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Record of *Aenasius bambawalei* Hayat, 2009 (Hymenoptera: Encyrtidae), a Parasitoid of *Phenacoccus solenopsis* (Sternorrhyncha: Pseudococcidae) from Punjab, Pakistan

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Abstract.- The cotton mealybug *Phenacoccus solenopsis* Tinsley parasitoid, *Aenasius bambawalei* Hayat has been recorded for the first time from mummified mealybugs collected in the field on various weeds and cotton crop from different districts of Punjab province of Pakistan. The redescription of the species is provided with its four host plants and distribution in the Punjab province of Pakistan. The parasitoid is illustrated using micrographs and line drawings. In addition, this paper also presents brief information on its biological characteristics.

Key words: *Aenasius*, Encyrtid parasitoid, Hymenoptera, Pakistan.

INTRODUCTION

Cotton plays a vital role in the economic development of Pakistan as it provides source of raw material for industry and earning for large part of the community of the country. Besides other important pests, a new menace to cotton since year 2005 was identified as *Phenacoccus solenopsis* Tinsley (Hodgson *et al.,* 2008). This devastating polyphagous pest spread rapidly to all other cotton growing areas of the country and has become most damaging pest of cotton and many other economically important plants (Arif *et al*., 2009), causing heavy losses to this cash crop (Anonymous, 2005). This insect pest has also been reported from cotton growing neighbouring countries like India (Hodgson *et al.,* 2008). Use of insecticides is considered effective for the control of insect pests particularly for this growing sucking insect pest, *P. solenopsis* (Saeed *et al.,* 2007). But the insecticide costs can be prohibitively expensive for some cotton growers. Moreover, insecticidal control for mealybugs is often incomplete and can disrupt natural enemies (Meyerdirk *et al*., 1982).

Keeping this in view, presence of indigenous predators and parasitoids were searched intensively and some predators mainly belonging to Coleoptera, Sternorrhyncha and Neuroptera as *Brumus* spp., *Menochilus* spp., *Orius* spp., *Geocoris* spp., *Chrysoperla* spp., respectively, were recorded by different research Institutes. In addition, one hymenopteran encyrtid parasitoid was identified as *Aenasius* sp. *nov. nr. longiscapus* Compere by CABI through the Natural History Museum in London, UK. (CCRI, 2007). This encyrtid parasitoid has been multiplied and released in cotton belt of the Punjab and Sind provinces through different biocontrol laboratories established in collaboration with the Ministry of Food Agriculture & Livestock (MINFAL) project by CABI.

Recently, an encyrtid parasitoid species on *P. solenopsis* has been described as *Aenasius bambawalei* from India (Hayat, 2009). This study was carried out to find out whether *Aenasius* sp. found in Pakistan is same or not.

MATERIALS AND METHODS

Plant parts of *Hibiscus rosasinensis* L., *Parthenium hysterophorus* L., *Malvestrum coromendelianum* (L.) and *Gossypium hirsutum* L. infested with mummified *Phenacoccus solenopsis* were collected during surveys of Multan , Layyah, Rawalpindi, Islamabad and Attock districts.

The field collected mummies were brought to the laboratory and were reared in four Kg. transparent plastic jars under controlled conditions at 25±2°C temperature, 50±10% RH and 14 hr photophase for the emergence of parasitoids. Adult

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parasitoids emerged within 4-6 days from mummies. To increase the number of adult parasitoids for the purpose of further research studies, the emerged adults were then transferred on to already maintained culture of mealybugs on *H. rosasinensis* shoots with the help of an aspirator.

The parasitoids were identified according to reliable literature (Noyes and Ren, 1995; Noyes, 2000; Hayat, 2009). Photographs were made with line drawing method and also taken with the help of a digital camera attached to a Nikon microscope (Sms-1500, with 30x 1-11.25x magnification). Measurements of taxonomically important parts were taken with the help of stage and ocular micrometer using Noif microscope (XSZ 107BN, with 10X10X magnification).

RESULTS AND DISCUSSION

Aenasius bambawale was originally described by Hayat (2009). The following characters were the main identification characters used for species identification.

Cylindrical antennal scape, hyaline streak adjacent to the postmarginal and stigmal veins of fore wing.

Redescription

Female

Head (Fig.1) smooth, from above broad and frontal height to width = 0.78-0.80. Compound eyes sparsely setose and about 1.67 times longer than wider in dorsal view. Ocelli triangle with apical angle obtuse. Temple about 16.67 times shorter than eyes length in dorsal view. Interocular line 1.38 times than transfacial line. Distance between posterior ocellus is 7 times the distance between a posterior ocellus and occipital margin. Distance between posterior and anterior ocellus is 2.27 times the eyes length in dorsal view. Antennal (Fig. 1C) scape cylindrical, about 6 times in length than width. Pedicle about 1.6 times in length than width. Clava large about 4.1 times in length than its maximum width. The truncate part of clava with a slightly curved median line. F1-F3 are same in length and width, F6 slightly longer and wider than F4-F5. Last antennal segment 4.1 times in length than its width.

Mesoscutum is 2.48 times wider than longer, scutellum 1.39 times in length than the mesoscutum length. Fore wing (Fig. 1D) about 2.4 times in its maximum length than width. Marginal vein 1/3 of postmarginal vein; stigmal vein slightly curved and 1.1 times longer than postmarginal vein. Both veins not touching wing margin; hyaline break between submarginal vein and marginal vein not separate clearly; a hyaline streak adjacent to postmarginal and stigmal veins present. Gaster smooth, very finely reticulated, shorter than thorax, gaster to thorax length ratio varies and on average thorax is 1.25 times that of gaster.

Punctation: Punctures are present on head, face, scutellum and mesoscutum varying in sizes and colors. Punctures in interantennal area are reddish bronzy, thimble like and dull bluish-green on mesoscutum and hardly bluish-green on scutellum.

Coloration: Body shiny black with head bluish-green. Antennal radicle black; scape testaceus yellow with a brownish patch in middle in some specimens in others this patch may be faint or even absent. Pedicel, F1 and F2, black; F3 dark brown, F4 pale brownish yellow; F5 and F6 testaceus yellow; clava dark brown, basally brownish yellow; clava variable ranging from largely dark brown to brownish yellow.

Pronotum, mesoscutum, axillae and scutellum, blackish. Visible part of pronotum dull bluish-green. Fore wings infuscate about in basal third, the infuscation becoming faint distally and hyaline in distal half and the costal cell; hind wings hyaline. Propodeum bluish-green shiny. Gaster dark brown with some bronzy violet to bluish-green.

Male

It differs from the female in its generally smaller size (1.04–1.45 mm) and large, curved, banana-shaped antennal clava (Fig. 1G).

Material examined

Pakistan: Punjab, Layyah, 20.09.09, 20♀ and 15♂; Rawalpindi, 10.08.09, 24♀ and 15♂; Islamabad, 13.08.09, 3♀and 1♂; Multan, 16.09.09, 2♀ and 1♂. On *H.rosasinensis* (Malvaceae).

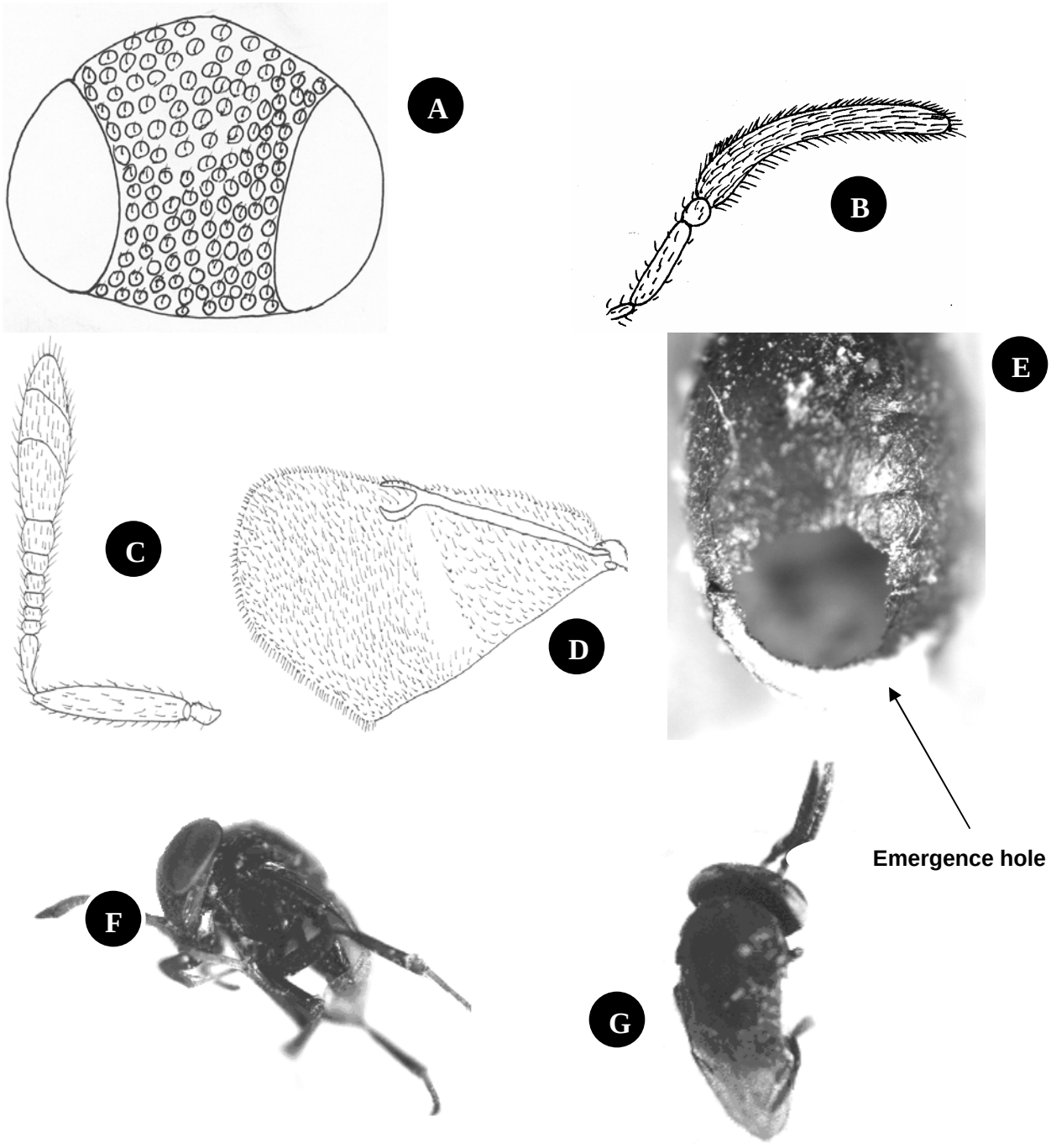

Fig. 1. External morphology of *Aenasius bambawalei* Hayat, 2009 and the parasitized cotton mealybug A, dorsal view of female head; B, male antenna; C, female antenna; D, anterior view of the female fore wing; E, parasitized cotton mealybug; F, lateral view of female; G, dorsal view of male.

Rawalpindi, 10.08.09, 44♀ and 25♂; Islamabad, 10.08.09, 33♀and 13♂; Attock , 19.08.09, 24♀ and 15♂ On *P. hysterophorus* (Astraceae).Attock, 24.09.09, 8♀ and 5♂; Rawalpindi, 16.08.09, 9♀ and 5♂; Islamabad, 20.08.09, 3♀and 1♂. On *M. coromendelianum* (Malvaceae).Layyah, 24.09.09,

29♀ and 15♂; Multan, 18.09.09, 26♀ and 13♂. On *G. hirsutum* (Malvaceae). All specimens reared from *P. solenopsis*

Biology

In addition to taxonomic characters some observations were made on biology of the parasitoid. The laboratory rearing of the field collected mummies on different host plants showed that maximum mummies were collected from *P. hysterophorus* followed by *H. rosasinensis, G. hirsutum* and *M. coromendelianum*. The emergence time of field collected mummies was recorded on an average 4-6 days and the sex ratio was female biased.

Moreover, during laboratory rearing, activity of ants as predator of mummified mealybugs was particularly observed, which could be a delimiting factor in field conditions in application of biological control agent like this important endoparasitoid.

Remarks

Morphological characters of the *A. bambawalei* (Hayat, 2009) were compared with published information given by Hayat (2009) and found to be similar. Therefore, this study confirms the status of *A. bambawalei* as parasitoid of *P. solenopsis* which was previously identified as *Aenasius* sp. *nov. nr. longiscapus.* During this study some additional taxonomically important biological characters were noted like the emergence hole of the parasitoid was always found on the posterio-dorsal part of the dorsum of the mummified *P. solenopsis* (Fig. 1E) and reddidsh brown colour of mummies, these characters could be of further help in the future identification of this species.

The biological characters of this species presented in this study are based on field collected specimens. Therefore, there is a need to take up detailed studies to find out these biological characters to use this parasitoid effectively in future bio-control programs.

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