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External Morphology of *Aceria tulipae* Keifer, a Garlic Pest in Thailand (Prostigmata : Eriophyidae)

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ABSTRACT

The morphological characteristics of the dorsal shield, genitalia, cuticular sculpturing and leg of *Aceria tulipae* Keifer were described with the aid of scanning electron microscopy. Male genitalia was reported for the first time.

INTRODUCTION

The eriophyid mite, *Aceria tulipae* keifer, has been known since 1938 from tulip bulbs collected in Sacramento, California (Keifer 1938). Today, this species is reported feeding on several host plants including garlic *(Allium sativum* L.) in North America, Europe and Asia (Keifer, 1952; Liro and Roivainen, 1951 and Puttarudriah and Channa BasaVanna, 1953). In 1980-81, *A. tulipae* was reported as a garlic pest in Thailand (Charanasri *et al.* 1984). Heavy infestation by this mite causes plant stunting, yellow patches on leaves with peculiar arching of leaf tucked in the next younger leaves.

Eriophyids are microscopic in size and many morphological characters cannot be distinguished clearly with the light microscope. Therefore, higher resolution with three dimensionality is needed to reveal certain characters. By using the SEM technique, this paper provides the information on the external morphology of *A. tulipae* with emphasize in the dorsal shield, genitalia, cuticular sculpturing and leg.

MATERIALS AND METHODS

A. tulipae examined in this study were from garlic bulbs collected at various markets in Chiangmai and Srisaket provinces. Adult mites were fixed in 3% glutaraldehyde and 2.5% paraformaldehyde in 0.2M sodium cacodylate buffer pH 7.2 at 4°C for 8 h., washed, and then post fixed in 2% Osmium tetroxide for 20 h. at 4°C. After washing in distilled water, the mites were placed in plastic containers made from BEEM® capsules. The BEEM capsules were cut about halfway to form a cylinder (5 × 7 mm.). The open ends were covered with filter paper held in place by BEEM capsule lids with removed center. This facilitated liquid exchange during dehydration and critical point drying. Specimens in plastic containers were dehydrated in a graded series of acetone (20, 30, 50, 70, 95 and 100%). The containers were then soaked in amyl acetate for 5 min. before transfering into the Hitachi HCP-2® Critical Point Dryer. The dried specimens were glued to stubs with double sticky tape and coated with gold in Eiko IB-2® Ion Coater. A Jeol JSM 35 CF® scanning electron microscope was employed at 5-15 KV to view the specimens. The images were recorded on Kodak VP 100 film.

RESULTS

The body of *A. tulipae* exhibits the three standard acarine body region (Fig. 1): the gnathosomal region with the mouthparts, the podosoma with only 2 pairs of legs and the opisthosoma with the genital region.

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Dorsal shield (Fig. 2):

A. tulipae possesses a flattened, sub-triangular, dorsal shield. The posterior region of the dorsal shield eventually merges into the dorsal half-rings of the anterior, opisthosoma. The anterior projection of the dorsal shield, frontal lobe, is small with a narrow base.

The surface of the dorsal shield has several strong longitudinal lines that are formed by the cuticle projecting above the surface of the body. The median line is restricted to the rear 1/4. Admedian lines are complete, diverging gradually to the rear margin. Submedian lines run from anterior magin toward the dorsal tubercles. Other two laterally directed lines are formed on the submedian areas. Each side of the lateral shield area is granulated. A pair of dorsal tubercles situate on the posterior shield margin. The dorsal setae, which insert in the dorsal tubercle, point backward.

Genital region:

The female and male genitalia are situated anteriorly on the opisthosoma, behind the second coxae. A pair of genital setae always accompanies these structures in both sexes.

Female genitalia (Fig. 3). The genitalia protrudes from the ventral surface of opisthosoma. The genital coverflap, which is opened posteriorly, covers the genital opening, a transverse slit. The bowl-shaped coverflap of *A. tulipae* has distinct 11 - 12 longitudinal lines.

Male genitalia (Fig. 4). The male genitalia has a genital shield open anteriorly. A pair of peg-like setae are situated on the anterior margin of the genital shield. Part of the genital shield, posterior to these setae, is covered with granules arranged in several longitudinal rows.

Cuticular sculpturing (Figs. 5, 6):

The cuticular sculpturing is restricted to the annulated or ring-like opisthosoma in eriophyid mites. *A tulipae* has similar tergites and sternites. The dorsal sculptural element, microtubercles, are strongly pointed and situated on the ring margins. The ventral thanosomal microtubercles are narrowly spaced in comparision to the dorsal microtubercles. *A. tulipae* possesses triangular microtubercles on the posterior margin of the sternites. The ventral telosomal microtubercle are cylindrical.

Leg (Figs. 7, 8, 9):

Each leg consists of the granulated coxal plate, trochanter, femur, genu, tibia and tarsus. A solenidion and featherclaw are attached on the distal end of each tarsus. The solenidion is found on the dorso-distal region whereas the featherclaw is on the ventro-distal region of the tarsus. Each solenidion is curved, without knob at the end. Featherclaw of *A. tulipae* is simple, with an undivided central shaft. Number of rays in each featherclaw vary among sexes. Female mite has 7-rays whereas male mite has only 6-rays. Each ray ends in a bulb-like structure.

Discussion

Most of the morphological characters studied by the scanning electron microscope were agreed with the work done by Keifer (1938), who first described this species. Keifer's definition stated that the anterior coxae toaching and forming a forked sternal ridge. The electron micrographs of both male and female clearly showed that the sternal ridge is not formed in this species. The study of the cuticular sculpturing also revealed that both dorsal and ventral thanosomal microtubercles are pointed and situated on the rear ring margin. The male mite is smaller than the female. On the anterior of its genital shield possesses a pair of sensory peg which is probably function as mechanoreceptors during spermatophore deposition.

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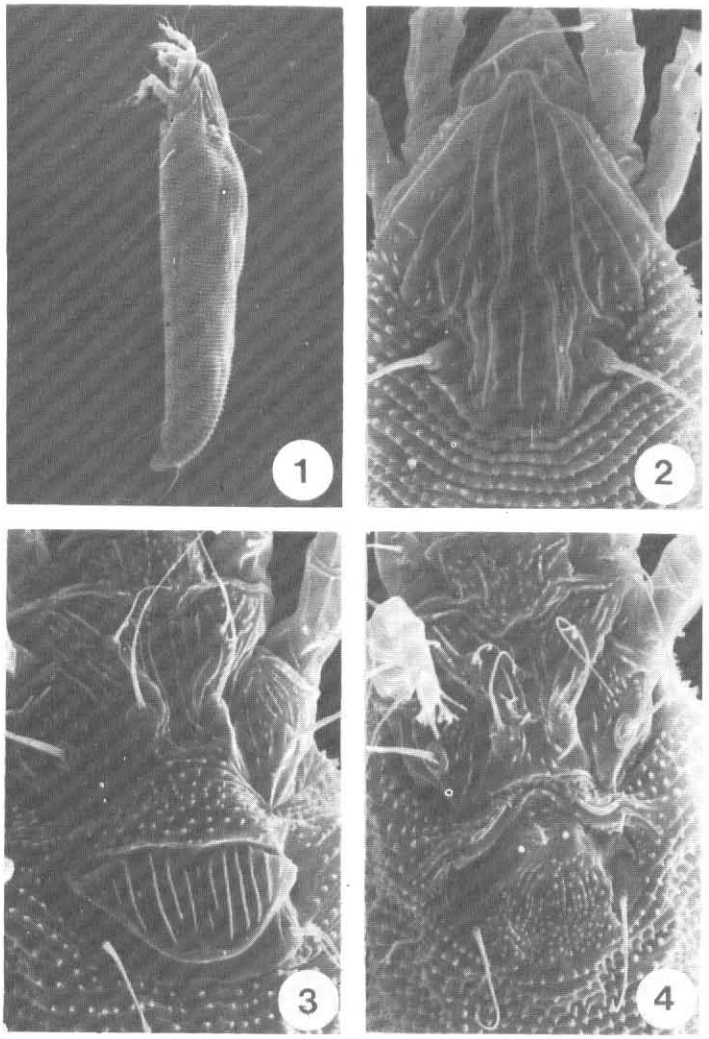

Fig. 1 Lateral view of female mite (540 x).
Fig. 2 Dorsal shield of female mite (2200 x).
Fig. 3 Female genitalia (2200 x).
Fig. 4 Male genitalia (2400 x).

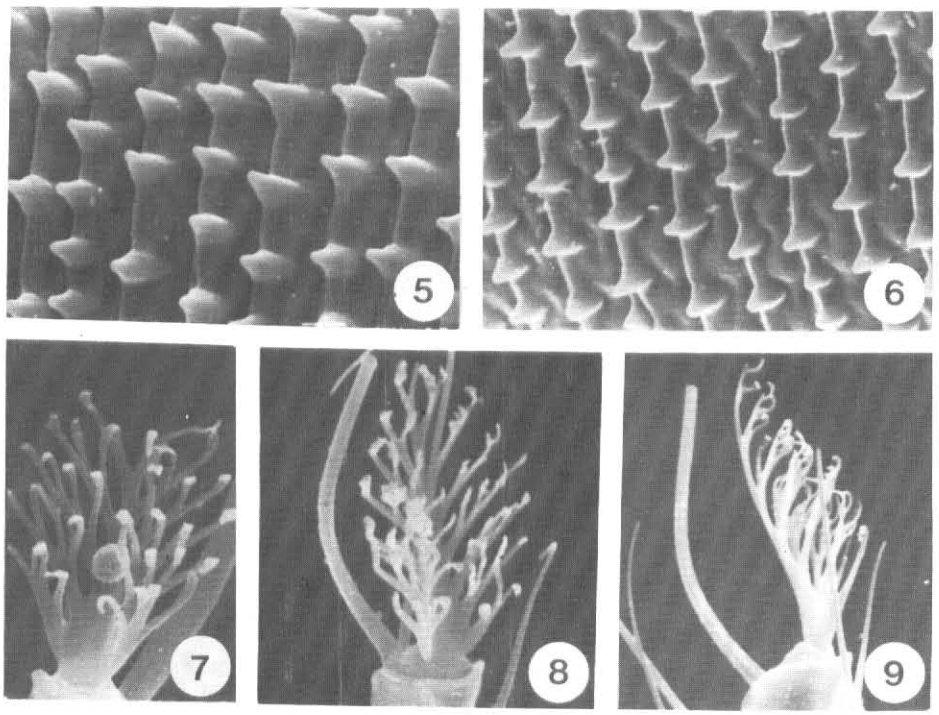

Fig. 5 Dorsal microtubercle (10,000 x).
Fig. 6 Ventral microtubercle (10,000 x).
Fig. 7 Ventral view of male featherclaw (12,000 x).
Fig. 8 Ventral view of female featherclaw (7800 x).
Fig. 9 Lateral view of female featherclaw (8600 x).

LITERATURE CITED

Charanasri, V., C. Saringkaphaibul, T. Kulpiyawat, C. Seriphunpanich and N. Wongsiri. 1984. Studies on the taxonomy and biology of mites injurious to garlic in Thailand. Proc. of the 4th Conference of Ent. and Zool. Division. Bangkok. (in Thai).

Keifer, H.H. 1938. Eriophyid studies I. Bull. Calif. Dept. Agric. 27: 181-206.

Keifer, H.H. 1952. The eriophyid mites of California. Bull. Calif. Insect Survey. 2(1): 1-123.

Liro, J.L. and H. Roivainen. 1951. Eriophyidae (of Finland, in Finnish). Anim. Fenn. Helsinki. 6: 281.

Puttarudriah, M. and G.P. Channa BasaVanna. 1958. Occurrence of an eriophyid mite as a new pest of garlic *(Allium sativum)* in Mysore. F.A.O. Pl. Prot. Bull. 6(8): 123-126.