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Research Article

New taxonomic position for a recently collected eurytomid species (Hymenoptera: Chalcidoidea) from Iran

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Abstract: The seed-eater wasp, *Bruchophagus verbasci* (Erdös, 1969) **comb. nov.** (Hymenoptera: Chalcidoidea, Eurytomidae) is newly quoted from Iran. This species was originally described in the genus *Eurytoma* Illiger, 1807. Considering its morphological characters and the new finding of its biological association with some fabaceous plants, it was transferred to the genus, *Bruchophagus* Ashmead, 1888. It was redescribed and illustrated. Two fabaceous plant species, *Astragalus brachydonatus* Boiss. and *Trigonella montana* C. A. Mey. are revealed as host plants of *B. verbasci* for the first time. It is a new record for France, Morocco, and Turkey.

Keywords: *Bruchophagus*, Fabaceae, *Eurytoma*, phytophagous, Eurytomidae

Introduction

Bruchophagus Ashmead is a large genus, with 702 and 92 species worldwide and in the Palaearctic region, respectively (Noyes, 2020). So far, Twenty-five *Bruchophagus* species are known to occur in various regions of Iran (Saghaei *et al.*, 2018; Alizadeh *et al*., 2020). Biologically, most members of the genus *Bruchophagus* are phytophagous on Fabaceae and Liliaceae, while some of the *metallica* and *squamea* groups are parasitoids on gall-midges and various insects (Cephidae, Curculionidae) infesting twigs, respectively (Zerova and Serogina, 1994; Lotfalizadeh *et al*., 2007).

Phytophagous species of *Bruchophagus* have been studied in some parts of Iran and comprise some new species and records. Many *Bruchophagus* species have recently been recorded from various regions of Iran (Lotfalizadeh and Zarnegar, 2014; Zarnegar and Lotfalizadeh, 2014; Kalantary *et al.*, 2017, 2019; Naghizadeh *et al*., 2017; Parsa *et al.*, 2018, 2020; Zerova *et al.*, 2019; Alizadeh *et al*., 2020).

Our recent samplings from Iran indicated the occurrence of some new species records of the genus *Bruchophagus*. Among them, there was a species with incorrect generic placement in *Eurytoma*. Based on its morphological and biological evidence the taxonomic combination of this species was changed and re-described.

Materials and Methods

Studied specimens in this research were collected from East-Azarbaijan, Qazvin, and

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Qom provinces. Collected and reared specimens were treated and mounted on rectangular cards according to Noyes (1982). An Olympus™ SZH stereomicroscope and Leica CLS 150X fiber optic light source were used for card-mounted specimen observations. The specimens were identified according to the keys of Szelényi (1976), Zerova (1978, 1995, 2010), and Zerova and Serogina (1994).

The determination was made through comparison with the reference specimen from Turkey which had already been compared with a female paratype housed in HNHM (Hungarian Natural History Museum) by GD. Further specimens from France, Morocco, and Turkey were also examined.

Multifocal photographs of the redescribed species were taken using Keyence VHX-5000 equipment. Assemblage and edition of illustrations in the plates were done in Adobe Photoshop CS4© software.

Redescription is based on the specimens collected in Iran. Terminology follows Lotfalizadeh *et al*. (2007). The studied specimens are deposited in the HMIM (Hayk Mirzayans Insect Museum, Tehran, Iran).

The following abbreviations are used:

Fu1-Fu6: Funiculars 1−6

POL: Distance between posterior ocelli

OOL: Distance between posterior ocellus and the eye

Gt1- Gt6: Gastral terga 1-6

Results

Bruchophagus verbasci (Erdös, 1969) **comb. nov.** (originally described in *Eurytoma* Illiger, 1807) was found from the studied areas in association with *Astragalus brachydonatus* Boiss. and *Trigonella montana* C. A. Mey (Fabaceae). Here it was transferred to the genus *Brouchophagus* Ashmead, 1888.

The new combination is based on its morphological features. This species has all of the morphological characteristics of the genus *Bruchophagus*, especially lack the postgenal carina and depression characteristic of *Eurytoma* (Lotfalizadeh *et al*., 2007), absence of post genal lamina, propodeum with a brush of hairs on each side of the petiolar cavity, marginal vein short (Fig. 1F), metacoxa dorsally hairy at the base (Fig. 2A), Gt1 with sublateral lines of hairs (Fig. 2C).

Brouchophagus verbasci **comb. nov.** has been reported from Bulgaria, Hungary, and former USSR (Noyes, 2020) on *Verbascum austriacum* Schott and *V. lychnitis* L. (Scrophulariaceae) (Zerova and Seregina, 1994; Zerova, 1995).

***Bruchophagus verbasci* (Erdös, 1969) comb. nov.** (Figs 1-2)

Diagnosis. The following set of morphological characters differentiate *B. verbasci* from other *Bruchophagus* species: Body mainly dark; setation of fore wing dusky; funicular as long as wide; notauli impressed, not obliterated by the sculpture of the mesoscutum; marginal vein about 4 times as long as broad, marginal vein and postmarginal veins equal to and 1.5 times as long as stigmal vein, respectively (Fig. 1E); metacoxa setose dorsally at base; first gastral tergum with a dense lateral line of hairs (more than 10 on each side) (Fig. 2C), Gt4 much longer than Gt3, valvulae upturned.

Re-description. ***Female*** (Fig. 1A). Body length 2.5–3.13 mm, type materials 1.9-2.1 mm.

The body generally black; antenna (Fig. 1C) entirely yellowish-brown except for pedicel brownish-black, scape black (in type materials and European specimens examined by GD) and brownish-yellow (in Iranian specimens examined by HL, Fig. 1C), clava yellowish-brown; all femurs basal and distally, all tibiae and tarsi honey yellow; tegulae darkish-brown; gaster ventrally brownish-yellow; fore wing hyaline (Fig. 1E), veins yellow; body pubescence silvery white.

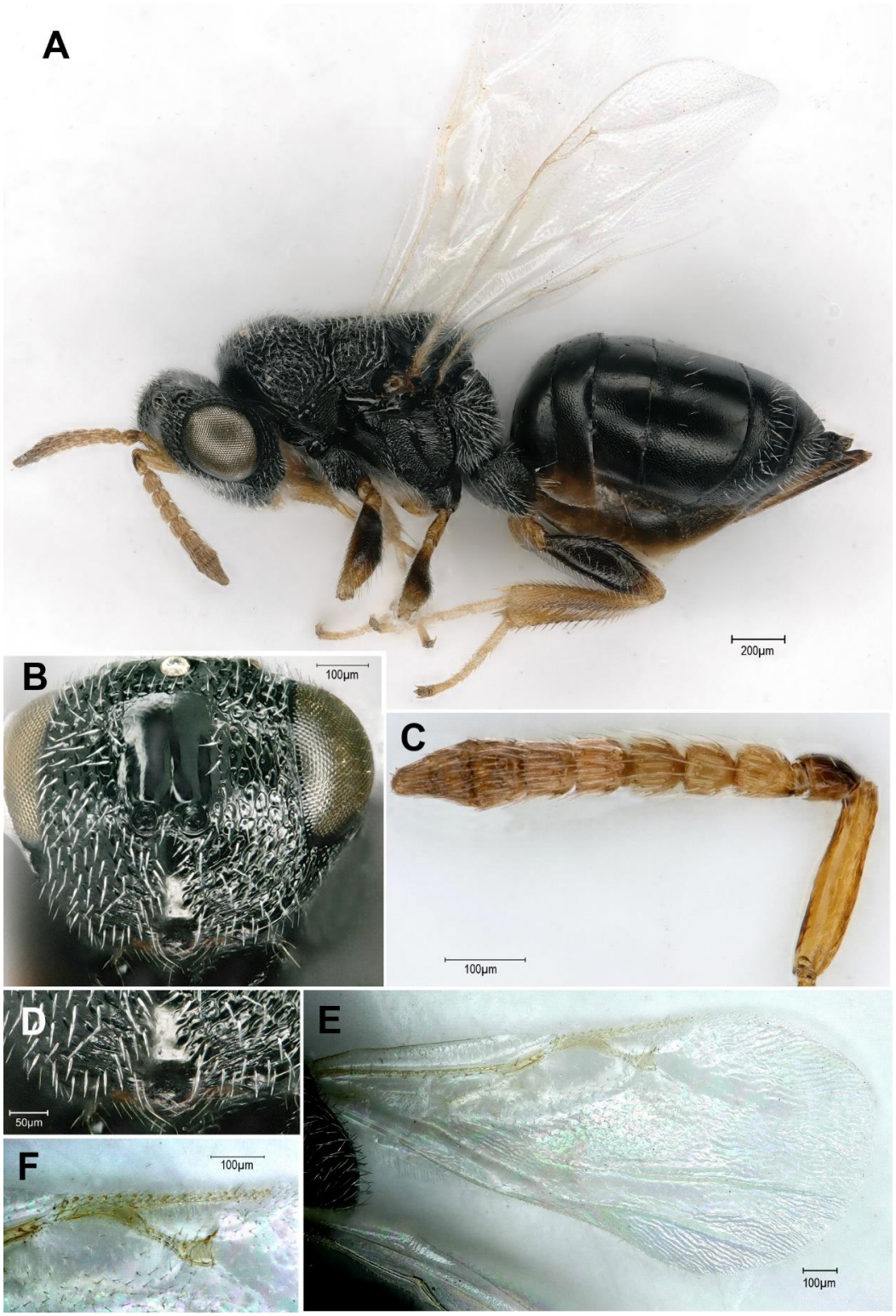

Figure 1 *Bruchophagus verbasci*, female: A. Habitus in lateral view, B. Head in frontal view, C. Antenna, D. Clypeus, E. Fore wing, F. Fore wing venation.

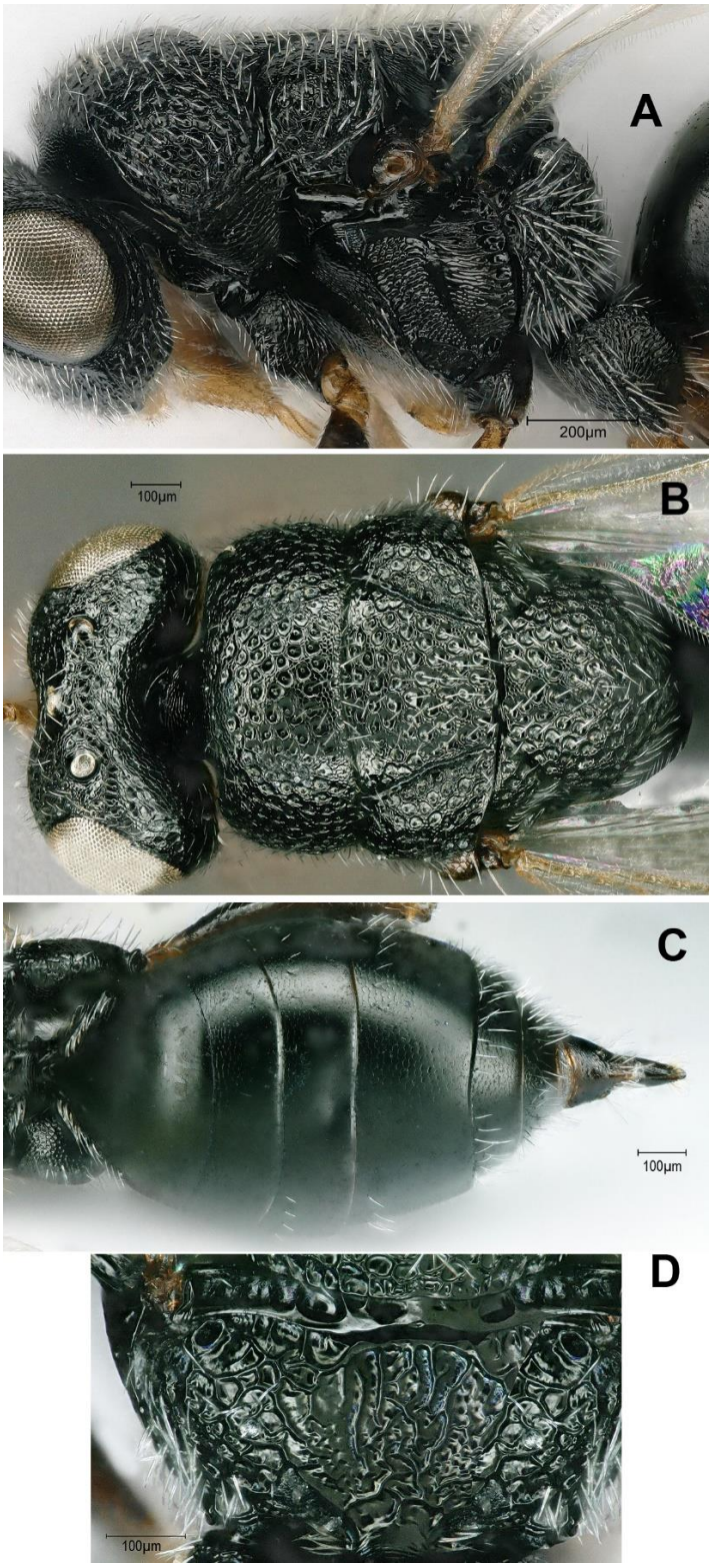

Figure 2 *Bruchophagus verbasci*, female: A. Mesosoma in lateral view, B. Mesosoma in dorsal view, C. Metasoma in dorsal view, D. Propodeum.

Head (Fig. 1B) sparsely umbilicate sculpture dorsally, densely umbilicate in frontal view, and densely pubescent. Head dorsally 2.25 times broader than long (135: 60) (Fig. 2B), somewhat broader than pronotum (135:118), in frontal view 1.28 times wider than high (135:105); POL 2.87 times longer than OOL (43:15). Eye sparsely setose, malar space 0.35 times as long as eye high (20: 57); clypeus ventrally straight, very shallowly emarginate (Fig. 1D), dorsomedially smooth, dorsolaterally radiating striate.

Antenna (Fig. 1C) inserted at middle of the face, slightly above lower ocular line (Fig. 1B), nearer to the clypeal margin than median ocellus; scrobal depression not reaching median ocellus; scape long, 4.3 times as long as broad (112: 26); anellus strongly transverse, pedicel slightly longer than its distal width (34: 28); Fu1 as long as pedicel, slightly longer than wide (34: 30), Fu2-Fu5 as long as wide, club 1.8 times longer than wide (38: 21), slightly wider than flagellar (38: 36), flagellar pubescence short.

Mesosoma (Fig. 2A) relatively flattened in profile, 1.36 times as long as wide in dorsal view (170: 125) (Fig. 2B), 1.4 times as long as high in lateral view (85: 60), pronotal (Fig. 2B) 2.2 times as broad as long (118: 53), as long as mesoscutum on the median line, the mid lobe of mesoscutum slightly shorter than mesoscutellum (55: 60), pronotum and mesonotum with distinct umbilicate sculpture and narrow coriaceous interspaces; notauli clearly impressed, not obliterated by the sculpture of the mesoscutum; axillar grooves quite deep medially and widely separated on transscutal line; mesopleuron finely reticulate; propodeum strongly sloping relative to the main axis of mesosoma but not vertical (Fig. 2D), without a median furrow, with irregular longitudinal rugae, umbilicate punctured laterally. All coxae reticulate laterally, densely setose, metacoxae is dorsally setose in basal part. Fore wing (Fig. 1E) more than 2 times longer than wide (175: 130), basally bare, with a row of setae in the distal margin of basal cell, the rest part of fore wing with very short dusky sparse pubescence; veins yellow (Fig. 1F); costal cell 8.3 times longer than wide (125: 15); postmarginal vein 2 times longer than marginal vein; marginal, postmarginal and stigmal veins length ratio 8: 16: 11, respectively.

Metasoma (Fig. 2C) 1.38 times longer than mesosoma (145:105), Gt1 smooth, polished, with a dense lateral line of hairs, Gt2–6 with thin punctuation, Gt4 1.75 times longer than Gt3, Gt4–7 with white pubescence laterally; external part of ovipositor as long as Gt7; ovipositor slightly turned up.

Male

Differs from female in the structure of the antenna and shape of the gaster. Gastral petiole long, as long as metacoxae; antennae with four petiolate segments.

Distribution. Eastern Europe (Bulgaria, Hungary and former USSR) (Erdös, 1969; Szelényi, 1976; Zerova, 1995), Iran (East-Azarbaijan, Isfahan, Qazvin and Qom provinces) (**new record**) and France, Morocco, Turkey (**new record**) (see Fig. 3, Table 1).

Biological association. This species has been reported on the genus *Verbascum* (Scrophulariaceae) (Zerova, 1978) but we found it for the first time on the family Fabaceae. Therefore, its association with *Astragalus brachydonatus* and *Trigonella montana* is new.

Discussion

Szelényi's (1976) key to the *Bruchophagus* species in the Palaearctic region lead us to the couplet 25, "scape red" that includes two species *B. ambiguus* Szelenyi, 1976 and *B. gallicola* Szelényi, 1968 [known as *Eurytoma gallicola* (Szelényi)]. However, the examination of a large series of specimens indicated that this is an interspecific variation, which was dark-brown in European specimens (examined by GD) and mainly yellowish-brown to red in Iranian specimens (examined by HL).

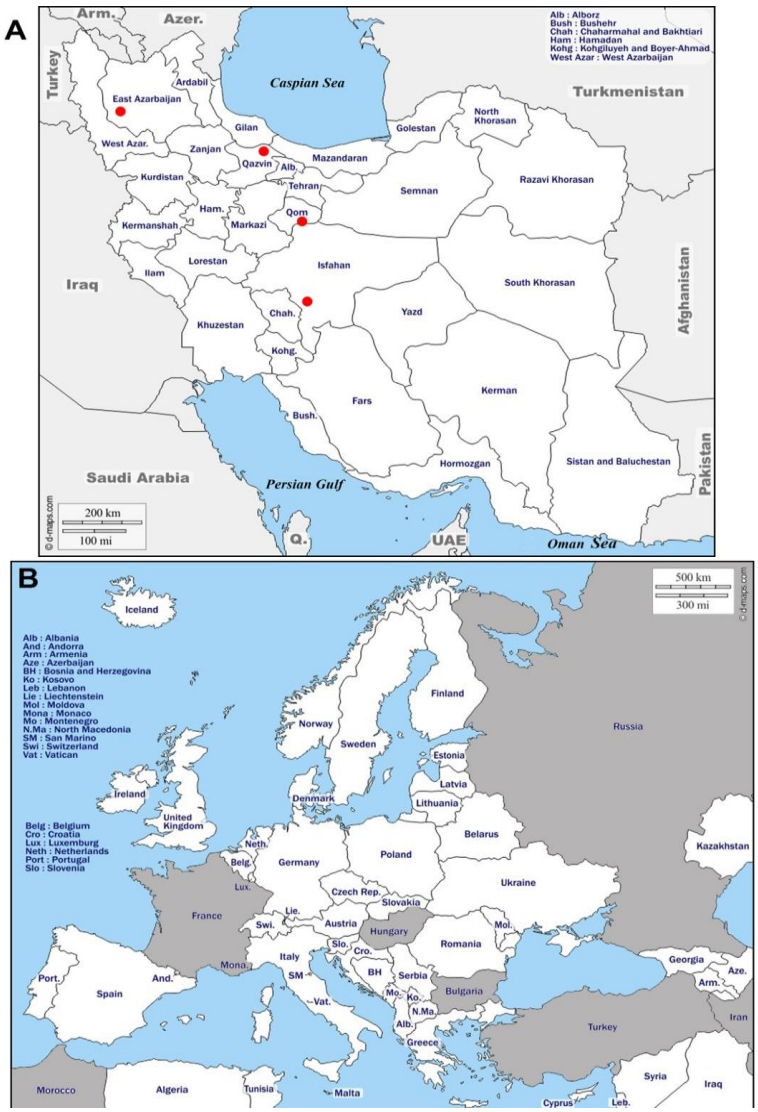

Figure 3 A. Map of Iran with geographical distribution of studied collections of *Bruchophagus verbasci*, B. Geographical distribution of *B. verbasci* in the Palaearctic region.

We reared *B. verbasci* for the first time on the seeds of two fabaceous species, *Astragalus brachydonatus*, and *Trigonella montana*. This species is widely distributed in the Palaearctic region from Morocco in the west to Russia and Iran in the eastern Palaearctic (Fig. 3B). Further samplings could help to discover its distribution pattern in the Palaearctic.

Conflict of interest

The authors declare that there is no conflict of interest regarding the publication of this paper.

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Table 1 Examined materials of *Bruchophagus verbasci* (Erdös) comb. nov. in the present research.

Country	Location	GPS (a.s.l.)	Host plant	Date	Collector	No.
IRAN	East-Azarbaijan province, Arshad-Chaman	37°45'04"N, 46°18'51" E, 2847m	-	30.viii.2016	H. Lotfalizadeh	6♀♀
	Qazvin province, Alamut	36°34'02"N, 50°20'23" E, 2250m	*Astragalus brachydonatus*	21.viii.2013	B. Gharali	5♀♀
	Qom province, Qom-Kashan road	51°12' 38"E, 34 25'15"N, 935m	*Trigonella montana*	-	Z. Alizadeh	3♀♀
	Isfahan province	51°00'15.75"E, 32°20' 28.91"N	-	-	Z. Alizadeh	1♀
FRANCE	Hérault, Grabels	-	-	11.viii.1990	H. Tussac	1♀
	Lot, Brengues	-	-	21.vii.1984		1♀
	Lot-et-Garonne, Buzet-sur-Baïse	44°14'73"N 00°18'68"W	-	13.viii.1994	J.-P. Sarthou	1♀
MOROCCO	High Atlas, Southern slope of Tizi 'n Test	1600-2000 m	-	30.v.1992	G. Delvare	1♀
TURKEY	Cukurova, Adana	-	-	22.vii.1996	G. Delvare	1♀
	near Adana, eastern edge of Seyhan Lake	-	-	23.vii.1996	G. Delvare	1♀
	Urfa, Koruklu Research Centre	-	-	20.vii.1996	G. Delvare	1♀
	Bahce	-	-	19.vii.1996	G. Delvare	1♀

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جایگاه تاکسونومیکی جدید برای یک گونه زنبور از خانواده Eurytomidae (Hymenoptera: Chalcidoidea)، اخیراً جمع‌آوری شده از ایران

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چکیده: زنبور بذرخوار *Bruchophagus verbasci* (Erdös, 1969) **comb. nov.** (Hym.: Chalcidoidea, Eurytomidae) اخیراً در جنس *Eurytoma* از ایران گزارش شده است. با توجه به مشخصات مورفولوژیک و یافته‌های بیولوژیک تحقیق حاضر که مؤید ارتباط زیستی این‌گونه با گیاهان تیره Fabaceae است، سبب شد این‌گونه به جنس *Bruchophagus* منتقل شود و توصیف مجدد این‌گونه انجام بگیرد. دو گونه گیاهی *Astragalus brachydonatus* Boiss. و *Trigonella montana* C. A. Mey. برای نخستین بار به‌عنوان گیاهان میزبان این زنبور گزارش می‌شوند. این‌گونه برای نخستین بار از کشورهای فرانسه، مراکش و ترکیه گزارش می‌شود.

واژگان کلیدی: *Bruchophagus*، Fabaceae، *Eurytoma*، خانواده Eurytomidae