

Fine Structure of the Scales of *Tychius* Germar, 1817 (Coleoptera: Curculioninae) Species

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Abstract: The scales of four species of *Tychius* genus were studied with light microscope and scanning electron microscope (SEM). The similarities and differences among the species were discussed. The shape and color of scales of species seem similar under a light microscope, but under a scanning electron microscope, they have a lot of differences. The surface morphology of scales in *T. squamulatus* has projections that are like spines and are rather different from the other species. In other species (*T. aureolus*, *T. brevisculus*, *T. medicaginis*), the surface of scales have a longitudinal process.

Key words: Coleoptera, Curculionidae, *Tychius*, scales, SEM.

Introduction

Curculionidae is considered to be one of the richest families in Coleoptera in terms of number of species. All of the species in the family Curculionidae are phytophagous with the exception of several species (ROSS 1963). Larva and adult stages of the organisms feed on plant organs such as: roots, stems, leaves and fruits. That's why they have a detrimental effect on crops and forest trees and can cause economic losses (HOFFMANN 1950, MIHAJLOVA 1978). The family Curculionidae is the organism group that has economic importance. The species of *Tychius* genus is a parasite and of considerable importance. All the species of *Tychius* seem to live on plants of the family Fabaceae, and on plants of the family Caryophyllaceae, Paronychiaceae, Plumbaginaceae and Thymelaeaceae (CALDARA 1990). The *Tychius* together with the genus *Sibinia* belongs to the big tribe Tychiini. The *Tychius* genus is characterized by 7 funiculus segments, and is distinguished easily from the *Sibinia* genus which has 6 segments (HOFFMANN 1954, CALDARA 1990). Besides, in the

Tychius genus, the pygidium in the two sexes is covered from the elytra, while in *Sibinia*, the pygidium is uncovered from the elytra (CALDARA 1990). In the palearctic region, there are 175 species of genus *Tychius* Germar, 1817 (Curculioninae) (CALDARA 1990), and in Turkey, 40 exist (LODOS *et al.* 2003, SERT 2004, 2005).

The aim of this study was to review the fine structures of scales on *Tychius* species and take out the taxonomic characters.

Material and Methods

In this study, the four species of *Tychius* Germar, 1817 (Coleoptera: Curculionidae: Curculioninae) (*Tychius aureolus*, *T. brevisculus*, *T. medicaginis* and *Tychius squamulatus*) were used. For the investigation, the specimens were selected from the museum materials that were collected from the central Anatolia. For the first time, the specimens were examined under a light microscope and the photos

of species were obtained. Under a scanning electron microscope, the species were cleaned from the organic chitins and mounted with double-sided carbon tape on SEM stubs, coated with gold in a Polaron SC 502 Sputter Coater, and examined with a JOEL JSM 6060 SEM operated at 5-10 kV. Then, we investigated the surface morphology of scales on x500, x1000, x1500. The classification follows ALONSO-ZARAZAGA, LYAL (1999).

Results

Under the light microscope

The species (*T. aureolus*, *T. brevisculus*, *T. medicaginis* and *T. squamulatus*) were investigated under a light microscope (Figs. 1a-d). For the first time, in all species, the color and shape of the scales are similar, except in *T. squamulatus*. The shape of scales in *T. squamulatus* are nearly oval or oblong, while in other species, the scales are longitudinal, but the color of scales in all species is reddish yellow. The scales in all species cover the body (Figs. 1a-d). In *T. squamulatus*, the scales seem more dense than in the other species (Fig. 1d).

Under the scanning electron microscope (SEM)

The details of the surface morphology of the

scales seem clear. The ultrastructure of scales that covered the surface of the body appear rather different in each species. In *Tychius aureolus*, the scales are longitudinal, oblong, the apical part is oval, the surface has a longitudinal process, the beam process, especially in the apical, is divided, the lateral of the apical is nearly straight (Figs. 2a, 3a, 4a); in *Tychius brevisculus*, the scales appear oblong, towards the apical, they are less wide, the surface of the scales have a longitudinal process like root, the lateral of the apical part seems serrated (Figs. 2b, 3b, 4b); in *Tychius medicaginis*, the scales appear as parallelograms, the apical part seems serrated, the surface has a longitudinal process like sulcus (Figs. 2c, 3c, 4c); in *Tychius squamulatus*, the scales are oval and wide, the surface has dense short projections, the projections are toward the apical (Figs. 2d, 3d, 4d). The scales are less concave.

Discussion

In this study the scales of four species of *Tychius* (Coleoptera: Curculionidae) genus were investigated with a scanning electron microscope for the first time. The similarities and differences of characters among species were discussed. In taxonomy, the several external morphologic characters, such as hairs, setae, scales, punctures and color were used

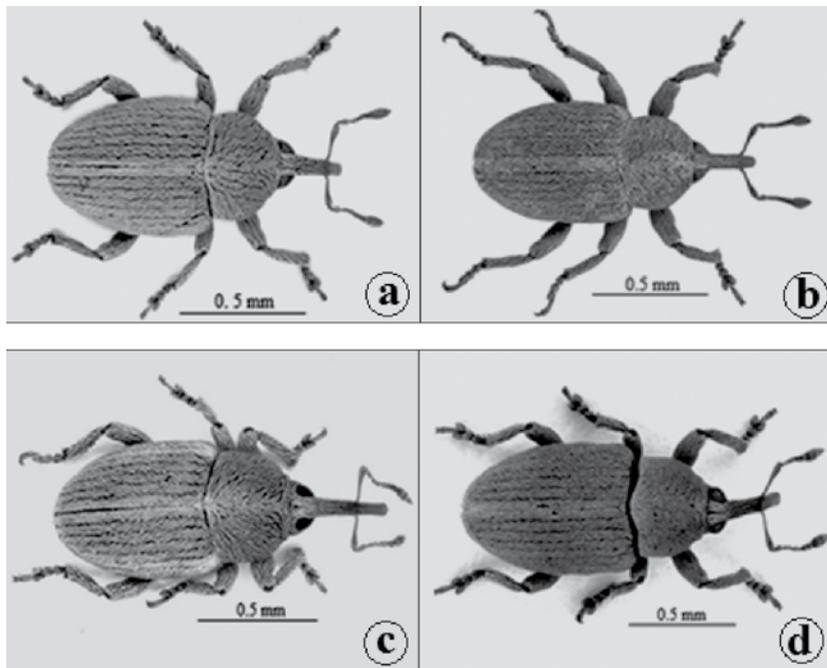


Fig. 1. Photos of the *Tychius* species under a light microscope; a) *T. aureolus*, b) *T. brevisculus*, c) *T. medicaginis*, d) *T. squamulatus*.

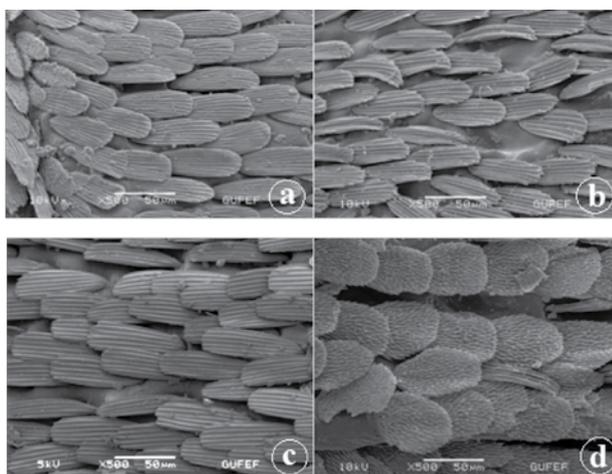


Fig. 2. SEM photos of scales in species of *Tychius* genus at x500; a) *T. aureolus*, b) *T. brevisusculus*, c) *T. medicaginis*, d) *T. squamulatus*.

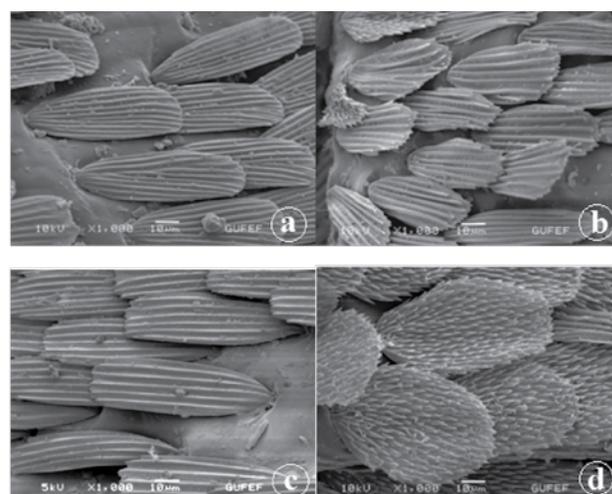


Fig. 3. SEM photos of scales in species of *Tychius* genus at x1000; a) *T. aureolus*, b) *T. brevisusculus*, c) *T. medicaginis*, d) *T. squamulatus*.

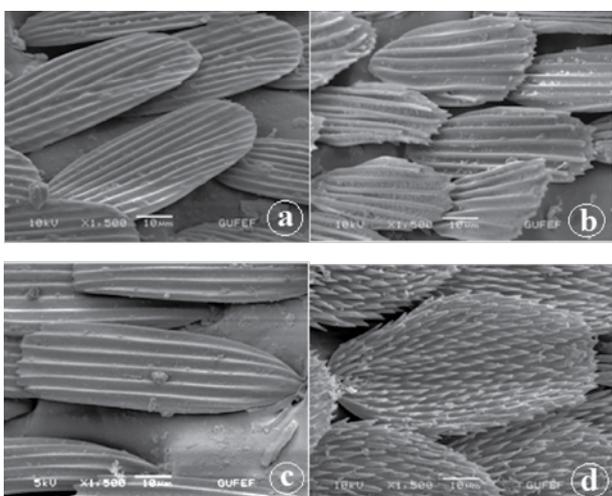


Fig. 4. SEM photos of scales in species of *Tychius* genus at x1500; a) *T. aureolus*, b) *T. brevisusculus*, c) *T. medicaginis*, d) *T. squamulatus*.

(CALDARA 1984, DIECKMANN 1980, KUSCHEL 1995, MARVALDI And LANTERI 2005, MORIMOTO 1962A, TER-MINASYAN 1978, 1988, THOMPSON 1992). In Curculionidae, many researchers use the scales of the insect for taxonomy, but they show the simple drawing of shape and arrangement (HOFFMANN 1954, PESARINI 1979-80, CALDARA 1990).

The scales of the four species seem similar in shape and color in the investigation under the light microscope. In *T. squamulatus*, the shape of the scales has little differences compared to those in the other species. But in the investigation under the scanning electron microscope in an especially high magnitude (x1500), the structures of scales that have many differences are shown (Figs. 4a, b, c, d). These differences are not seen in light and low measure of the electron microscope. In *T. squamulatus*, the fine structures of the surface morphology of scales are rather different from those in the other species. The surface of scales has dense projections that are like spines (Figs. 3d, 4d). In other species, the surfaces of scales have a longitudinal process but its design clearly appears different among the species. Besides, the apical parts of scales have differences (Figs. 4a, b, c).

As a result, we think that the surface morphology can be used as a taxonomic character, besides the shape and color of scales. In addition, the investigation of the surface morphology of scales in insects may help in the differentiation of similar species that have similar shape and color. In this study, we determined that the electron microscope shows exactly the characteristic structures. Consequently, we think that this study and many similar future studies will be useful for taxonomic research.

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