http://www.pjbs.org

PJBS

ISSN 1028-8880

Pakistan Journal of Biological Sciences

ANSInet
Asian Network for Scientific Information
308 Lasani Town, Sargodha Road, Faisalabad - Pakistan

Pakistan Journal of Biological Sciences 14 (2): 112-117, 2011
ISSN 1028-8880 / DOI: 10.3923/pjbs.2011.112.117

New Records of Eriophyoid Mites (*Acari*: *Prostigmata*: Eriophyoidea) from Saudi Arabia

Fahad J. Al-Atawi and Alaa M. Halawa
Department of Plant Protection, College of Food and Agriculture Sciences, King Saud University,
P.O. Box 2460, Riyadh 11451, Kingdom of Saudi Arabia

Abstract: A field study was conducted to investigate eriophyoid mites associated with some fruit trees in Riyadh, Saudi Arabia. The survey was carried out in four localities (El-Waseel, Al-Beer, Al-Haiyer and El-Deriya) and included seven species of fruit trees, namely olives (*Olea europea*), fig (*Ficus carica*), grapes (*Vitis vinifera*), apple (*Malus domestica*), citrus (*Citrus* spp.), pomegranate (*Punica granatum*) and pear (*Pyrus communis)*. Seven new records of eriophyoid species (*Aceria benghalensis* Soliman and Abou-Awad, *A. olivi* Zaher and Abou-Awad, *Caleptrimerus baileyi* K., *Colomerus oculivitis* (Attiah), *Oxycenus niloticus* (Zaher and Abou-Awad), *Rhynchaphytoptus ficifolia* (Keifer) and *Tegolophus hassani* (Keifer)), belonging two families, Eriophyidae and Diptilomiopidae, were collected from four species of fruit crops covering four different production localities in Riyadh. An illustrated identification key for these mites is provided. The present study is the first scientific study on Saudi eriophyoid mites.

Key words: Eriophyoid mites, fruit crops, fauna of Saudi Arabia, olive, new record

INTRODUCTION

Eriophyoid mites have a worldwide distribution whereas more than 3,690 species are known (Amrine *et al*., 2003). Members of Eriophyidae and Diptilomiopidae families live on trees, shrubs and herbaceous plants causing heavy injuries to leaves, buds and fruits (Zaher, 1986; Ripka, 2008). In addition, some of these mites are able to transmit some virus diseases, causing complete deterioration to the trees (Kozlowski, 2000; Stenger *et al*., 2005; Smales *et al*., 1996).

Mite fauna of Saudi Arabia (SA) has received a very little consideration and the groundwork for essential taxonomic, biological and ecological studies of agricultural mites is extremely rare. Despite the economic importance of many different fruit crops grown in SA, such as date palm, olives and citrus trees, a few numbers of eriophyoid mite species have been reported (Martin, 1972).

Fruit crops like fig (*Ficus carica*), grapevine (*Vitis vinifera*), citrus (*Citrus* spp.), apple (*Malus domestica*) and olive (*Olea europea*) are extremely important for local consumption. However, olive occupies the most advanced position in terms of acreage and fruit production for both local consumption and exportation. There is only one eriophyoid specis (*Aceria oleae* Nalepa) that has been recorded on olive in SA (Martin, 1972). However, previous studies recorded 11 eriophyid mite species on olive trees in different countries, namely, *Aceria oleae* Nalepa, *Oxycenus maxwelli* Keifer, *Ditrymacus athiasella* Keifer, *Aculus olearius* (Castagnoli), *Shevtchenkella oleae* (Natcheff), *Aceria Olive* (Zaher and Abou-Awad), *Oxycenus niloticus* (Zaher and Abou-Awad), *Aculops benakii* (Hatzinikolis), *Aceria cretica* (Hatzinikolis), *Shevtchenkella bicarinata* (Meyer) and *Tegolophus Hassani* (Keifer) (Snjezana *et al*., 2009).

The objectives of this study were to (1) investigate eriophyoid mites associated with some fruit trees in Riyadh and (2) provide an identification key for new recorded mites species found in this study. The mite identification key presented in this study will serve to pave the way for further taxonomical investigations for the super family Eriophyiodea in the kingdom.

MATERIALS AND METHODS

The survey was conducted in four localities surrounding Riyadh city (El-Waseel, Al-Beer, Al-Haiyer and El-Deriya) and included seven species of fruit trees, namely olives (*Olea europea*), fig (*Ficus carica*), grapes (*Vitis vinifera*), apple (*Malus domestica*), citrus (*Citrus* spp.), pomegranate (*Punica granatum*) and pear (*Pyrus communis)*. At each locality, sampling was carried out irregularly from October 2008 to September 2009 including plant foliages, branches and buds. Samples were individually bagged in tightly-closed plastic bags and transported the same day to the Acarology Laboratory,

Corresponding Author: Fahad J. Al-Atawi, Department of Plant Protection, College of Food and Agriculture Sciences, King Saud University, P.O. Box 2460, Riyadh 11451, Kingdom of Saudi Arabia

Department of Plant Protection, College of Food and Agriculture Sciences, King Saud University for mite extraction.

Mites were extracted from leaves and buds samples by using a fine hair brush under a high quality Olympus stereo-microscope (SZX-10) at magnifications 100-200×. Subsequently, mites were mounted onto micro-slides with Keifer medium and later dried in a 40°C-oven for one week.

An Olympus compound microscope (BX-51) with an attached drawing tube was used for examination and initial pencil drawing of mite diagnostic features at magnifications of 400-1200×. The oil lens was used to examine the featherclaws, microtubercles and male and female genitalia. The line drawings of mites were scanned and imported into Adobe Photoshop and used as templates for final illustrations in Adobe illustrator. The figure measurement lines were fixed at 25 micrometer (μm).

The terminology and morphological characteristics used in the identification key presented in this study are based on Amrine *et al.* (1996) and Amrine *et al.* (2003).

All specimens were deposited in the King Saud University Museum of Arthropod (KSMA), College of Food and Agriculture Sciences, King Saud University.

RESULTS

Seven eriophyoid mite species, namely, *Aceria benghalensis* Soliman and Abou-Awad, *A. olivi* Zaher and Abou-Awad, *Caleptrimerus baileyi* K., *Colomerus oculivitis* (Attiah), *Oxycenus niloticus* Zaher and Abou-Awad, *Rhynchaphytoptus ficifoliae* Keifer and *Tegolophus hassani* (Keifer), belonging to two families (Eriophyidae and Diptilomiopidae) were collected from leaves, buds and branches of four fruit crop species (*Ficus carica, Olea europea, Malus domestica* and *Vitis vinifera*) in different localities in Riyadh (Table 1). All of these seven mites found in this study are new records in SA. Plant samples collected from the fruit crop species, *Citrus* spp., *Punica granatum* and *Pyrus communis*, were free from mites.

Table 1: List of eriophyoid mites associated with various parts of four fruit crops from different localities, Riyadh, SA.

Mites recorded	Host plant and part(-s) infested	Locality
Aceria benghaleusis	*Ficus carica* (Under scales of open buds)	1, 2, 4
A. olive	*Olea europea* (Lower surface of leaves)	2, 3, 4
Caleptrimerus baileyi	*Malus domestica* (Upper surface of leaves)	3
Colomerus oculivitis	*Vitis vinifera* (Buds and branches)	3
Oxycenus niloticus	*Olea europea* (Upper surface and around the midvine of leaves)	2
Rhynchaphytoptus ficifoliae	*Ficus carica* (Lower surface of leaves)	1, 2, 3, 4
Tegolophus hassani	*Olea europea* (Upper and lower surface of leaves)	1, 4

1- Al-Beer 2- Al-Deriya 3- Al-Haiyer 4- El- Waseel

DISCUSSION

Eriophyoid mites are one of the most specialized groups of plant feeders and symptoms of their feeding run the gamut from simple rusting to complex gall formation and they can transmit plant viruses posing a great threat on the yield of the crops (Keifer *et al.*, 1982).

Martin (1972) reported only four eriophyoid species (*Aceria oleae* Nalepa, *Eriophyes granati* Can., *Aceria sheldoni* Ewing and *Phyllocoptruta oleivora* Ashm.) on olive, pomegranate and citrus, respectively, in different regions of SA. Interestingly, in this study the four mite species reported by Martin (1972) were not recovered from the tree plants representing seven different species investigated in our survey.

The two species (*Aceria benghalensis* and *Rhynchaphytoptus ficifoliae*) extracted from fig buds and leaves were previously recorded in Egypt (Zaher, 1986), India (Mondal and Chokrabatris, 1982) and Iraq (Al-Mallah and Mohammad, 1989). *Aceria benghalensis* causes discoloration of scales and partial blasting of buds while *Rhynchaphytoptus ficifoliae* does not induce obvious symptoms (Mondal and Chokrabatris, 1982; Zaher, 1986; Al-Mallah and Mohammad, 1989). *Colomerus oculivitis*, found on grapevine, was recorded in Egypt and in U.S. (Attiah, 1967; Zaher, 1986; Amrine and Stasny, 1994). It causes scarlet and brown coloration around edges of leaves spread inwards causing dryness of leaves. *Caleptrimerus baileyi* was previously recorded in U.S. causing slight browning to the leaf surfaces and the deutogynes hibernate around the buds just back of the terminal bud (Keifer, 1952).

Olive is a strategic crop in SA and about 13 million trees are grown in Tabouk, El-gouf and Haiyl regions (Personal communication, Plant Production Department, Agriculture College, King Saud University). In this study, three mite species (*Aceria olivi*, *Oxycenus niloticus* and *Tegolophus hassani*) were extracted from olive plants. Members of these mites usually live underside terminal olive leaves where they insert themselves under stellate hairs, causing these stellate structures to drop off and making yellow leaf spots and various forms of leaf deformation or defoliation. *Oxycenus niloticus* is normally found on upper surface of terminal olive leaves and produce some leaf pitting and deformation (Hatzinikolis *et al.*, 1989; Shahinia *et al.*, 2009). These mites were previously recorded in different countries as follows: *A. olive* recorded in Egypt (Zaher, 1986; Hatzinikolis, 1989); *O. niloticus* recorded in Iran and

Egypt (Mahisani *et al*., 2004; Zaher, 1986) and *T. hassani* recorded in Egypt and Albania (Shahinia *et al*., 2009; Zaher, 1986). This study sheds the light on the importance of these mite species and more attention is needed regarding their biology, ecology and control.

The identification key presented in this study should encourage other researchers for more investigations in identifying eriophyoid mites in SA.

Identification key for adult stages of eriophyoid mites associated with olive, *Olea europea*; fig, *Ficus carica*; grapevine, *Vitis vinifera* and apple, *Malus domestica* in Riyadh region.

Stage 1: Rostrum large in comparison to body, abruptly bent down near base; oral stylet long-form; dorsal setae absent or present, if present always pointing forwards ..... **Diptilomiopidae** Keifer

most setal tubercles enlarged (Fig. 1a) …… ***Rhynchaphytoptus*** K. fore tibia as long as or longer than tarsus (Fig. 1b and c)…… …… … ***Rhynchaphytoptus ficifoliae*** Keifer

- Rostrum usually small, not abruptly bent down near bases; oral stylet short; dorsal setae various present or absent ……..…… **Eriophyidae** Nalepa …… 2

Stage 2: Ridges on female coverflap typically in 2 uneven ranks; female genetalia in lateral view, usually noticeably projecting from venter, appressed to coxae, separating coxa more than normal …….. ***Colomerus*** Newkirk and Keifer genetal flap with 12 longitudinal markings (Fig. 2) …..... ***C. oculivitis*** (Attiah)

- Ridges on female coverflap occurring in 1 rankes; female genetalia in lateral view, lying more on level with venter, genetalia not appressed to coxae and coxae not usually spread apart .....…….. 3

Stage 3: Body vermiform, annuli subequal dorsoventrally at least on anterior one-half two-thirds of opithosoma …….. ***Aceria*** Keifer …….... 4

- Body usually more fusiform ……..... 5

Stage 4: Featherclaw 4 rayed; median line of shield absent (Fig. 3a, b)…… ……..... ……. ***Aceria olivi*** Zaher and Abou-Awad

- Featherclaw more than 5- rayed; median line of shield present (Fig. 4a, b) ……..... ***Aceria benghalensis*** Soliman and Abou- Awad

Stage 5: Posterior opithosoma with adorsal depression; scapular setae directed posteriorly (Fig. 5a) …… ……..……..…… ***Oxycinus*** Keifer female genetalia with 16 longitudinal ribs (Fig. 5b) …..... ***Oxycinus niloticus***

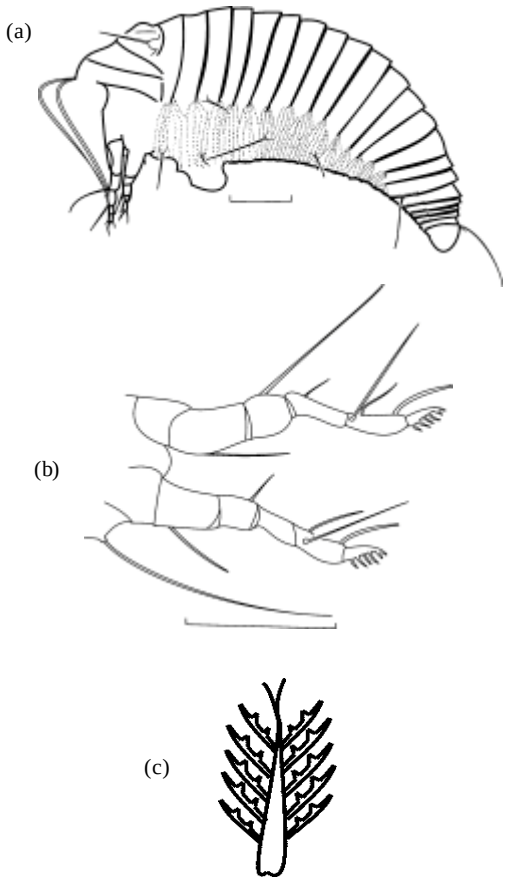

Fig. 1: *Rhynchaphytoptus ficifoliae* Keifer; (a) Side view; (b) Legs and (c) Featherclaw

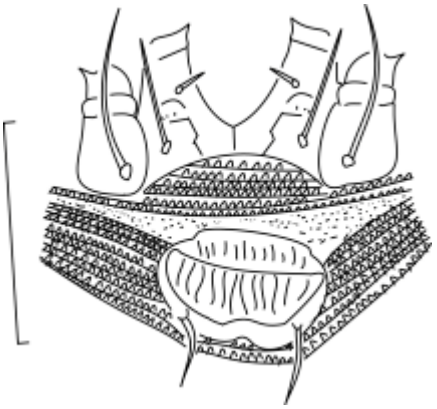

Fig. 2: Genital coverflap of *Colomerus oculivitis* (Attiah)

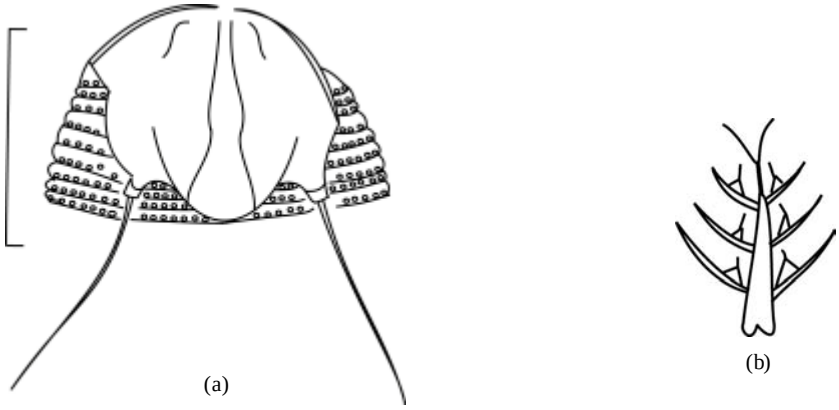

Fig. 3: *Aceria olivi* Zaher and Abou- Awad; (a) Dorsal shield and (b) Featherclaw

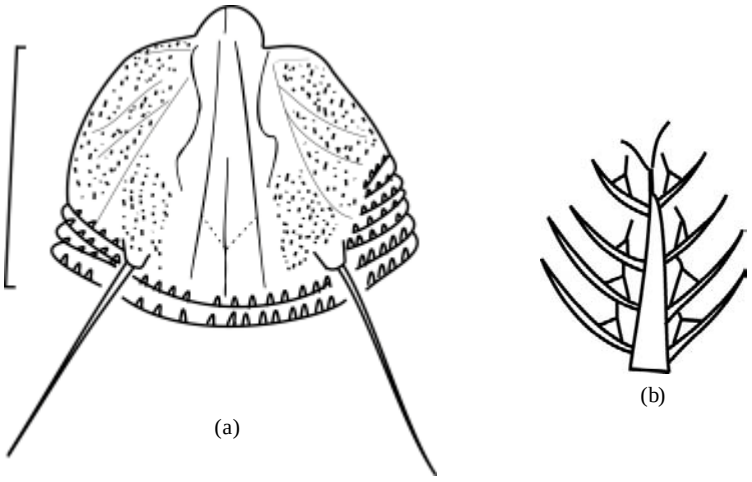

Fig. 4: *Aceria benghalensis* Soliman and Abou-Awad; (a) Dorsal shield and (b) Featherclaw

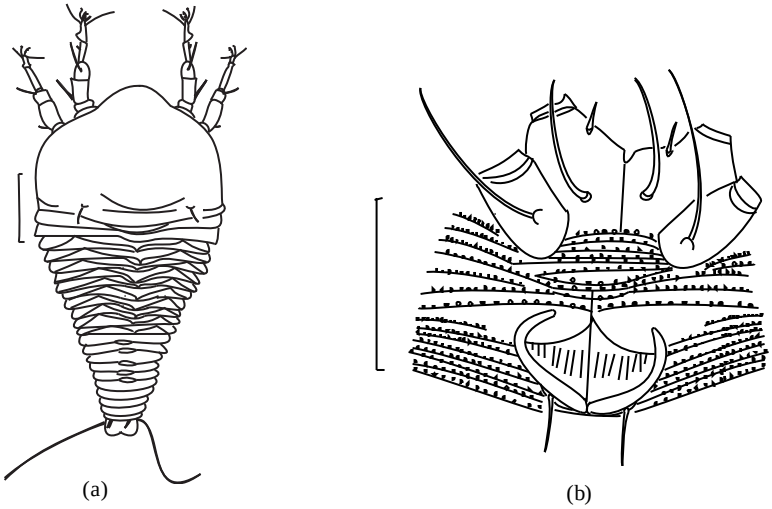

Fig. 5: *Oxycenus niloticus* Zaher and abou-Awad; (a) Dorsal view and (b) Genital coverflap

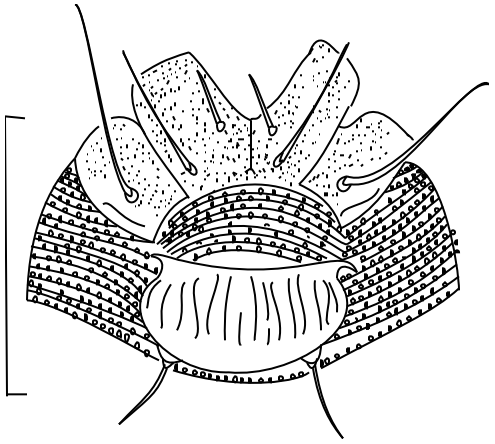

Fig. 6: Female genitalia and body anterior of *Tegolophus hassani* (Keifer)

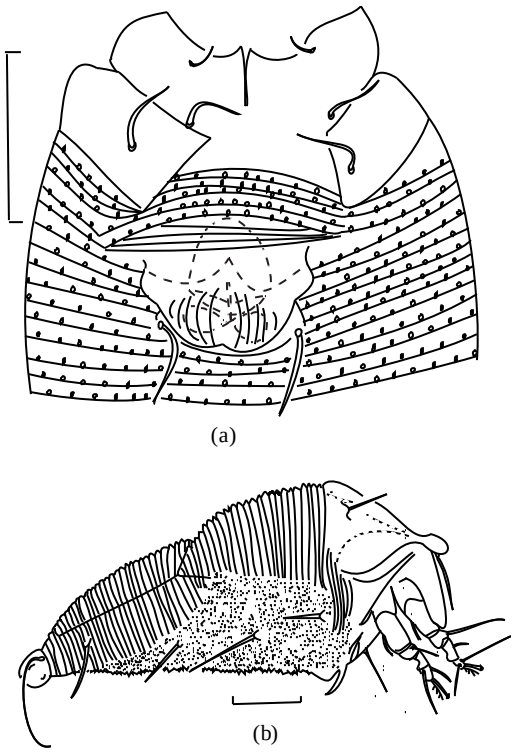

Fig. 7: *Caleptrimerus bailyei* Kiefer; (a) Female genitalia and body anterior and (b) Side view

- Posterior opithosoma without rear depression; scapular setae variable……6

Stage 6: Anterior coxae not separated …… ***Tegolophus*** Keifer anterior and posterior coxae with heavy lines of granules curving around setiferous tubercles (Fig. 6) …… ***Tegolophus hassani*** (Keifer)

- Anterior coxae separated (Fig.7a) …… ***Calepitremerus*** Keifer central dorsal ridge one half abdominal length (Fig. 7b) …….. ***Calepitremerus baileyi*** Keifer

ACKNOWLEDGMENTS

The Authors wish to express their deep gratitude to the members of Acarology lab for their help, support and cooperation. We also thank Dr. Amgad Saleh for revising the manuscript. All thanks to King Saud University for support and encouragement.

REFERENCES

Al-Mallah, N.M. and M.A. Mohammad, 1989. Biological of the fig mite *Rhyncaphytoptus ficifoliae* Keifer. Arab Plant Protection, 7: 23-29.

Amrine, J.W. Jr., T.A.H. Stasny and C.H.W. Flechtmann, 2003. Revised Key to World Genera of Eriophyoidea (Acari: Prostigmata). Indira Publishing House, West Bloomfield.

Amrine, J.W. and T.A. Stasny, 1994. Catalog of the Eriophyoidea (Acarina: Prostigmata) of the World. Indira Publishing House, Michigan, USA.

Amrine, J.W., 1996. Keys to the World Genera of the Eriophyoidea (Acari: Prostigmata) of the World. Indira Publishing House, Michigan, USA.

Attiah, H.H., 1967. Two new species of mites on fig from Egypt. Bull. Soc. Ent. Egypt, 51: 1-5.

Hatzinikolis, E.Z., 1989. Description of *Aceria cretica* new species from olive trees in Greece (Aceria: Eriophyidae). Entomologia Hellenica, 7: 31-34.

Keifer, H.H., 1952. The Eriophoid mites of California. Department Agric., 2: 123-123.

Keifer, H.H., W.B. Edward, K. Tokuwo, D. Mercedes and E.S. William, 1982. An Illustrated Guide to Plant Abnormalities Caused by Eriophyid Mites in North America. USDA., California, USA., pp: 178.

Kozlowski, J., 2000. The occurrence of *Aceria tosichella* Keifer (Acari, Eriophyidae) as a vector of wheat streak mosaic virus in Poland. J. Applied Entomol., 124: 209-211.

Mahisani, A.A., M. Golmohammadi and J. Davoudi, 2004. Study of Injurious Eriophyid mites (Acari: Eryiophyidae) and Susceptibility of Different Olive Varieties to them. Agricultural and Natural Resources Research Center, Zanjan, Iran.

Martin, H., 1972. Report to the government of Saudi Arabia on research in plant Protection. FAO, pp: 38.

Mondal, S. and S. Chokrabatris, 1982. Studies one the eriophyid mites (Acari: Eriophyidae) of the India. XI. Descriptions of three new species from West Bengal. Entomology, 7: 361-366.

Ripka, G., 2008. Additional data to the Eriophyoid mite fauna of Hungary (Acari: Prostigmata: Eriophyoidea). Acta Phytopathologica et Entomologica Hungarica, 43: 143-161.

Shahinia, S., E. Kullajab, A. Akallic and E.D. Lillod, 2009. Preliminary survey and population dynamics of some eriophid mites (Acari: Eriophyoidea) associated with olives in Albania. Int. J. Acarol., 35: 419-423.

Smales, T.E., C.M. Ferguson, P.L. Guy and J.A. Shand, 1996. A survey of ryegrass mosic virus and endophyte in Otago and Southland. Proceedings of the 49th N.Z. Plant Protection Conference, (NZPPC'96), New Zealand, pp: 220-224.

Snjezana, H., T. Perovic, S. Radonjic, R. Petanovic and B. Vidovic, 2009. The occurrence, intensity of attacks and counter two new species eriophyid, *Aceria oleae* and Shevtchenkella barensis on seedling Olive in Montenegro. Pestic. Phytomed. (Belgrade), 24: 303-308.

Stenger, D.C., G.L. Hein, F.E. Gildow, K.M. Horken and R. French, 2005. Plant virus HC-Pro is a determinant of eriophyid mite transmission. J. Virol., 79: 9054-9061.

Zaher, M.A., 1986. Survey and ecological studies on phytophagous, predaceous and soil mites in Egypt. I-phytophagous mites of Nile Valley. PL. 480 Program, USA., pp: 567.