# DESCRIPTION OF DIFFERENT STAGES OF *ERIOPHYES SHELDONI* (EWING), A CITRUS BUD MITE ON "HAMLIN" CITRUS (ACARI: ERIOPHIDAE) WITH THE AID OF THE SCANNING ELECTRON MICROSCOPE (SEM).

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***Abstract***

The egg, protonymph, deutonymph, adult male and female of *Eriophyes sheldoni* (Ewing) and with their fine structures are descibed.

Scanning electron micrographs revealed much greater details of the dorsal shield rostrum, the genital cover flap, articulations of the legs and microtubercles. The first record in this study is that the female has 6-and the male has 5-rayed feather claws.

## INTRODUCTION

The citrus bud mite, *Eriophyes sheldoni* (Ewing) is one of the most injurious pest of citrus. It causes deformation and malformations of twigs, buds, and fruits. *E.sheldoni* has been found on all citrus varieties (Sternlicht, 1969). It is a very small mite and lives primarily in sheltered places such as axillary buds, under the fruit calyx or among the young tender tissue of a bud that has just begun to elongate (Boyce and Maxwell 1938; Boyce and Korsemrir 1941; Sternlicht 1967).

*E.sheldoni* is a common wide world recorded in eriophyid mite on citrus (Turkey, Argentina, Kenya, South Africa, Italy, Australia, Yugoslav, Israel, Egypt and USA) (Duzgunes 1953; Di Martino 1952; Le Pelley 1955; Ryke and Meyer 1960; Costantino 1956; Bowman 1956; Muuskovic 1973; Grunberg 1957; Hely 1939; Attiah 1970; Keifer 1938).

This eriophyid mite was firstly described by Ewing (1937) on lemon trees near Santa Paula Ventura county, California, USA. Subsequently, the systematics of this species have been very extensively studied by keifer (1938).

This peper presents descriptions of the protonymph and deutonymph of *E.sheldoni* including scanning electron micrographs for both the adult and remarks on fine structures.

## MATERIALS AND METHODS

Citrus bud mite, *Eriophyes sheldoni* (Ewing) was collected from buds on twigs of the three years old wood of "Hamlin" orange bearing all stages of citrus bud mite at Florida university "Black # 8 " in lake Alfred, Florida.

More than 1000 slides of citrus bud mite species were mounted and identified by Denmark at USDA, Florida.

The specimens were mounted by using the technique of keifer (Krantz 1978).

Specimens of the present work were taken alive from citrus buds and placed directly on an aluminum stub with a double sticky tab and coated immediately in 20% palladium and 80% gold for twenty minutes.

The specimens were then dehydrated in aladd vacuum evaporator at an atomosphere of 0.01 torr for 3 hours according to new method for preparation of eriophyid mite (Ebrahim et al. 1997).

Examination was undertaken using Hitachi S530 scanning electron microscope and photographed with polaroid type 55 positive-negative film.

Measurements of mite individuals were made with a vickers image splitting eye piece on olympus microscope with a zeiss adaptor. A minimum of 10 specimens were given in microns.

## RESULTS AND DISCUSSION

Description of the different stages of *E.sheldoni.*

**Female** Ewing (1937) and Keifer (1938) described the female of *E.sheldoni* as follows: Female spindle form yellow to orange in color, 170 to 180 microns long. The feather claws are 5-rayed; shield gently curved above, design usually indistinct in disc of three principal longitudinal lines, the central broken and anchor-shaped cauded, side of shield with curved lines and band of granulations along rim. Female genitalia subcordate, cover flap longitudinally furrowed, 8-10 furrows. However, female described in this study with the aid of scanning electron microscope showed difference in the come morphological characters. Since Ewing and Keifer's descriptions were inadequate, thus it is found necessary to carry out a thorough description using scaning electron microscope.

This incidentally brings to light the variation in the species in respect of certain characters.

The principal difference between this species and the description by Ewing and Keifer are:

1. The size of the specimens now examined is longer.
2. Dorsal seta, female genital seta and caudal seta are also longer.
3. The female has 6-and the male has 5-rayed feather claws.
4. Coverflap high in number with about 11 logitudinal ribs (furrows).

Female is 190-200 microns long (rostrum included), shape cylindrical, narrowed posteriorly; colour rather whitish or somewhat creamy. Rostrum moderately long about 20 microns, Fig 1, 1D and 2A. Shield 21 microns wide, 25 microns long, median line complete with a faint duct at rear end. Shield sparsely granular laterally.

Dorsal seta slender, 13 microns long, diverging to the rear, one pair arising from the posterior part of the dorsal shield in the cephalothoracic area. The shield triangular, with a U-shaped structure and vertical line inside, Figs 1D, 3B and 3C.

Legs, 2 pair placed anteriorly, six-jointed about 24 microns long; tibia 4 microns long; tarsus 3 microns long end in a six -rayed feather claw and three distal bistles, Fig 2 C, the exterior one being the longest. The bristle between it and the claw ends with a knob. Femora 1 and 2 with a rather small bristle. The bristle on patella 1 longer than that on patella 2. Tibia 1 with a short bristle which is missing on tibia 2, Fig 2A.

Palpi with three unequal segments, the distal one carries two small distal bristles and comparatively long one laterally and one the exterior side; chelicerae fine, styliform and lay between palpi, Fig 2 B and 2A.

Abdomen with about 68 rings; uniformly microtuberculate; microtuberculates elongate-oval, occupying almost entire width of rings from rear ring margins. Lateral seta 15 microns long, on ring 10-11, first ventral seta 45 microns long, on ring 20-22, second ventral seta 8 microns long on ring 38-40, Fig 1D and 3C.

Third ventral seta 16 microns long on ring 6 from rear, caudal seta 55 microns long; Accessary seta 5 microns long. Female genitalia 13 microns wide, 8 mi-

crons long quite away from hind coxae, coverflap with about 11 longitudinal ribs, Fig 1E.

**Male:** Fairly common 130-135 microns long. Genitalia 10 microns wide, seta 12 microns long. Male has 5-rayed feather claws, Fig 2A.

**Egg:** The eggs are deposited singly and not in groups inside the bud. The egg translucent white, nearly hyaline, Almost nearly oval 45 microns in length by 32 microns in width, Fig 1A.

**Protonymph and Nymphosalis:** Newly hatched protonymph, triangular; Cephalothorax greatly out of proportion to the remainder of the body and incomplete in development. Body length approximately 110 microns. During quiescent period the nymph gives the nymphochrysalis, Fig 1B and 1C. The latter can be observed with enlarged cuticle and moults to imagochrysalis.

**Deutonymph and Imagochrysalis:** The deutonymph is similar to the adult in shape, but somewhat smaller, approximately 140 microns long. Genital organs not evident externally; 62 rings on the abdomen. The deutonymph becomes imagochrysalis during the quiescent period and moults, where genital organs of adult become apparent externally, Fig 1 C.

I hope that new techniques such as the scanning electron microscope will provide needed clarifications and provide for future improvements in eriophyid taxonomy.

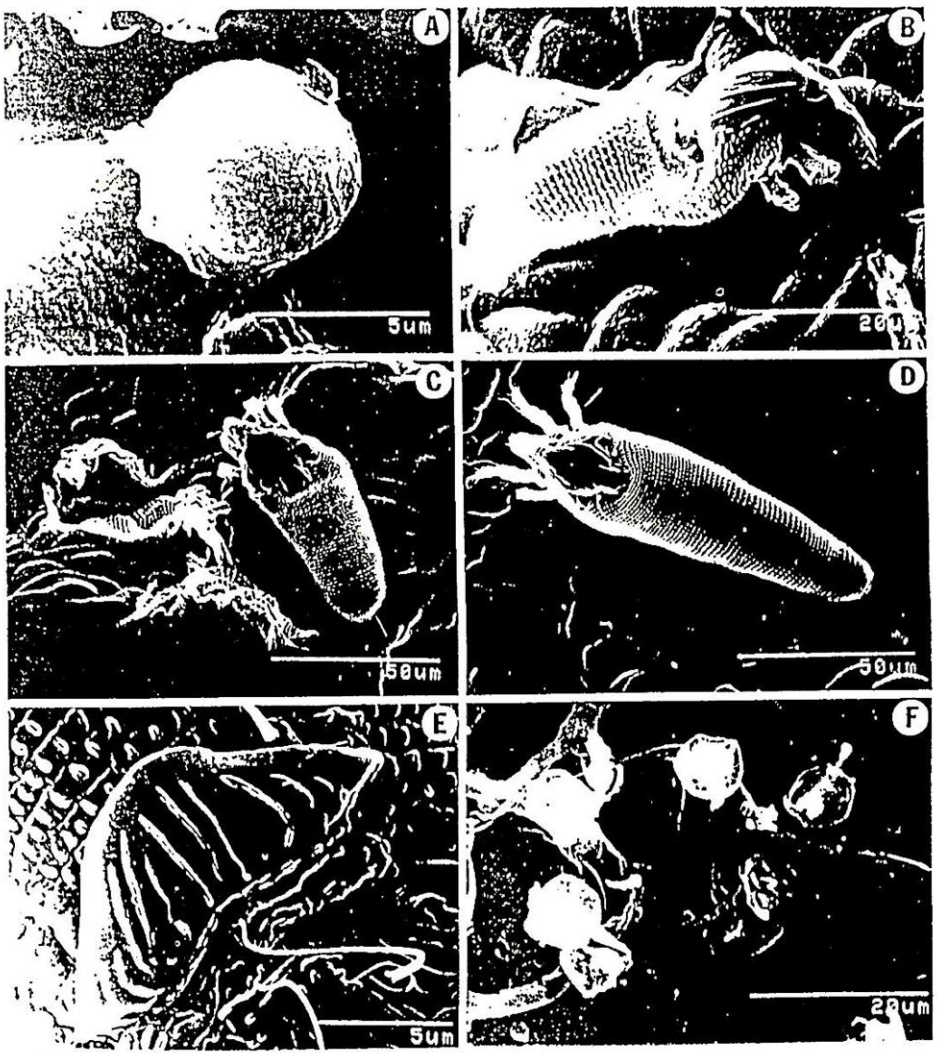


Fig. 1. Scanning electron micrograph of *E.sheldoni* A. Egg. B. Protonymph. C. Deutonymph after moult. D. Dorsal view of adult female. E. Genital flap and coxal setae. F. Spermatophore.

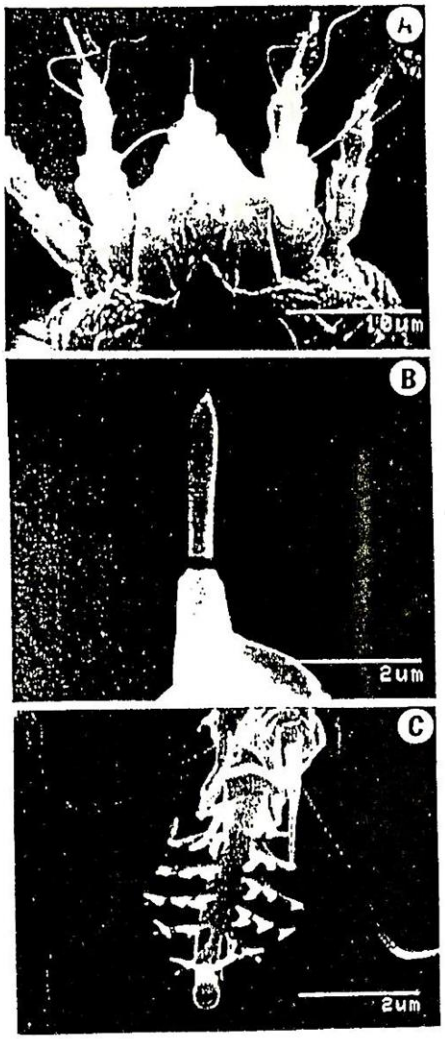


Fig. 2. Scanning electron micrograph of *E.sheldoni*

A. Adult Rostrum. B. Styliform. C. Feather claw of female, six-rayed.

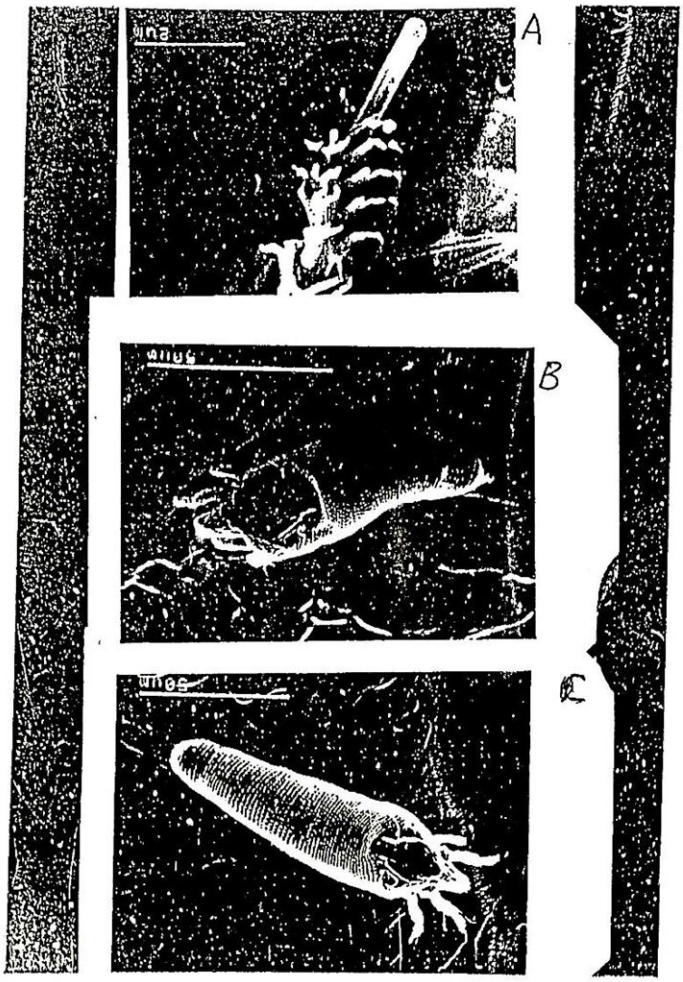


Fig. 3. Scanning electron micrograph of *E.sheldoni*

A. Feather claw of adult male, 5-rayed.
B. Dorsal view of adult male.
C. Dorsal view of adult female.

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# وصف الأطوار الحية للحلم الدودي لبراعم البرتقال من خلال التصوير بالميكروسكوب الألكتروني

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تم وصف كل من البيضة والحورية الأولي والحورية الثانية والطور الكامل لكل من الذكر والأنثي للحلم الدودي لبراعم البرتقال والتي تسبب أضرارا كبيرة تؤدي الي تشوهات في الأوراق والبراعم والثمار الناتجة علي أشجار البرتقال والليمون.

كما درست النواحي التقسيمية والشكل الظاهري لكل من الذكر والأنثي وتم تسجيلها لأول مرة من خلال التصوير بالميكروسكوب الألكتروني وبدقة متناهية. وجد أن هذا النوع به أختلاف بين الذكر والأنثي حيث أن الوسادة القدمية "الرجلية" للذكر تحتوي علي ٥ شعاعيات بينما الأنثي تحتوي علي ٦ شعاعات.

كما ظهرت واضحة التركيبات الخاصة بالأرجل والشعيرات علي كل جزء من الرجل وتم تصوير الحاضنة القابلة للحيوانات المنوية وتم تحديد شكلها والشكل الظاهري لرأس الحيوان والتي تستخدم في التصنيف وكذلك وضع الشعيرات علي جسم الحلم الدوي لبراعم البرتقال.

ونأمل في المستقبل من خلال التصوير بالميكروسكوب الألكتروني إيضاح وتحسين النواحي التقسيمية للحلم الدودي الذي لايري بالعين المجردة وإمدادنا بالمعلومات التي تساعد علي تطوير هذا العلم علي مستوي العالم.