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FIRST RECORD OF *CEROCEPHALA ECCOPTOGASTRI* MASI (HYMENOPTERA: PTEROMALIDAE) ON THE ALMOND BARK BEETLE (*SCOLYTUS AMYGDALI* GUERIN) (COLEOPTERA: SCOLYTIDAE) IN TUNISIA

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Abstract. During 2009 and 2010 the biology and the life cycle of *Scolytus amygdali* Guerin (Coleoptera: Scolyidae) have been studied in two orchards in the Sahel of Tunisia (Jammel and Esswassi). Adults of *S. amygdali* and their natural enemies have been collected. Branches of 20 to 30 cm of infested almond, plum, apricot, and peach trees were taken to the laboratory for further use. Infested branches were reared in plastic boxes (21×21×9 cm) at 25°C and (16L:8D) as photoperiod, with 5 branches in each box. The parasitoid *Cerocephala eccoptogastri* Masi was collected in the Jammel region in November 2009 and Esswassi region in May 2010, and represents the first record of this species in Tunisia. The species proved to be an ectoparasitoid of the mature larvae and pupae of *S. amygdali*, with a sex ratio of 0.78. It was the most important parasitoid reared from *S. amygdali* in Jammel region in 2009, with a parasitism percentage of 53.26%.

Keywords: *Cerocephala eccoptogastri*, Almond bark beetle, *Scolytus amygdali*, parasitoid, Sahel, Tunisia.

Résumé. Premier signalement de *Cerocephala eccoptogastri* Masi, parasitoïde des scolytes de l'amandier (*Scolytus amygdali* Guerin) (Coleoptera: Scolytidae) en Tunisie. En 2009 et 2010, la biologie et le cycle vital *Scolytus amygdali* Guerin (Coleoptera: Scolyidae) ont été étudiés dans deux vergers dans le Sahel de Tunisie (Jammel et Esswassi). Les adultes de *S. amygdali* et leurs ennemis naturels ont été collectés. Des branches de 20 à 30 cm d'amandier, de prunier, d'abricotier, et de pêcher infestées ont été prises au laboratoire pour suivre la biologie de *S. amygdali* et leur ennemis naturels. Les branches infestées ont été élevées dans des boîtes en plastique (21×21×9 cm) à 25° C et (16L:8D) comme photopériode à raison de 5 branches par boîte d'élevage. Le parasitoïde *Cerocephala eccoptogastri* Masi a été collecté dans la région de Jammel le mois de Novembre 2009 et dans la région d'Esswassi le mois de Mai 2010 et c'est un premier de l'espèce signalement en Tunisie. L'espèce est un ectoparasitoïde de larves matures et de pupes de *S. amygdali*, avec une sex-ratio de 0,78. Il s'agit d'un important parasitoïde de *S. amygdali* dans la région de Jammel en 2009, avec un pourcentage de parasitisme de 53,26%.

Mots clés: *Cerocephala eccoptogastri*, scolyte de l'amandier, *Scolytus amygdali*, parasitoïde, Sahel, Tunisie.

Rezumat. Prima menționare a speciei *Cerocephala eccoptogastri* Masi (Hymenoptera: Pteromalidae) ca parasitoid al gândacului de scoarță al migdalului *Scolytus amygdali* Guerin (Coleoptera: Scolytidae) în Tunisia. Biologia și ciclul de dezvoltare al speciei *Scolytus amygdali* Guerin (Coleoptera: Scolyidae) au fost studiate în anii 2009-2010 în două livezi din Sahel, Tunisia (Jammel și Esswassi). Au fost colectați atât adulți de *S. amygdali*, cât și paraziții lor. Crengi infestate de migdal, prun, cais și piersic cu lungime de 20-30 cm au fost duse în laborator. Crengile au fost puse în cutii de plastic (21×21×9 cm) la 25°C și o fotoperioadă de (16Z:8N), cu 5 crengi în fiecare cutie. Parazitoidul *Cerocephala eccoptogastri* Masi a fost colectat în regiunea Jammel în noiembrie 2009 și regiunea Esswassi în mai 2010, reprezentând prima menționare a acestei specii în Tunisia. Specia s-a dovedit a fi un ectoparazitoid al larvelor mature și al pupelor de *S. amygdali*, cu un sex ratio de 0,78. A fost cel mai important parazitoid al speciei *S. amygdali* în regiunea Jammel în 2009, cu un procentaj de parazitare de 53,26%.

Cuvinte cheie: *Cerocephala eccoptogastri*, cariul migdalului, *Scolytus amygdali*, parazitoid, Sahel, Tunisia.

Introduction

The almond bark beetle *Scolytus amygdali* Guerin is a pest of fruit trees in Tunisia. This beetle was well studied in Morocco by Benazoun (1983) who showed that the biological cycle of this pest has three annual generations per year in this country. In Morocco parasitoid hymenopterans were reared from various hosts such as *Scolytus amygdali* (Benazoun, 1983; Benazoun & Schvester, 1990), *Phloeotribus scarabaeoides* (Bernard) (Benazoun, 1999), *Scolytus rugulosus* (Muller), and *Hylesinus toranio* (Danthoine) (= *oleiperda* Fabricius) (Jardak *et al.*, 2002; Benazoun & Schevester, 1990; Arambourg, 1964; Lozano & Campos, 1993).

Cerocephala eccoptogastri Masi, 1921 (Pteromalidae: Cerocephalinae) seems to be particularly abundant in the southern Europe and the Mediterranean region (Russo, 1938; Mendel, 1986; Noyes, 2003; Andriescu & Mitroiu, 2007), being the most encountered species on *S. amygdali* in Morocco (Benazoun, 1983; Benazoun & Schvester, 1990). Another species of the genus, *C. cornigera* Westwood, 1832, was also reared in Morocco by Benazoun & Schevester (1990), while in Tunisia it was recorded by Arambourg (1964).

Material and Methods

The study of natural enemies of bark beetles was conducted in two orchards of fruit trees in the Sahel of Tunisia (Jammel and Esswassi) in 2009 and 2010. Branches of almond, plum, apricot, and peach trees were cut and taken to laboratory where they were placed in rearing plastic boxes (21×21×9 cm) at 25°C and (16L:8D) as photoperiod, with 5 branches in each box. Emerged adults of *Cerocephala eccoptogastri* were collected and put in 70° alcohol for identification. Part of them were mounted and examined using a Krüss MSZ5400 stereomicroscope.

The pictures were taken using a Canon Power Shot S50 camera attached to a stereomicroscope LEICA (DMLB2), a MZ 12.5 Binocular and a SEM (Quanta 200 FEI).

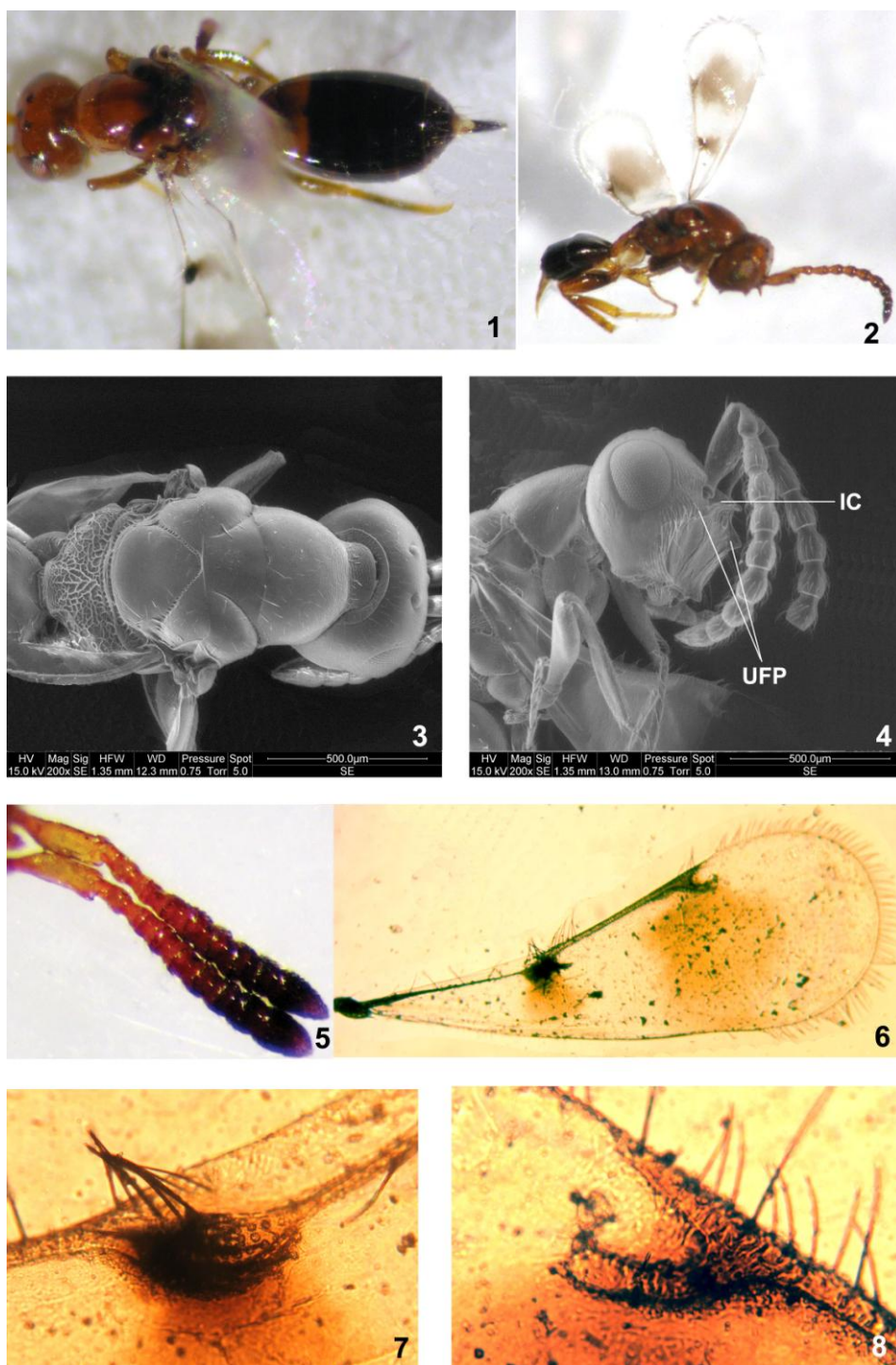
Results and Discussion

Two species of *Cerocephala* Westwood have been previously reared from *S. amygdali*: *C. cornigera* Westwood and *C. eccoptogastri* Masi (Noyes, 2003).

According to Mendel (1986), the general biology of *C. eccoptogastri* is similar to that of other species of the genus, the species being a parasitoid of scolytid larvae and pupae. The parasitoids usually locate their host by walking on the bark, paralyzing the larvae or pupae by injecting venom, and laying eggs in the paralyzed host. Benazoun (1983) stated that the overwintering took place in the larval stage and that the adults appeared from March to September.

In November 2009 many adults of *C. eccoptogastri* were obtained from branches of peach trees infested with *S. amygdali* and collected in the Jammel orchard. In May 2010 several other adults were obtained from almond tree branches collected in the Esswassi orchard. *Cerocephala eccoptogastri* proved to be a solitary ectoparasitoid attacking old larvae and pupae of *S. amygdali*. The species was the most important parasitoid reared from *S. amygdali*, with a parasitism percentage of 53.26% in 2009 (Jammel orchard). In total, 204 adults of *C. eccoptogastri* were obtained, with a sex ratio of 0.78.

Graham (1969) briefly described several specimens of *Cerocephala* collected in Turkey, Palestine and Egypt and deposited in the BMNH collection that he considered to be neither *C. cornigera* Westwood, nor *C. rufa* Masi; according to this author they probably belonged to *C. eccoptogastri*. The latter species can be separated from *C. cornigera* and *C. rufa* by the characters listed below.

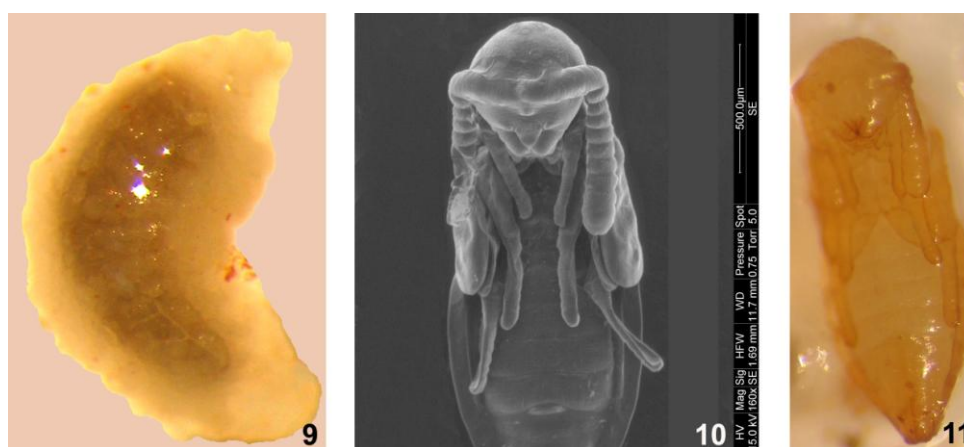


Figures 1-8. *Cerocephala eccoptogastri* Masi: 1. Female, dorsal view; 2. Male, lateral view; 3. Female, detail of head and mesosoma, dorsal view; 4. Male, detail of head, lateral view (IC = interantennal crest; UFP = upper facial processes); 5. Antennae of female; 6. Forewing; 7. Detail of parastigma; 8. Detail of stigma vein.
(not to the same scale)

Female. Head, most part of mesosoma and anterior quarter of gaster brownish orange; dorsal side of mesosoma, along the sutures separating mesonotum, axillae and scutellum, and most part of gaster blackish (Fig. 1); antennae orange, gradually infuscating towards apex (Fig. 5); legs of same color as mesosoma. Interantennal crest slightly acute in profile; upper facial processes forming distinct pointed teeth. Scutellum rounded at base; frenum smooth, like the rest of the scutellum (Fig. 3). Forewing with both brownish clouds distinct (Figs 6-8).

Male. Color as in female, excepting the gaster, which is entirely blackish (Fig. 2). Interantennal crest distinctly spike-like in profile; upper facial processes as in female (Fig. 4). Scutellum, including frenum, and forewings as in female.

Both larva and pupa are probably very similar to those of the other two species of *Cerocephala* mentioned above; they are illustrated in the figures 9-11.



Figures 9-11. *Cerocephala eccoptogastri* Masi: 9. Larva, lateral view; 10-11. Female pupa, ventral view. (not to the same scale)

Conclusions

Part of the results obtained during the investigations carried out in the Sahel region of Tunisia regarding the natural enemies of *Scolytus amygdali* are synthesized below:

- *Cerocephala. eccoptogastri* Masi (Hymenoptera: Pteromalidae) is recorded for the first time in Tunisia.
- This species was the most important parasitoid reared from *Scolytus amygdali* in Jammel in 2009, with a parasitism percentage of 53.26%.
- Males and females (sex ratio = 0.78) of *C. eccoptogastri* were obtained from peach and almond branches infested with almond bark beetles, and proved to be ectoparasitoids of old larvae and pupae.

Acknowledgments

The authors would like to thank Dr. Michael Obach, Dr. Gary Gibson and Dr. Gérard Delvare for their valuable help and the unit of ESEM Borj Cedria for the production of the SEM pictures. This study was partly supported by the Sectorial Operational Program "The Development of Human Resources" through the project "Development of the innovation capacity and increase of the research impact through postdoctoral programs POSDRU/89/1.5/S/49944.

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