NEW RECORD OF PARASITOIDS OF *MELANAGROMYZA OBTUSA* ON *CAJANUS CAJAN* AND THEIR REVIEW

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**KEYWORDS**

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ABSTRACT

The pod fly, Melanagromyza obtusa Malloch (Diptera: Agromyzidae) is reported to cause more than 40.00 per cent damage to pigeon pea, Cajanus cajan L. (Leguminosae) pods. Two hymenopteran parasitoids viz., Apanteles sp. and Bracon sp. (Braconidae) were recorded from M. obtusa on C. cajan for the first time from India during the surveys carried out in the year 2010, 2011 and 2012 in Agra and adjacent districts. Apanteles sp. was recorded as ecto-larval parasitoid whereas Bracon sp. was found as pupal parasitoid of the pod fly and their incidence of parasitism ranged from 2.00 to 6.47 and 1.92 to 7.40 per cent respectively. The review of the parasitoids is discussed.

INTRODUCTION

Melanagromyza obtusa (Malloch) (Diptera: Agromyzidae), commonly known as tur-pod fly or Red-gram pod fly is a major pest of pigeonpea (Hindi: Arhar), Cajanus cajan (Leguminosae) (Lal and Yadava, 1987; Lateef and Reed, 1990). Melanagromyza obtusa is reported to cause more than 40.00 per cent damage to the pods of Arhar crop (Bhalani and Parsana, 1991). The population of pigeonpea pod fly is available from October to May around Agra. More than 20 Hymenoptera parasitoids have been recorded on this pest (Table 1). Various workers like Singh, 1982, Singh et al. (1991), Peter (1992), Kumar (2002), Durairaj (2005), Dahiya, 2005, Yadav et al. (2011, 2012), Yadav and Yadav (2013) studied the incidence of parasitism of pod fly. Euderus lividus (Eulophidae), larval ecto-parasitoid and Ormyrus orientalis (Ormyridae), larval-pupal endo-parasitoid reported as major biocontrol agents of M. obtusa and cause 80.00 and 46.66 per cent parasitism respectively (Yadav et al., 2012).

Integrated pest management (IPM) seeks to provide an effective and economical control strategy that minimizes the disturbance of anthropogenic control measures on the natural components of the agro-ecosystems. As a result, biological control is emphasized as an important remediation strategy to combat pest outbreaks by many workers (Shanower et al., 1998; Singh, 1994; Singh et al., 1991; Tiwari et al., 2006). Therefore, the surveys have been carried out during the year 2010-2012 in pigeon pea crop areas in Agra and its adjacent districts to record the parasitoids and evaluate their role in the biological control of the pod fly.

A random sampling method was applied to investigate the incidence of infestation and parasitism. C. cajan 200 pods were collected at weekly interval. These pods were opened in the laboratory under stereoscopic zoom bionocular microscope to determine the incidence of infestation and parasitism.

Two parasitoids viz. Apanteles sp. and Bracon sp. were recorded for the first time on M. obtusa during the surveys in 2012.

Superfamily Ichneumonoidea

Family Braconidae

1. Genus Apanteles Foerester

(a) Synonyms

Apanteles Foerester 1862
= Cotesia Cameron, 1891
= Microgaster (Apanteles) Thompson, 1895
= Pseudapanteles Ashmead, 1897
= Protanteles Ashmead, 1897
= Urogaster Ashmead, 1897
= Parapanteles Ashmead, 1900
= Glypatapanteles Ashmead, 1904
== Cryptapanteles Vieereck, 1909 ==
A. Apanteles (Dolichogenidea) Vieereck, 1911
== Stenopleura Vieereck, 1911 ==

Apanteles was proposed by Foerester in 1862 with the type species Apanteles obscura Nees and subsequently the majority of microgastrine species have been placed in this genus, whether by original designation or by later synonymy. Nixon (1965) reorganized the subfamily, formally recognizing the tribe Microgastrini, which comprised 19 genera. He placed most of the species in Apanteles, and divided the genus into 44 species groups for ease of handling. Mason (1981) established that Nixon’s concept of the genus was polyphyletic, i.e., not based on a ‘natural’ grouping, but with species in the genus derived from two or more ancestral sources. Mason elevated the tribe Microgastrini to subfamily status, and reorganized in microgastrine species onto 5 tribes and 51 genera, of which 23 were new. Mason’s analysis was rejected by Walker et al. (1990), who showed cladistically that Apanteles sensu Nixon was polyphyletic, but they did not provide any formal alternative classification for the subfamily, and Mason’s classification is currently widely accepted. Austin and Dangerfield (1992) have since revised the Australasian Microgastrinae, providing a beautifully illustrated and user-friendly key to this group.

(b) Diagnostic characters

Apanteles can be recognized among the New World microgastrines by the following combination of features: forewing with second r-m vein absent, so that the small areolet (second submarginal cell) is open distally; hindwing with vannal lobe distally flattened and with reduced fringe of hairs; punctuation of posterior part of mesonotum breaking down into more confluent longitudinal sculpturing, especially submedially; propodeum with oval, pentagonal, hexagonal or anteriorly open medial areola; first metasomal tergite usually with medial subapical depression and second metasomal tergite strongly transverse, often with convex or sinuate posterior margin; ovipositor and sheaths long and exserted, manipulatable via a medially desclerotized hypopygium (subgenital plate). The genus is easily confused with the related but less diverse Dolichogenidea, which differs in having distinct punctures posteriorly on the mesonotum, and a convex and evenly fringed hindwing vannal lobe.

(c) Distribution

Cosmopolitan (Berry, 1997).

(d) Biology

The members of this group are parasitic wasps which play an important role in regulating lepidopteran pest population. They are particularly important components in many biological control programmes and have been imported as biocontrol agents into almost every country in the world (Berry, 1997).

Apanteles sp. (Fig. 1 New record)

This parasitoid was recorded on late variety of C. cajan from Firozabad district, Uttar Pradesh during the year 2012. It is recorded as ecto-larval parasitoid of M. obtusa for the first time from India. The parasitoid larvae pupate in silken white cocoons. One to three cocoons were found in single pod. The incidence of pod infestation and parasitism is given in Table 2.

Apanteles sp. was found in the first week of February with 2.00 per cent parasitism. The incidence of parasitism increased upto 6.47 per cent by th end of February. Maximum 21.17 and 11.39 per cent parasitism was recorded in the IV week of February for the major parasitoids, E. livids and O. orientalis respectively.

2. Genus Bracon Fabricius

<table>
<thead>
<tr>
<th>Species</th>
<th>Superfamily</th>
<th>Family</th>
<th>Reference</th>
</tr>
</thead>
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<tr>
<td>Euderus sp.</td>
<td>Chalcidoidea</td>
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<td>E. livids (Ashmead)</td>
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<td>Diglyphus tunicularis</td>
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<td>Khan, 1985</td>
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<td>Tetrastichus atomella</td>
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<td></td>
<td>Ipe, 1987</td>
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<td></td>
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<tr>
<td>Ormyrus orientalis (Walker)</td>
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<td>Fellowes and Amarasena, 1977</td>
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<tr>
<td>O. fredreki Narendran</td>
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<td>Ormyrus sp.</td>
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<td>Eurytoma sp.</td>
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<td>E. melanagromyzae Narendran</td>
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<td>E. robusta Mayr</td>
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<td>Sithanathan et al., 1987</td>
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<tr>
<td>Plutarchia indefensa (Walker)</td>
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<td>Sithanathan et al., 1987</td>
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<td>Plutarchia sp.</td>
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<td>Microdontomerus (= Antistrophoplex) sp.</td>
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<tr>
<td>Pseudotorymus (= Senegalella) sp.</td>
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<tr>
<td>Callitula sp.</td>
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<td>Pteromalidae</td>
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<td>Eupelmus sp.</td>
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<td>Eupelmidae</td>
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<td>E. urozonus</td>
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<td>Bracan sp.</td>
<td>Ichneumonoidea</td>
<td>Braconidae</td>
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<td>B. Betcheri Silvestri</td>
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<td>Omytes sp.</td>
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(a) Synonyms

*Bracon* Fabricius 1804
- *Bracon* Agassiz, 1846
- *Microbracon* Ashmead, 1890
- *Amicoplidea* Ashmead, 1900
- *Mycrodyctium* Ashmead, 1900
- *Tropidobracon* Ashmead, 1900
- *Liobracon* (Ashmead) Nason, 1905

= *Brazon* Shulz, 1911
= *Eutropobrachon* Ramakrishna Ayyar, 1928

The genus was proposed by Febricius (1804) with the type species *Ichneumon minutator* Fabricius. It is the largest genus in the subfamily Braconinae, having about 800 species. The subfamily Braconinae has largely been neglected from the standpoint of generic revision and many of the genera are poorly defined, and doubtless a considerable number must eventually be placed in synonymy with *Bracon*. Ashmead (1890) proposed the new genus *Microbracon* for the reception of those species in the genus *Bracon* having the recurrent vein joining the first submarginal cell between its middle and its apex, restricting the genus *Bracon* to those species having the recurrent vein interstitial with the first transverse cubital. Subsequently Ashmead (1900) synonymized *Amicoplidea*, *Mycrodyctium* and *Tropidobracon* with *Bracon*. Fahringer (1927) and Tobias (1957, 1961) divided *Bracon* into several subgenera because of having a great number of species (Quicke, 1987). Author (Singh and Kumar, 1985) recorded *Bracon* sp. from *Chomatomyia horticola* (Gour.) (Diptera: Agromyzidae) on *Pisum sativum* and *Brassica campestris* for the first time from Agra, India. Guler and Cagatay (2007) further contributed to the knowledge of *Bracon* and introduced 8 more species from Turkey. Guclu and Ozbeck (2011) did remarkable contribution to the knowledge of *Braconinae* from Turkey and placed 6 species in genus *Bracon*.

(b) Diagnostic characters

Face usually smooth to subpunctate-punctate, less frequently rugulose to rugose - never with a pair of vertical keels. Dorsal carinae obsolete just above spiracles. Nervulus (Cu-a) usually interstitial (vertically aligned with 1M); second submarginal cell (of fore wing) less long, 3-SR (1.4-) 1.6-1.8 times (exceptionally twice) as long as 2-SR. Antenna usually with (15-) 20-30 flagellomeres.

(c) Distribution

Cosmopolitan (Guler and Cagatay, 2007).

(d) Biology

Primary parasites of the larvae of Tephritidae, Lonchaeidae (Diptera), Curculionidae, Bruchidae, Cerambycidae (Coleoptera); Plutellidae, Geometridae, Gelechiidae, Pyralidae, Crambidae, Pyralidae, Scythrididae.
Alucitidae, Noctuidae, Coleophoridae, Tortricidae and Sessidae (Lepidoptera); Eurytomidae and Cynipidae (Hymenoptera) which are quite important pests of economically important plants (Guler and Cagatay, 2007).

**Bracon** sp. (Fig. 2 New record)

It is recorded on early variety of *C. cajan* from Firozabad district, Uttar Pradesh in 2012. *Bracon* sp. is a pupal parasitoid of *M. obtusa*. The incidence of infestation and parasitism is given in Table 3.

The parasitoid appeared for the first time in the first week of December. The incidence of parasitism increased from 1.92 to 7.40 per cent during December. Maximum 20.00 and 55.55 per cent parasitism recorded for *E. lividus* and *O. orientalis* respectively during the corresponding month.

*Bracon* sp. has been reared from *M. obtusa* on *Flemminigia macrophylla* instead on * Cajanus cajan* (Sah and Mehra, 1986). Rao and Babu (2009) suggested that *Bracon* sp. prevalent on the related species of pod fly in Africa may be a potential candidate for the introduction for the biological suppression of this pest. Author (Singh and Kumar, 1985) *Bracon* sp. as a pupal parasitoid of *Chromatomyia horticola* (Diptera : Agromyzidae) on *Pisum sativum*.

*Bracon fletcheri*, another parasitoid of *M. obtusa* has been reported as an important biological control agent of fruit flies. 4,01,965 pupae of the fruit fly, * Carpomyia vesuviana* were collected from the fruits of zucchini (*Zizyphus jujube*) from Agra and shipped to Hawaii in 1950. 9526 adult *Bracon fletcheri* were reared from these pupae and utilized for the further mass culture of the parasitoids for the control of fruit flies in Hawaii (Clausen et al., 1965).

The incidence of parasitism of *Apanteles* sp. and *Bracon* sp. was found low as compared to major parasitoids, *E. lividus* and *O. orientalis*. Therefore, fixed plot surveys are required throughout the crop season in Firozabad district to evaluate the role of these new parasitoids in the biological control of pigeonpea pod fly.

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