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Research Note

Rearing techniques for three species of *Othreis* (Lepidoptera: Noctuidae) and their ectoparasitoid, *Euplectrus maternus* Bhatnagar (Hymenoptera: Eulophidae)

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ABSTRACT: **A rearing technique for three species of fruit piercing moths, namely, *Othreis materna* (Linnaeus), *O. fullonia* (Clerck) and *O. homaena* Hübner and their ectoparasitoid, *Euplectrus maternus* has been described.**

KEY WORDS: Ectoparasitoid, *Euplectrus maternus*, *Othreis* spp., rearing method

Biological control of the fruit-piercing moth, *Othreis fullonia* (Clerck) had been attempted in the Pacific region (Waterhouse and Norris, 1987). Kumar and Lal (1983) successfully mass reared *O. fullonia* and its tachinid parasitoid, *Winthemia caledoniae* Mesnil in Fiji. The introduction of *W. caledoniae* into Tonga appeared to be unsuccessful (Crooker, 1979) and recent surveys have failed to find any larval parasitoids (Langi,1986). Some of the larval parasitoids (except *Euplectrus maternus* Bhatnagar) attacked a range of unrelated Lepidoptera and were therefore, unsuitable as biological control agents for the suppression of *Othreis* spp. (Sands, 1996). The host range restricted to the genus *Othreis*. The multiplication of *E. maternus* can only be achieved by utilizing the larvae of *Othreis* spp. Bhumannavar (2000) studied the biology of *Othreis materna* (Linnaeus), *O. fullonia* and *Othreis homaena* Hübner on several Menispermaceae while Bhumannavar and Viraktamath (2000) studied the detailed biology of *E. maternus*. Production techniques for these three species of *Othreis* and their larval ectoparasitoid *E. maternus* is detailed in this paper.

Caterpillars of *O. materna* were collected on *Tinospora cordifolia* Miers, whereas *O. fullonia* on *T. cordifolia* and *Cocculus hirsutus* Diels and *O. homaena* on *C. hirsutus* around Bangalore. Caterpillars collected from the field (after separating parasitised ones) were mass reared by providing leaves of respective Menispermaceae in either 30cm cage (30x30x30cm) or 90cm cage (90x90x 90cm) with nylon/ copper mesh (40 to 100 mesh) on sides for aeration. The excreta were removed every day to avoid contamination. The

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pupae formed (along with webbed leaves) were placed in wide mouthed plastic containers without lid and kept in adult breeding cages for adult emergence. Twenty-five neonate larvae of each species of *Othreis* were provided with tender leaves of each of the available Menispermaceae (*T. cordifolia*, *C. hirsutus*, *Anamirta cocculus* W. & A., *Diploclisia glaucescens* Diels, *Tiliacora acuminata* Miers, *Cissampelos pareira* L., *Stephania japonica* Miers, *Stephania wightii* Dunn., *Cyclea peltata* Diels) in separate aerated clear plastic containers (250ml). The petiole of the leaf was dipped in a vial containing water to avoid desiccation. The species on which most of the released larvae survived to next instar was considered as a natural host and was taken as the most suitable host plant for production.

To collect the female moths feeding on the fruit, beam of torchlight was focussed on them, which stupefied them and made to stay on the fruit. Moths were collected by bringing a wide mouthed plastic container (0.5 to 1.0 litre capacity) very near and just below the fruit and closing the lid swiftly litre after the moth enters the container. Pieces of guava/banana fruits were placed carefully inside the container as food for the moths before and after transportation of the adults to the laboratory but not during transit to prevent damaging the moths.

Emerging/ field collected moths were enclosed in a nylon cage (2x2x3m) protected from rain and entry of rats by securing the sides firmly to the ground by placing wooden sticks or any other suitable material. The nylon net was provided with a zip at one corner for easy entry of a person for placing food and water. Ripened banana/guava were provided in small nylon bags with holes (10mm diam) hung inside the cage. Water was provided in plastic Petri-plates or shallow containers with dry wooden sticks to enable moths to siphon the water. Potted-vines of respective Menispermaceae (*T. cordifolia*, *C. hirsutus*, *A. cocculus*, *D. glaucescens*, *T. acuminata*, *C. pareira*) were provided inside the cage to induce egg laying by the females, though the eggs were not laid on these plants. The eggs were utilised for raising the culture.

Nylon cage used in the present studies was found suitable for adult rearing and oviposition. Kumar and Lal (1983) used a glasshouse of the size 2x3x4m size for breeding *O. fullonia* in Fiji. In spite of providing the potted-larval host plants, the females invariably laid eggs on the nylon surface at the corners of the net. Srivastava and Bogawat (1968) obtained unfertilised eggs when they tried to rear *Othreis* spp. in smaller cages. During the present studies, larger cages were used which provided enough space for moths to mate and lay fertilized eggs. Similar observation was made by Kumar and Lal (1983), Fay (1994) and Muniappan *et al.* (1995) who used larger glasshouse or screenhouse. Under caged condition the oviposition and post-oviposition period lasted for 7-8 and 25-28 days, respectively. The female moths started laying eggs 4-5 days after their emergence and continued to lay eggs for 7-8 days, though they survive for a period of 40 days. The eggs were removed every day morning to prevent parasitisation by egg parasitoids like *Trichogramma* spp. The eggs were removed using a wet brush and placed on a card. The card containing eggs was placed in mass larval rearing cage for hatching and further rearing. Hatched larvae on nylon mesh were collected with the help of a brush for further rearing.

Caterpillars of *O. materna* could feed and develop only on *T. cordifolia*, whereas *O. fullonia* could feed on *T. cordifolia*, *C. hirsutus*, *A. cocculus*, *D. glaucescens* and *T. acuminata*, and *O. homaena* could feed on *C. hirsutus*, *A. cocculus*, *D. glaucescens*, *T. acuminata* and *C. pareira*. Generally the larvae of all the three species had five and rarely six instars and invariably pupated inside a loose cocoon made by webbing leaves.

First, second and third instars parasitised (by *E. maternus*) larvae of *Othreis* spp. were usually found on the under surface of the respective larval host vines during August to November. *Euplectrus maternus* normally lay eggs on the first and second abdominal segments near the eyespots where the larvae also get attached soon after hatching and can be seen with the help of a hand lens (10x). The field parasitised caterpillars were reared on

respective plant leaves in glass vials (150 x 25 mm). The leaf bits were changed every day till the host larvae died and the parasitoids pupated.

Emerging adult parasitoids were enclosed in separate glass vials (150x25mm). Adult males are slightly smaller (2.31±0.04mm) than the females (2.67±0.06mm). Males possessed narrow and pointed abdomen, whereas in females the abdomen was slightly bulged and had a pair of brown sclerotised short lines (accessories of ovipositor) on the ventral side. A pair of male and female parasitoids was separated 4 days after their emergence to ensure the females were mated and used for mass multiplication. The enclosed pair in a glass vial (150x25mm) was provided with honey (50%) in cotton swab. A single first to third instar host larva along with a bit of its host plant leaf was enclosed into the vial till the parasitoids laid her eggs.

A single female laid 1-2 eggs on first instar and 2-7 eggs on second and third instar of *Othreis* spp. (Bhumannavar and Viraktamath, 2000). Only one egg developed into male on each instar and remaining were females. The sex ratio ranges from 1:1 (on I instar of host) to 1:4.04 (on II & III instar of host). For obtaining adequate number of males first instar host larvae were exposed. Second and third instar larvae were suitable for obtaining large number of females for field releases. A single host larva could be exposed to 2-3 females with a male in a glass vial for obtaining quick oviposition. The parasitised host larvae were removed immediately to prevent second female destroying the eggs laid by the previous female. The female parasitoid tends to feed on body contents of the host caterpillar by killing it on sixth and ninth day after her emergence. Eggs were not laid on fed caterpillars. Females were found to lay eggs continuously till a day prior to death. The oviposition period was 13 days. The results of this study indicated that continuous supplies of young larvae are essential for mass rearing of *E. maternus*.

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