



Research Article

Natural parasitoids of fruit piercing moth, *Eudocima* spp.

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ABSTRACT: *Eudocima* spp. (Noctuidae) also known as fruit piercing moth, is a serious pest of tropical countries including subtropical Southeast Asia, Australia, and the western Pacific islands. It is found commonly occurring on ripening fruits. Surveys conducted in Maharashtra revealed that three abundant larval parasitoids viz., a tachinid fly, *Goniophthalmus halli*, eulophid wasps, *Euplectrus maternus* and *Tetrastichus* sp. were contributing up to 36.65, 41.46 and 36.58 % larval mortality, respectively. Laboratory assays were conducted to test the parasitoids for host specificity by exposing them to larvae of *Eudocima* sp. However, *Goniophthalmus halli* showed parasitization on other species of *Eudocima*, whereas *E. maternus* was found to be host specific on *E. materna*. In laboratory investigation, 72 to 89% parasitization of *Trichogramma chilonis* on the eggs of *E. materna* was also recorded.

KEY WORDS: *Eudocima* spp., fruit piercing moth, larval parasitoids

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INTRODUCTION

Adult fruit piercing moth (*Eudocima* spp.) is a destructive pest of ripening fruits in tropical and subtropical countries including India, Africa, Southeast Asia, Australia and the South Pacific (Waterhouse and Norris 1987). The moths are destructive as their long, serrated, sharp, stout proboscis can puncture the rind of ripening fruits to feed on the fruit juice and pulp. Punctured fruits are exposed to secondary infections by bacteria and fungi leading to rot and premature fruit-fall (Sands *et al.*, 1993). The larvae of fruit piercing moths feed on several vines viz., *Tinospora cardifolia*, *Cocculus hirsutus*, *Anamirta cocculus*, *Diploclisa glaucescens* and *Tiliacora acuminata* (Lam.) of the family Menispermaceae which are generally located near-by rivers and inaccessible water back areas. The moths can travel hundreds of kilometers and orchards located nearer to breeding areas are more prone to the pest attack. It is also observed that these moths migrate from breeding sites to orchards, which are often very distant to one another. The immature stages of the moth survive only on twining vines of the family Menispermaceae occurring in scrub and forest areas, often remote from orchards and hence it is difficult to control this pest (Fay, 1996 and Denton *et al.*, 1991). In India, studies on management of this pest is very limited in spite of it being a serious pest of the fruits in tropical countries. Their mode of damage to ripening fruits

enables them to have insufficient contact with chemicals and escapes from knockdown effect. Also adequate holding period is not achieved as ripe fruits are normally attacked. Hence biological control using egg and larval parasitoids is a safe and better alternative to manage these fruit piercing moths. Hence, the investigation was planned to find out natural enemies of fruit piercing moths and extent of their parasitization.

MATERIALS AND METHODS

The efforts were made to identify and collect natural enemies of fruit piercing moth by conducting survey at MPKV campus and river bank areas in Ahmednagar Region and Paithan (Aurangabad Region) of Maharashtra where larval host plants were available.

Parasitization by egg-parasitoid *Trichogramma chilonis* on eggs of *Eudocima materna* under laboratory condition

No parasitized eggs of fruit piercing moth were found in nearby Menispermaceae plants. Therefore, Trichocards (already parasitized by *Trichogramma chilonis*) were procured from Bio-control laboratory, Department of Entomology, College of Agriculture, Pune, Maharashtra to study the per cent parasitization of *T. chilonis* on eggs of *E. materna* under laboratory condition. Five sets of 100 eggs

were spread on yellow paper (1 cm X 4 cm) smeared with the glue and were kept in the transparent polythene bag with one strip of Trichocard (1 cm X 4 cm) and the top end of the polythene bag was closed tightly. The observations on parasitization were recorded from next day.

Natural parasitization by eulophid wasps, (*Euplectrus maternus* and *Tetrastichus* sp.) and tachinid fly, *Goniophthalmus halli* Mesnil on larvae of fruit piercing moth

The field collected larvae were critically observed under microscope for parasitization and parasitized larvae were recorded after every field collection. The collected specimens of parasitoids were identified from National Project on Insect Biosystematics, Division of Entomology, IARI, New Delhi.

RESULTS AND DISCUSSION

Study on natural enemies of fruit piercing moths

In the investigation during field survey, one egg parasitoid, *Trichogramma chilonis*, larval parasitoids i.e eulophid wasps (*Euplectrus maternus* and *Tetrastichus* sp.) and a tachinid fly, *Goniophthalmus halli* were reported parasitizing the eggs and larval stage of fruit piercing moth.

Per cent parasitization by *Trichogramma chilonis* on eggs of *Eudocima materna* under laboratory condition

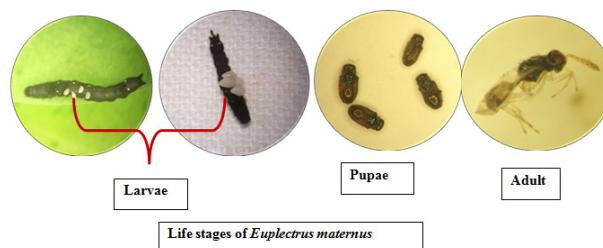
The per cent parasitization by *Trichogramma chilonis* on eggs of *E. materna* is presented in Table 1 and it was revealed that *T. chilonis* was promising and effective egg parasitoid parasitizing about 80.67 % eggs. The egg parasitization ranged from 72.0 to 89.0 % under laboratory conditions. Similar observations were recorded by Maddison (1982) who reported parasitization by *Trichogramma* sp. on eggs of fruit piercing moth. Kumar and Lal (1983) recorded *T. papilionis* parasitizing the eggs of *O. fullonia* to the extent of 7.7-50.5 per cent from Fiji. Dodia *et al.* (1986) demonstrated the successful parasitization of *T. chilonis* on the eggs of *O. fullonia*. Bhumannavar (2000) recorded that *T. chilonis* were parasitizing eggs of *E. materna*. Bhumannavar and Viraktamath (2001) recorded the mean per cent parasitization of eggs of *Eudocima* by *T. chilonis* during 1998 to be 21.45 ± 27.45 and during 1999 to be 50.40 ± 34.08 .

Table 1. Per cent parasitization by egg parasitoid, *Trichogramma chilonis* on eggs of fruit piercing moth under laboratory condition

No. of eggs exposed	No. of eggs parasitized	Per cent parasitization
100	89	89.0%
100	72	72.0%
100	81	81.0%
	Mean	80.67 %

Natural parasitization by eulophid wasp, *Euplectrus maternus* and *Tetrastichus* sp. on early instar larvae of fruit piercing moth during 2012-13

The natural parasitization of eulophid wasps is presented in Table 2 and it was revealed that the per cent natural larval parasitization by eulophid wasps, *Euplectrus maternus* and *Tetrastichus* sp. was 41.46 % and 36.58 % on early instar larvae FPM, respectively. The parasitoids, *Euplectrus* and *Tetrastichus* sp. were found to be typically parasitizing to the larvae near the eye spot bearing region on 3rd and 4th abdominal segment and eggs laid on this region also observed on field collected larvae. These parasitoids were found to be specific 2nd and 3rd instar larvae. The present results are in conformity with Ayyar (1944) who recorded *Tetrastichus ophiusae* as larval parasitoid on both *Ophideres* and *Achaea* species. Bhatnagar (1957) reported a eulophid wasp, *Euplectrus maternus* on *O. fullonia* and *O. materna* from Uttar Pradesh (India). *Euplectrus maternus* parasitized first three larval instars of *E. materna*, *E. fullonia* and *E. homaena* (Bhumannavar, 2000). Muniappan *et al.* (2004) studied the biology of *E. maternus* on *E. fullonia* larvae in Guam and their attempts to establish this parasitoid in the field failed. The present findings were in agreement with the reports of these workers.



Natural parasitization by tachinid fly, *Goniophthalmus halli* Mesnil on late instar larvae of fruit piercing moth during 2012-13

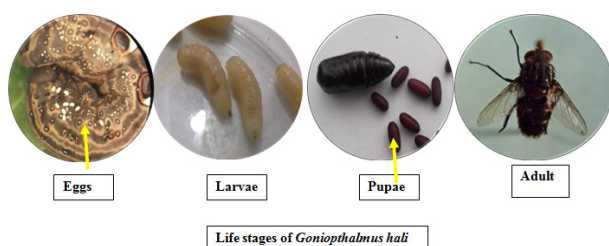
Data pertaining to the natural parasitization of tachinid fly, *Goniophthalmus halli* Mesnil presented in Table 2, it was revealed that 81 out of 221 collected larvae of fruit piercing moth were parasitized by *G. halli* and the average per cent parasitization of late instar larvae was recorded as 36.65 per cent. The natural parasitization of *G. halli* was observed from last week of September to the end of October during 2012-13. The fly usually laid its eggs on the fifth instar larvae and the eggs hatched in 3-3.5 days. The maggots penetrated into the body of *Eudocima* sp. caterpillar and fed inside on the body fluids, until the caterpillar pupated.

Maddison (1982) reported a tachinid fly, *Winthemia caledoniae* an important larval parasitoid of *O. fullonia* from New Caledonia. The fly usually laid its eggs on the fifth instar larvae. Cochereau (1977) reported *Winthemia*

Table 2. Natural parasitism of different larval parasitoids of fruit

Natural Enemy	No. of larvae collected	No. of Parasitized larvae	Per cent parasitization
<i>Tetrastichus</i> sp.	41 (Early instars)	17	41.46 %
<i>Euplectrus maternus</i>		15	36.58 %
<i>Goniophthalmus halli</i>	221 (Late instars)	81	36.65 %

caledoniae larval parasitoid accounting 25–46 per cent parasitization in New Caledonia. Bhumannavar and Viraktamath (2001) reported parasitization by *Winthemia* sp. to be 51.5 ± 24.07 per cent on fifth instar larvae of *E. maternus* and it did not parasitize other species of *Eudocima*. Jayanthi and Verghese (2010) recorded up to 40 per cent parasitization of *E. maternus* larvae by *Winthemia* sp. The present findings were in agreement with the reports of these workers.



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