



Research Article

New record of parasitoid, associated with pigeonpea pod fly, *Melanagromyza obtusa* (Malloch) (Diptera: Agromyzidae)

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ABSTRACT: The study was carried out during 2010-11 at farmer fields and laboratory, College of Agriculture, Osmanabad District (Vasant Naik Marathwada Agricultural University (VNMKV), Parbhani), Maharashtra, India on the incidence of parasitoids of *Melanagromyza obtusa* (Malloch) infesting pigeonpea. Four hymenopteran parasitoids recorded were; the Eulophid parasitoid, the Torymid *Torymoides* sp. (Walker), two ormyrids viz., *Ormyrus orientalis* (Walker) and *Ormyrus* sp. (Westwood). As per the literature available and reviewed, *Torymoides* sp. is the first ever record for new host association reported from *M. obtusa* maggots as an ecto-parasitoid. The natural larval parasitism of *M. obtusa* by *Torymoides* sp. ranged from 3.13 to 31.82 per cent. The parasitism was observed from 51st SMW (3.13 per cent) which increased gradually and attained a peak on 6th SMW with 31.82 per cent with a mean parasitism of 9.30 per cent over a period of 13 standard meteorological weeks. The new record of natural parasitism of pod fly by *Torymoides* sp. would add to the existing knowledge on the biological suppression of the pest.

KEY WORDS: *Melanagromyza obtusa*, new host association, parasitism, pigeonpea, *Torymoides* sp.,

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INTRODUCTION

Pigeonpea, *Cajanus cajan* Millsp. (Legumiosae) is grown throughout the tropics but most widely in south and Southeast Asia, where it is a major source of vegetable protein. *Melanagromyza obtusa* Malloch (Diptera: Agromyzidae), commonly known as tur pod fly or red gram pod fly is a major pest of pigeonpea (Lal and Yadava, 1987; Lateef and Reed, 1990). The pod fly, *M. obtusa* causes serious damage to the pods and seeds of pigeonpea from November to February, resulting in poor germination and making them unfit for human consumption. The percentage of infestation ranges from 12 to 100 per cent pods causing losses of 2.4 to 95.0 per cent seeds (Ahmad, 1938; Gangrade, 1963; Srivastava *et al.*, 1971; Chauhan and Dahiya, 1987) and the losses were estimated at US \$ 256 million annually (Sharma *et al.*, 2011). The pod fly maggots burrow inside the pods and do not show any symptoms from outside until exit of the adult, which complicates their management. Till date, more than 25 hymenopteran parasitoids were known to attack this notorious pest (Table 1). Among them *Euderus lividus* Ashmead (Hymenoptera: Chalcidoidea: Eulophidae) and *Ormyrus orientalis* Walker (Hymenoptera: Chalcidoidea:

Ormyridae) reported as major biocontrol agents of *M. obtusa*, respectively (Yadav *et al.*, 2012). 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). The natural biocontrol agents play an important role in the management of insect pests. Therefore, the present investigations were carried out to know the parasitoids of *M. obtusa* and their extent of natural parasitism.

MATERIAL AND METHODS

The survey was conducted in pigeonpea growing farmer fields at Osmanabad District and at laboratory, College of Agriculture, Osmanabad District (VNMKV, Parbhani), Maharashtra, India during 2010-11 to investigate on the incidence of parasitoids of *M. obtusa*, a pest of pigeonpea and their level of natural parasitism, respectively. Randomly, 100 pigeonpea pods were collected at weekly intervals (Tiwari *et al.*, 2006) from the farmer fields of Osmanabad District, Maharashtra and brought to the laboratory. These pods were opened through destructive sampling in the laboratory under stereoscopic zoom binocular microscope

Table 1. Hymenopteran parasitoids associated with *Melanagromyza obtusa*

Family	Species	Stage attacked	Reference
Eulophidae	<i>Euderus</i> sp.	Maggot	Sithanantham <i>et al.</i> , 1987
	<i>E. lividus</i> (Ashmead)	Maggot	Ahmad, 1938
	<i>E. agromyzae</i> (Gangrade)	Maggot	Gangrade, 1960
	<i>Diglyphus funicularis</i> Khan	Maggot	Khan, 1985
	<i>D. mandibularis</i> Khan	Maggot	Khan, 1985
	<i>Tetrastichus atomella</i>	Maggot	Ipe, 1987
	<i>Aprostocetus</i> sp.	Maggot	Narendran <i>et al.</i> , 2005
Ormyridae	<i>Ormyrus orientalis</i> (Walker)	Pupa	Fellowes and Amarasena, 1977
	<i>O. fredreki</i> Narendran	Pupa	Peter, 1992
	<i>Ormyrus</i> sp.	Pupa	Ketipearachchi, 2002
Eurytomidae	<i>Eurytoma</i> sp.	Pupa	Ipe, 1987
	<i>E. melanagromyzae</i> Narendran	Pupa	Narendran, 1994
	<i>E. robusta</i> Mayr	Pupa	Sithanantham <i>et al.</i> , 1987
	<i>Plutarchia indefensa</i> (Walker)	Pupa	Sithanantham <i>et al.</i> , 1987
	<i>Plutarchia</i> sp.	Pupa	Sebastian, 1993
	<i>Eurytoma ranjithi</i> Narendran	Pupa	Dar <i>et al.</i> , 2004
Torymidae	<i>Microdontomerus</i> (= <i>Antistrophoplex</i>) sp.	Pupa	Sithanantham <i>et al.</i> , 1983
	<i>Pseudotorymus</i> (= <i>Senegalella</i>) sp.	Pupa	Singh <i>et al.</i> , 1991
Pteromalidae	<i>Callitula</i> sp.	Maggot	Makinson <i>et al.</i> , 2005
Eupelmidae	<i>Eupelmus</i> sp.	Pupa	Thakur and Odak, 1982
	<i>E. urozonus</i>	Pupa	Fellowes and Amarasena, 1977
Braconidae	<i>Bracon</i> sp.	Maggot	Sah and Mehra, 1986
	<i>B. fletcheri</i> Silvestri	Maggot	Silvestri, 1914
	<i>Apanteles</i> sp.	Maggot	Yadav and Yadav, 2013
Diapriidae	<i>Tricopria</i> sp.	Maggot	Thakur and Odak, 1982
Unreported	<i>Omytes</i> sp.	--	Rao and Babu, 2009

to determine the infestation, parasitoids and parasitism, respectively. The collected larvae and pupae were maintained in plastic vials at the rate of one per vial and reared on soft pigeonpea seeds at ambient laboratory conditions (25±2°C temperature and 80±2% relative humidity) for observing the emergence of different parasitoids. The parasitoids were identified by taxonomists, at National Pusa Collection, IARI, Pusa, New Delhi. The specimens were also deposited at National Pusa Collection (NPC), IARI, New Delhi. The per cent parasitism was calculated by using the following formula.

$$\text{Per cent parasitism} = \frac{\text{Number of infected larvae or pupae}}{\text{Total number of larvae or pupae}} \times 100$$

RESULTS AND DISCUSSION

While rearing the collected larvae and pupae of *M. obtusa*, four hymenopteran parasitoids emerged namely, a Eulophid parasitoid (RRS No. 2672-2691/11, Code 1) and *Torymoides* sp. Walker (RRS No. 2692-2698/11, Code 2) as ecto-larval parasitoids (Fig. 1); and *Ormyrus orientalis* Walker (RRS No. 2692-2698/11, Code 2), *Ormyrus* sp.

Westwood (RRS No. 2699-2718/11, Code 3-5) as endo-pupal parasitoids, respectively. So far the parasitoids viz., *Euderus lividus* Ashmead (Ahmad, 1938) and *E. agromyzae* Gangrade (Gangrade, 1960) were the Eulophid parasitoids recorded as ecto-parasitoids of pod fly maggots. While the parasitoids namely, *Ormyrus* sp. (Ketipearachchi, 2002) and *O. orientalis* (Fellowes and Amarasena, 1977) were recorded as endo-parasitoids of pod fly pupae, respectively.

Brief description of the new parasitoids recorded based on the morphological characters and taxonomic keys is presented.

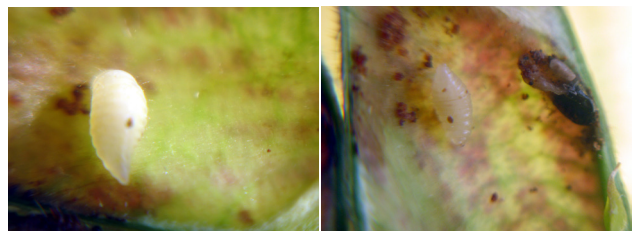


Fig. 1. *Torymoides* sp. larva parasitizing *Melanagromyza obtusa* larva.

Table 2. Parasitism of *Melanagromyza obtusa* maggots by *Torymoides* sp.

SMW	Pod fly Maggots (No.)	Per cent parasitism	
		Eulophid	<i>Torymoides</i> sp.
49	10.00	0.00	0.00
50	14.00	0.00	0.00
51	35.00	2.86	0.00
52	29.00	6.90	0.00
1	32.00	3.13	3.13
2	30.00	6.67	3.33
3	38.00	13.16	7.89
4	43.00	23.26	13.95
5	26.00	53.85	30.77
6	22.00	59.09	31.82
7	31.00	45.16	22.58
8	27.00	11.11	7.41
9	22.00	4.55	0.00
Mean	27.61	17.67	9.30

Genus *Torymoides* Walker

Hymenoptera: Chalcidoidea: Torymidae: Toryminae: Torymoini

a. Synonyms

Ameromicrus Nikol'skaya, 1954; *Didactyliocerus* Masi, 1916; *Dimeromicrus* Crawford, 1910; *Macrodontomerus* Girault, 1913; *Macrodontomerus* Girault, 1913; *Pondotorymus* Boucek, 1978; *Torymoides* Walker, 1871

b. Diagnostic Characters

Colour normally metallic green or blue ranging to partly yellow or occasionally black; antennal formula 11263 (antenna with two anelli, six funicular segments, three segmented club); thorax with variable sculpture, most often reticulate to coriaceous, occasionally with large punctures; frenal groove usually distinct; posterior margin of mesepimeron on sinuate; hind tibia with two spurs; unmodified propodeum; gaster with posterior margin of first tergite incised medially.

c. Distribution

Australia, Eritrea, India: Punjab and South Africa.

d. Biology

Members of this genus are parasitoids in various galls of herbaceous plants or on soft parts of woody plants, mainly in galls of Diptera (Boucek, 1988). The *Torymoides* sp. Walker was reported as parasitoid of *Rhopalomyia californica* Felt (Diptera: Cecidomyiidae) (Melksham, 1992);

Mesoclanis dubia Walker (Diptera: Tephritidae), *M. magnipalpis* Bezzi (Diptera: Tephritidae), *M. polana* Munro (Diptera: Tephritidae) (Edwards, 1998); and *Trupanea amoena* Frauenfeld (Diptera: Tephritidae) and *Urophora vernoniicola* Bezzi (Diptera: Tephritidae) (Herting, 1978), respectively.

No reports of *Torymoides* sp. as a parasitoid of *M. obtusa* was documented earlier. In the present study, the parasitoid, *Torymoides* sp. emerged from maggots of *M. obtusa* is a new record associated with pod fly from India. The natural occurrence of this new hymenopteran parasitoid on pigeonpea pod fly, *M. obtusa* has paved a new avenue for its control. Two to three years continuous studies are required throughout the crop season to evaluate the role of this new parasitoid in the biological control of pigeonpea pod fly, *M. obtusa*.

e. *Torymoides* sp.

Torymoides sp. is an ecto-parasitoid of *M. obtusa* larvae. The data on parasitism of pod fly, *M. obtusa* larvae by *Torymoides* sp. is presented in Table 1. The natural larval parasitization level of *M. obtusa* by *Torymoides* sp. ranged from 3.13 to 31.82 per cent. The parasitization was observed from 51st SMW (3.13 per cent) which increased gradually and attained a peak on 6th SMW with 31.82 per cent. The larval parasitization by *Torymoides* sp. was then declined to nil as no parasitoid was observed on 9th SMW with a mean of 9.30 per cent over a period of 13 standard meteorological weeks (49th to 9th SMW).

The parasitism of *M. obtusa* larvae due to *Torymoides* sp. are in accordance with earlier workers like Yadav *et al.* (2012), who reported the *Pseudotorymus* sp. Masi (Hymenoptera: Chalcidoidea: Torymidae) as a pupal parasitoid. On late variety of pigeonpea, the parasitoid emerged for the first time in the first week of November and the parasitism ranged from 2.06 to 3.53 per cent during November to December. Singh *et al.* (1991) recorded the parasite for the first time from Agra and its nearby districts in 1986. Singh (1994) reported that *Senegalella* sp. (= *Pseudotorymus* sp.) is a larval ecto-parasitoid which attacks third instar larvae of the pod fly. Singh *et al.* (1991) reported that *Senegalella* sp. parasitize 1.29 per cent larvae of *M. obtusa*.

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