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SOME OBSERVATIONS ON THE BIOLOGY OF *CIONUS OLENS* FABRICIUS, 1792 (COLEOPTERA: CURCULIONIDAE: CURCULIONINAE)

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ABSTRACT: The present study was carried out in Diyarbakır province in Southeastern Anatolia Region of Turkey in 2019. Larvae of *Cionus olens* were collected from *Verbascum* spp. Larvae, pupa, cocoon and adult specimens of *C. olens* were examined. Drawings (dorsal and ventral) of larvae and pupae are presented. Larval characters were examined for the first time with SEM microscope. Larval body very stout, flattened ventrally, strongly convex dorsally, head brown or blakish, body white, dorsal surface of body yellowish. Pupae moderately elongate, white or light yellow, cocoon elongate, cylidrical, surface smooth and have white tube which is the aeropile. Finally, the data obtained were compared with the literature.

KEY WORDS: Coleoptera, Curculionidae, *Cionus*, larva, pupa

Curculionidae is the largest insect family of in the superfamily Curculionoidea. The members of this family most commonly found. Curculionidae shows considerable variation in size and shape. The rostrum is well developed in most species, with capitate antennae appearing in the middle. The Curculionidae species present a complete metamorphosis (egg, larva, pupa and adult) (Fuentes et al., 2017). This group is important economically and all members are phytophagous. There are many important agricultural and forest pests within the family. They can attack specific parts of the plant, from the roots to the aerial parts; usually the larvae feed within plant tissues and adults make holes in the fruits, nuts and other parts (Domínguez, 2006), except for myrmecophilous, saprophagous and predatory species (Muñiz, 1970). The tribe Cionini that includes species of *Cionus* is recently used as a sister-group of the Mecinini (Caldara, 2001). The members of *Cionus* Clairville, 1798 genus are ectophages. Larvae live in the open or hidden among several sheets. They attack and eat the leaves of species of Scrophulariaceae, such as *Verbascum, Scrofularia, Budleija,* etc. (Erbey & Candan, 2015). The *Cionus* genus has forty species in Palearctic region (Hoffmann, 1958).

Turkey in fact seems to be like a small continent in terms of biological diversity. Despite Anatolia not being a continent on its own, it contains all the properties of a continent that a diverse ecosystem should have. Each of seven geographical regions in Turkey has a distinguishable climate, flora, and fauna. Asia, Middle East, and Europe intersect at the point where Turkey has a rich natural diversity of flora and fauna due to the favorable geographical conditions and climate. There are more than 10,000 plant species in Turkey. Approximately 3,400 of these species are endemic (Özhatay et al., 2005).

The current survey is aims to increase the knowledge on the biology (such as larval and pupal characters) of *Cionus olens* (Coleoptera: Curculionidae).

MATERIALS AND METHODS

This study was carried out in Diyarbakır in the Southeastern Anatolia Region of Turkey in 2019. Larvae of the species were collected from the leaves of *Verbascum* spp. during May 2019 and were brought to the laboratory for rearing. The larvae and pupae were reared at a temperature of 26±1°C, relative humidity of 65±5, and illumination of 3500 lux for 16 hours per day. Cocoons were dissected and removed pupae. Observations and measurements were made using a microscope (Olympus SZX12) at a magnification of X40. Drawings of larvae and pupae are presented and adult forms are given (ventral, dorsal and lateral view).

For Scanning Electron Microscope, larvae and cocoon were 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 10 kV.

RESULTS AND DISCUSSIONS

Cionus olens Fabricius, 1792

Synonym. *Rhynchaenus caprimulgus* Fabricius, 1801

Identification of species were made by second author according to Kostal & Caldara (2019). This species is recognizable by concealed elytral integument, erect long seta-like scales on all elytral interstriae, small profemoral teeth, rather subparallel elytral sides, pronotum in lateral view abruptly falling to anterior margin, and penis shape (Kostal & Caldara, 2019).

Material examined: Larvae collection; Diyarbakır (Ergani district) mountainous area, 1084 m, 01.V.2019.

Distribution in Diyarbakır: *Cionus olens* is a first record for the fauna of Diyarbakır.

Distribution in Turkey: Adana, Ankara, Eskişehir, İçel, Kırıkkale, Kırşehir, Konya, Yozgat (Sert, 1995; Lodos et al., 2003); Bolkar Mountains (Erbey, 2010).

World distribution: Austria, Belgium, Bosnia-Herzegovina, Belarus, Croatia, Czech Republic, France, Germany, Greece, Montenegro, Hungary, Italy, Luxembourg, Moldavia, Netherlands, Poland, Romania, Serbia, Slovakia, Spain, Russia, Switzerland, Ukraine, Turkey (Alonso-Zarazaga et al., 2017).

Host plants: *Verbascum* spp.

Description of mature larva: General. Body very stout, flattened ventrally, strongly convex dorsally, declivous and narrower posteriorly (Figs. 1a-3a). Coloration, head brawn or blakish, lateral margins of head dark, body white, dorsal surface of body yellowish (Figs. 3a-c). Head hypognathous, suboval;

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endocarinal line present and reaching behind middle of frons, and distinctly divided into two frontal sutures, extending to antennal sign, endocarina that strongly chitinized extends to the middle of frons (Figs. 2a-3c); antennae located at the end of the frontal suture on each side, membranous and slightly convex basal article bearing one conical sensorium (Figs. 2a-3c-4e); the clypeus and labrum extends over the mandibles but does not cover clypeal setae short, moderately subequal, length of labrum is almost twice the width, the end of the labrum is bent inward and appears to have two lobes (Figs. 4a-b); mandibles appear strongly, pronged at the anterior, small part on the outside, large part on the inside and threaded on the inner edge (Figs. 4a-b); maxillary palpus with two segments, the basal segment wider than long and with two seta and one very short lateral seta, apical segment longer than wide and without seta. Mala with four ventral setae (Figs. 2d; 4c-d).

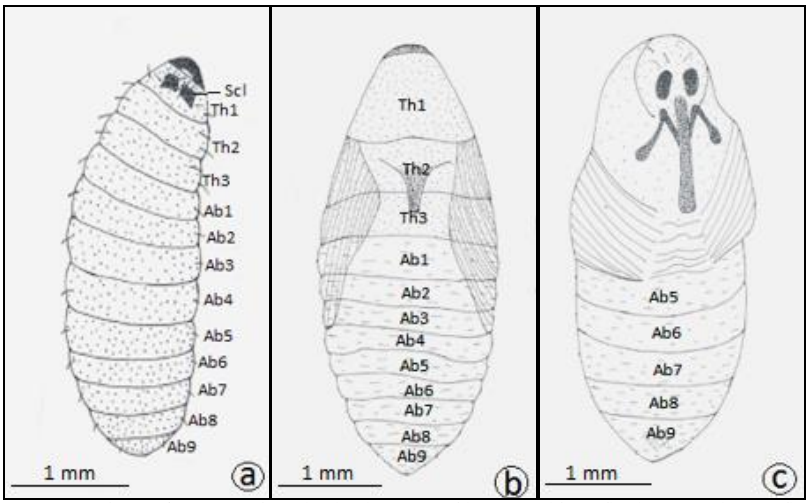

Figure 1. Drawings of *Cionus olens* (a-c); a) Larvae, b) Pupae (dorsal), c) Pupae (ventral).

Thorax: Prothorax smaller than meso- and metathorax (both with similar size) (Figs. 1a), two sclerites like rectangle on the prothorax (Figs. 3a-b).

Abdomen: Abdominal segments 1-5 subequal in length, 6–9 with length decreasing gradually posteriorly (Fig. 1a), anus terminal.

Chaetotaxy. Head: Pes_1 short, pes_2, des_1 a little longer, fs_1 long, like hair, fs_2 very short (Fig. 2a), cls_{1-6} very short, lbs_{1-4} short (Fig. 2b), mds_1 very short, mds_2 longer than mds_1 (Fig. 2c); $Mxml_{1-4}$ long, one short (Fig. 2d), antenna with apical segment elongate conical (Fig. 2e). Thorax: Each segments (pro-meso and metathorax) have two setae which are located in lateral side (Fig. 2f). There are some setae in front of sclerites and only two setae behind. Abdomen: The segments have one setas in the lateral side (Fig. 2g).

Pupae: Body shape (Figs. 1b-c; 3d), moderately elongate, white or light yellow, cuticle smooth. Rostrum very long (5 times longer than wide); antennae relatively long and slender; the length of the pronotum is almost equal to the wide and markedly longer than the mesonotum and metanotum, mesonotum almost as long as metanotum, abdominal segments 1-7 are gradually narrowing, 8-9 are

considerably smaller than others (Fig. 1c); head capsule has short setae (Fig. 1c), cocoon elongate, cylindrical, surface smooth and have white tubecul which of aeropile (Figs. 3e-f), cuticule slightly (Fig. 2f), at end of stage, adult out of cocoon (Fig. 2g); some adults are given in figure (3h) (lateral, dorsal and ventral view).

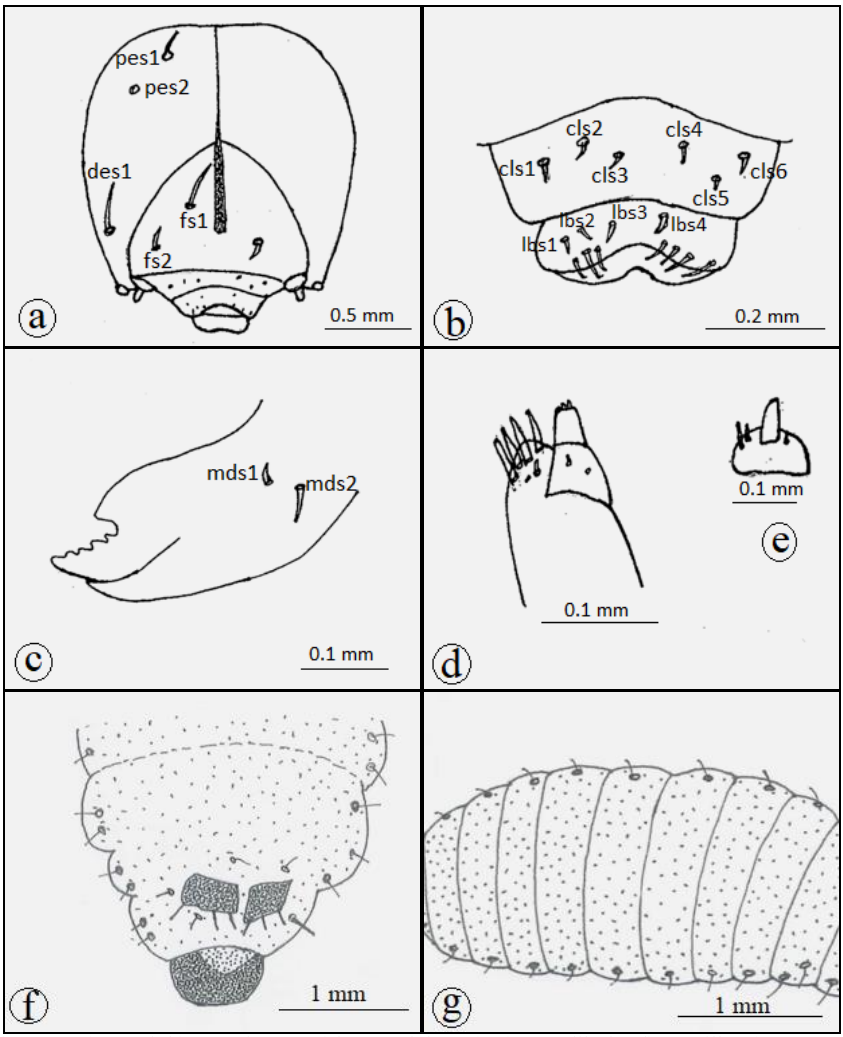

Figure 2. a) Head, b) Mouth parts (clypeus, labrum), c) Mandibule, d) Maxilla, e) Antenna, f) Thorax, g) Abdominal segments.

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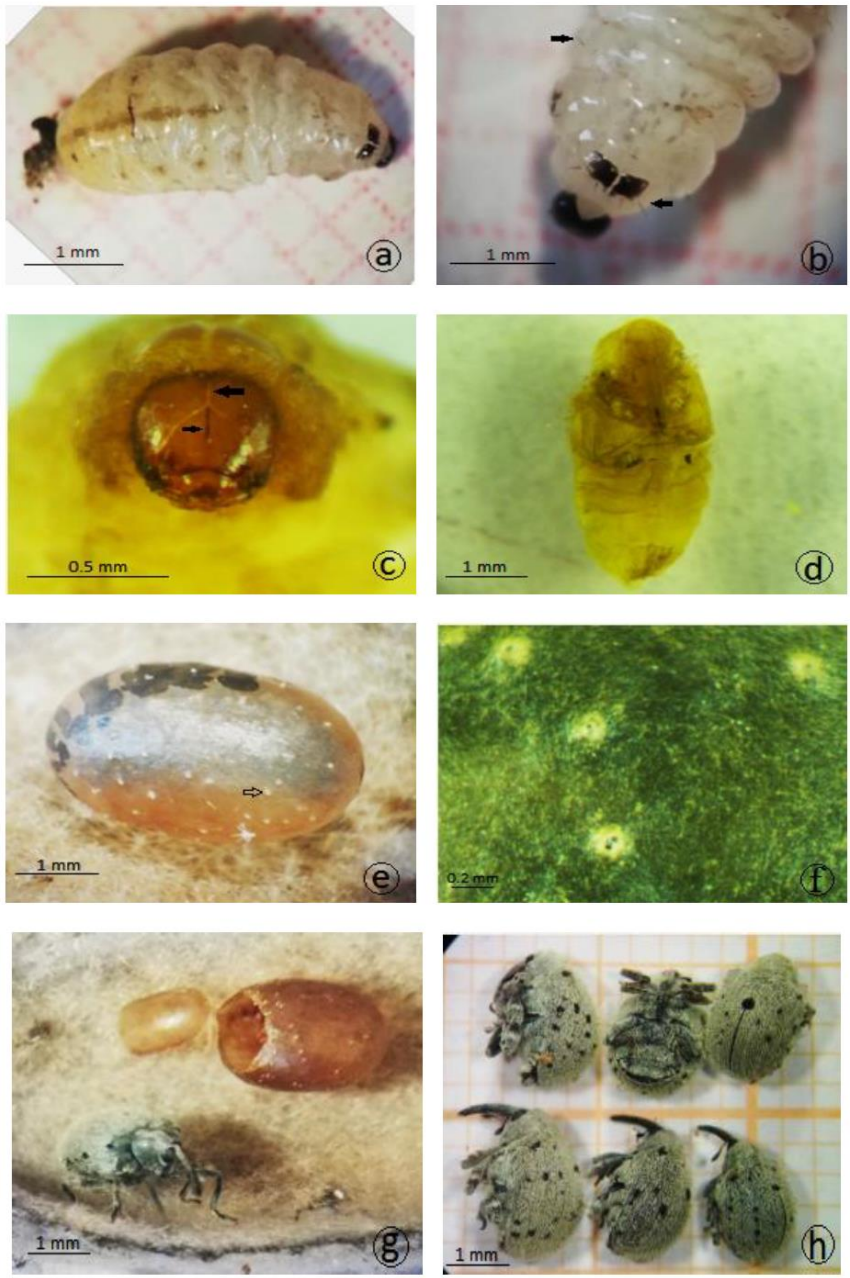

Figure 3. Light micrograph of *Cionus olens* (a-h); a) Larvae, b) Anterior of larvae, c) Head, d) Pupae, e) Cocoon, f) Aeropile on surface of cocoon, g) Adult out of cocoon, h) Adult stage (Lateral, ventral and dorsal view).

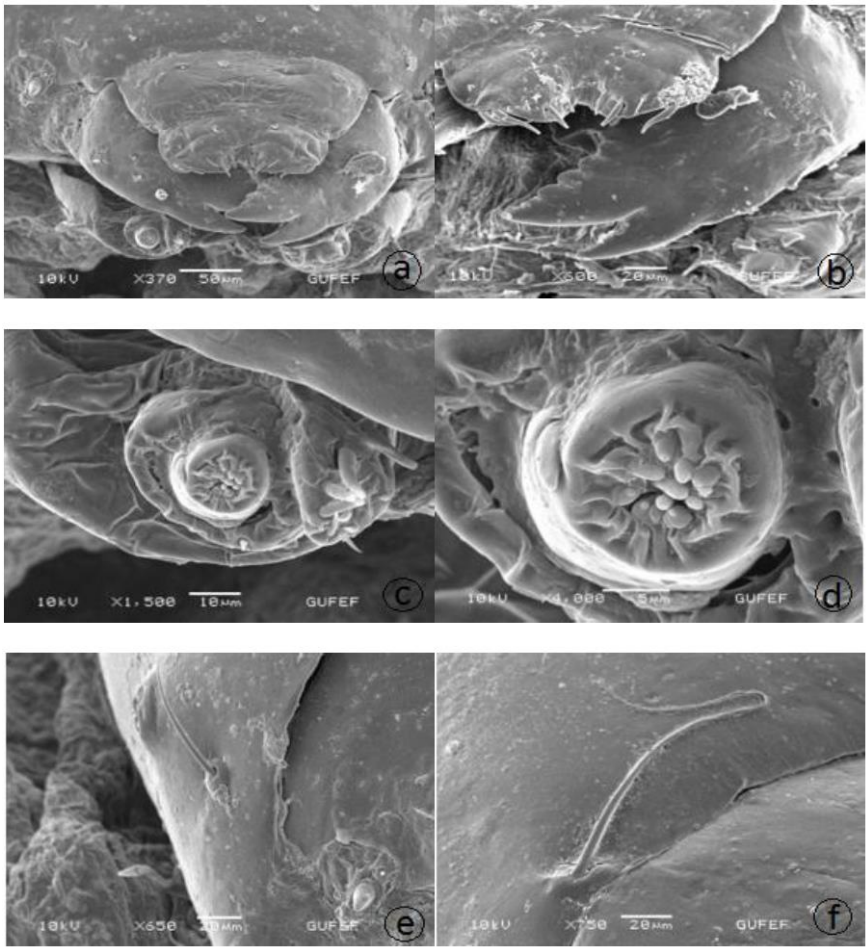

Figure 4. SEM micrograph of larval stage; a) Mounth parts, b) Mandibles, c-d) Maxilla, e-f) Antennae, and setae (like hair).

The members of *Cionus* Clairville, 1798 genus are generally ectophage. Larvae live in the open or hidden among several sheets. They attack *Verbascum*, *Scrofularia*, *Budleija*, etc. and eat the leaves (Hoffmann, 1954). Many researchers have studied the biology of the species *Cionus olens* and give information about larval characters (Grandi, 1938; Ruffo, 1937; Hoffmann, 1958; Scherf, 1964; Sreczyński, 1976; Kostal & Caldara, 2019). The first author collected *Cionus olens* in southern Moravia, Slovakia and Hungary on *Verbascum densiflorum*. Sreczyński (1976) reported *V. thapsus*, *V. phlomoides*, *V. pulverulentum* Vill. and *V. blattaria* L. as host plants. Hoffmann (1958) also reported *V. nigrum* as a host plant. *C. olens* is apparently an oligophagous species, which is often found in first-year rosettes of leaves (Kostal & Caldara, 2019). The insect has two annual generations, with flicker of the adults in June and October; it lays the eggs generally into the edge of the leaves and covers them with hair. The larvae live

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under the hair of the leaf edge. It usually attacks the smallest and most villous leaves, where it determines a suboval pseudomine of brownish-ashen color. On larger leaves erosion appears elongated and twisting. They remain under the layer of vegetable hair that protects them; the larvae of *C. olens* have the surface of the integument perfectly dry, while they come out of their galleries (Grandi, 1938).

In this study, biology of *Cionus olens* was investigated. Larvae, pupae, cocoon and adult forms of the species were examined (Figs. 1a-c, 3a-h). The definitions of larvae and pupae forms were made and their characters were shown in detail. Electron micrographs of larval characters are given for the first time (Figs. 4a-f). The data we obtained almost coincide with Grandi (1938). Grandi stated larval characters in 1938 only by drawing the head and mouth structures. In this study, we revealed the details by examining the head and mouth structures with an electron microscope. It was also shown in characters in thorax and abdomen outside the head and mouth structures. Lee & Morimoto (1988) examined the type of *Cionus helleri* and gave drawings of the larval characters. Here it is determined that some of the larval characters of the same genus are the same.

Cionus olens is common in Europe and is expressed as European plant parasite. Larva was found that the larvae belonging to *C. olens* species were commonly found on *Verbascum* and caused serious damage by eating their leaves (Figs. 5a-b). The identification of larvae and pupae characters is important in recognizing species. We believe that it is necessary to determine the larvae and pupae characteristics of *C. olens* and all other species of the genus. All the details of the relations of the species with the plants need to be revealed. We believe that this study will contribute to the spread of *Cionus olens* species known as European plant parasites in our country and to reveal the damages.

Figure 5. a-b) Larvae feeding and damage on leaves of *Verbascum* spp.

LITERATURE CITED

Alonso-Zarazaga, M., Barrios, H., Borovec, R., Bouchard P., Caldara, R., Colonnelli, E., Gültekin, L., Hlavá, P., Korotyaev, B., Lyal, C. H. C., Machado, A., Meregalli, M., Pierotti, H., Ren, L., Sánchez-Ruiz, M., Sforzi, A., Silfverberg, H., Skuhrovec, J., Trýzna, M., Velázquez De Castro, A. J. & Yunakov, N. N. 2017. Comperative Catalogue of Palaearctic Coleoptera Curculionidea. Society Entomologies Aragones S.E.A, Spain, 1-729.

Caldara, R. 2001. Phylogenetic analysis and higher classification of the tribe Mecinini (Coleoptera: Curculionidae, Curculioninae). Koleopterologische Rundschau, 71: 171 203.

Domínguez, J. V. 2006. Morphology of small borer seed *Conotrachelus perseae* Barber. Campus Montecillo, Postgrado en Fitosanidad, Entomología y Acarología, Colegio de Posgraduados, Montecillo, Texcoco, Estado de México.

Erbey, M. 2010. Taxonomic and morphological studies on Curculionidae (Coleoptera) family of Bolkar Mountains. Gazi University, Institute of Science and Technology, Ph.D. Thesis (Biology), Turkey, 486 pp.

Erbey, M. & Candan, S. 2015. Comparative morphology of scales in *Cionus* Clairville, 1798 (Coleoptera: Curculionidae) species. Journal of Entomology and Zoological Studies, 3: 27-32.

Hernández-Fuentes, L. M., Castañeda-Vildozola, A. & Urias-López, M. A. 2017. Weevil borers in tropical fruit crops: Importance biology and management. In: Shields VDC (editor). Insect Physiology and Ecology, Chapter 3: 37-54. DOI: 10.5772/66635

Grandi, G. 1938. Morfologia ed etologia comparate di Insetti a regime specializzato. Bolletin Entomology of Bologna, 11: 1-16.

Hoffmann, A. 1954. Fauna de France, Coleopteres, Curculionides 59 (Deuxième Partie), Paris, 730 pp.

Hoffmann, A. 1958. Fauna de France, Coleopteres, Curculionides 62 (Troisieme Partie), Paris, 640 pp.

Kostal, M. & Caldara, R. 2019. Revision of Palaearctic species of the genus *Cionus* Clairville (Coleoptera: Curculionidae: Cionini). Zootaxa, 1 (4631): 1-144.

Lee, Ch.-Y. & Morimoto, K. 1988. Larvae of the Weevil Family Curculionidae of Japan Part 2. Hyperinae to Cioninae (Insecta: Coleoptera). Journal of the Faculty Agriculture, Kyushu University, 33 (1-2): 131-152.

Lodos, N., Önder, F., Pehlivan, E., Atalay, R., Erkin, E., Karsavuran, Y., Tezcan, S. & Aksoy, S. 2003. Faunistic studies on Curculionidae (Coleoptera) of western Black Sea, Central Anatolia and Mediterranean regions of Turkey, Meta Basım Matbaacılık Hizmetleri, İzmir, 1-83. ISBN 975-288-720-1.

Muñiz, V. R. 1970. Estudio morfológico de dos especies de Conotrachelus que son plaga del aguacatero (Persea gratissima Gaertn) en México. Revista de la Sociedad Mexicana de Historia Natural, 31: 289-337.

Özhatay, N., Byfield. A. & Atay, S. 2005. Türkiye'nin 122 Önemli Bitki Alanı, WWF Türkiye Doğal Hayatı Koruma Vakfı Yayını, İstanbul, 476 pp.

Ruffo, S. 1937. Osservazioni sull'etologia di un Curculionide a larva "pseudominatrice" (Cionus olens F.). Bollettino dell'Istituto reale di Entomologia dell'Università di Bologna, 10: 167-177.

Sert, O. 1995. Taxonomic studies on Curculionidae (Coleoptera) family in Central Anatolia Region. PhD Thesis. Hacettepe University, Institute of Science and Technology, Ankara, 184 pp.

Scherf, H. 1964. Die Entwicklungsstadien der mitteleuropäischen Curculioniden (Morphologie, Bionomie, Ökologie). Abhadlungen der Senckenbergischen Naturforschenden Gesellschaft, 506: 1-335.

Sreczyński, S. 1976. Ryjkowce - Curculionidae: Podrodzina Curculioninae. Klucze do oznaczania owadów Polski, 87: 1-115.