, rotting wood and the nests or galleries of insects (Hirschmann, 1972).

Phoretic and /or parasitic mites locate hosts through a series of cues that attract the mite to the appropriate vicinity, then to the host, and then to an attachment site on the host. The specific stimuli that cause a phoretic or parasitic mite to mount or leave a host are unknown. Mite associations may be detrimental to the host, beneficial to the mite only, or beneficial for host survival (Hunter and Rosario, 1988).

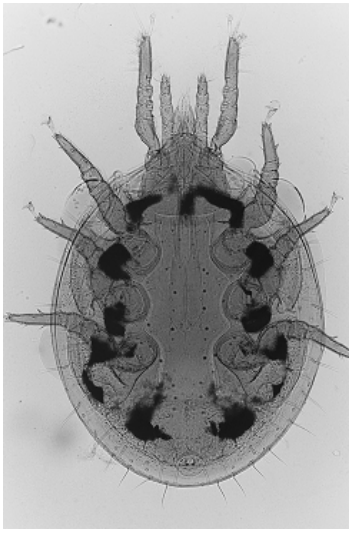

Fig. 3: *Leiodinychus krameri* (Can.) (100X).

Fig. 4:*Urobovella varians* Hirschman *et* Nicol (100X).

REFERENCES

Abraham. V.A., M.A. AL-Shuaibi, J.R. Faleiro, R.A. Abozuhairah (1998). An Integrated management approach for red palm weevil *Rhynchophorus ferrugineus*. Oliv. a key pest of date palm in the Middle East. Sultan Qaboos University Journal for Scientific Research Agricultural Sciences, 3: 77-83.

Berlese, A. (1904). Acari mirmecofili. Redia, 1: 299 – 474 + plates. C.f. Krantz (1978).

Buxton, P.A. (1918). Report on the failure of date crops in Mesopotamia in 1918. Agric. Directorate, M.E.F. Bassarah Bull No. 6.

Cox, M.L. (1993). Red palm weevil *Rhynchophorus ferrugineus* in Egypt. FAO Plant Protection Bulletin, 41(1): 30-31.

Elzinga, R.J.and C.W. Rettenmeyer (1966). A neotype and new species of *Planodiscus* (Acarina: Uropodina) found on doryline ants. Acarologia, 8 (2): 191 – 199. C.f. Krantz (1978)

Evans, G.O. (1972). Leg chaetotaxy and the classification of the Uropodina (Acari: Mesostigmata). J. Zool., London, 167: 166 – 185.

Evans, G.O. and K.H. Hyatt (1956). British mites of the genus *Pachylaelaps* Berlese (Gamasina: Pachylaelapidae). Ent. Monthly Mag. 92: 118 – 129. C.f. Krantz (1978)

Gilyarov, M.S. (1977). A key to the soil inhabiting mites : Mesostigmata. USSR Acad. of Sci. Nauka Publishers, Leningrad Branch., 1029 pp.

GOMEZ VIVES, S. AND M. FERRY. (1999). Attempts at biological control of date- palm pests recently found in Spain. In: CANARD M. AND BEYSSATARNAOUTY V. (Eds) Proceedings of the First Regional Symposium for Applied Biological Control in Mediterranean Countries. Cairo, 25–29 October 1998. Imprimerie Sacco, Toulouse, France, pp.121–125.

Hirschmann, W. (1972). Teilgange und stadien von 21 neuen Uropoda (Phaulodinychus). Arten (Uropodini, Uropodinae). Gangsyst. Parasitiformes. Schrift. Fur vergleich. Miben, 18 (123): 79 – 92.

Hirschmann, W. and W. Krauss (1965). Gamasiden Best immungstafelen von 55 *Pachylaelaps* arten. Gangsyst Parasitoforms. Shrift. Für Vergleich. Miben, 7(8): 32 pp. C.f. Krantz (1978)

Hughes, T.R. (1959). Associations with other animals. In Mites or the Acari. Athlone Press, London: 23 – 42. C.f. Krantz (1978)

Hunter, P.E. and R.M.T. Rosario (1988). Associations of Mesostigmata with other arthropods. Ann. Rev. Entomol, 33: 393 – 417.

Krantz, G.W. (1978). A mannual of Acarology second ed., Oregon State Univ. Book stores, Corvallis: 509 pp.

Lakashmanan, P.L., P.V. Subba-Rao, T.R. Subramaniam (1972). A note on the coconut red palm weevil on coconut. Madras Agricultural Journal, 59(11/12): 638- 639

Lal, Madan Mohan. (1917). Rept. Asst. Prof. Entomol; Rept. Dept. Sagr. Punjab, for the year ended 30th June, 1917

Lefroy, H. M. (1906). The more important insects injurious to Indian Punjab, for the year ended . 30th June, 1917 Agriculture. Govt. Press, Calcutta, India.

Radinovisky, S. and G. W. Krantz (1961). The biology and ecology of granary mites of the pacific Northwest. II. Techniques for laboratory observation and rearing. Ann. Ent. Soc. Amer. 54 (4): 512-518 [UROPODIDAE]

Reid, R.W. (1957). The barkk beetle complex associated with lodgepole pine slash in Alberta. Part III. Notes on the biology of several predators with special reference to *Enoclerus sphegeus* Fab. (Coleoptera Cleridae) and two species of mites. Can. Ent., 89 (2): 111 – 120. C.f. Krantz (1978)

Southwood, T.R.E. (1962). Migration of terrestrial arthropods in relation to habitat. Biol. Rev., 37: 171 – 214.

Stone, P. and G.D. Ogles (1953). Uropoda agitant, a mite pest in commercial fishworm beds. J. Econ. Ent. 46:711. C.f. Krantz (1978).

Treat A.E. (1975). Some vagrants. In mites of moths and butterflies. Cornell Univ., Press, Ithaca: 63 – 88.

إرتباط ثلاث أنواع من الحلم الجماسيدي بسوسة النخيل الحمراء في مزارع النخيل المصابة بالبحيرة ـ مصر

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الملخص العربي

سجلت لأول مرة بمصر ثلاث أنواع من الحلم الجماسيدي مصاحبة لذكور و إناث سوسة النخيل الحمراء في مزارع النخيل بمحافظة البحيرة. هذه الأنواع المحددة كانت *Leiodinychus krameri* (Can.) ، *Pachylaelaps spectabilis* ، *Urobovella varians* Hirschman *et* Nicol . و قد شوهدت هذه الأنواع الثلاثة منتشرة بأعداد وفيرة علي كل أجزاء جسم السوسة خاصة ترجات و إسترنات الصدر والبطن وعلي الرأس ونقرة قرن الإستشعار و الحرقفة والساق والرسغ و أسفل الأجنحة الأمامية. و قد تم وصف ومناقشة العلاقات بين كل من هذه الأنواع الثلاثة من الحلم مع سوسة النخيل الحمراء.