Volume 2 Issue No. 1 December 1999
P-ISSN: 2244-4432 • E-ISSN: 2984-7125
National Peer Reviewed Journal
DOI: https://doi.org/10.59120/drj.v2i1.69

Distribution and Development of the Wasp, *Microgaster manilae* (Ashmead) [Hymenoptera: Braconidael, in the Cutworm, *Spodoptera litura*(F.)

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Abstract

Laboratory tests and field observation/collection were done in Ilocos Norte in 1990-91 to determine the developmental periods and occurrence of the parasitic wasp, *Microgaster manilae* (Ashmead). The latter was also determined in Northern Samar (1994) and Davao Oriental (1996) to have an insight of the Braconid's distribution. The parasitoid had a higher success of development in, and/or preference for the second instar cutworm larva. Its egglarval development ranged from 7 to 13 days with a mean of 8 and 13 days in the first and second instars, respectively. Pupal period was completed in days with the adult emerging usually in the morning. The occurrence of the Braconid in the north, central and southern part of the Philippines suggests its relatively wide distribution.

Keywords: *Microgaster manilae* (Ashmead), development, distribution, parasitization, *Spodoptera litura* (F.)

Introduction

The wasp, *Microgaster manilae* (Ashmead) [*Hymenoptera:Braconidae*], is a solitary, internal parasitoid attacking the larva of the cutworm, Spodoptera litura(F.) [*Lepidoptera: Noctuidae*]. This biological association results in a significant 50% parasitization in Ilocos Norte, Northwestern Luzon and appeared to be specific to Spodoptera species as hosts (Torreno 1990), contrary to the early report of Ashmead (1904) and Edrozo (1918) that M *manilae* also attacked the other Noctuid pests, *Helicoverpa armigera and Helicoverpa assulta*.

Although the Braconid wasp is an efficient natural enemy and could be considered as a major factor in regulating the population of the cutworm, the latter continues to cause serious damage on many crops. Plants that are commonly attacked by the Noctuid include more particularly the cruciferous, leguminous and solanaceous plants (Torreno 1992), on which control measure is frequently needed.

With the fast-rising popularity of the so-called natural food without "toxic treatments", the use of pesticide-free methods of controlling pests become more essential and relevant. One of these methods is the use of biological control applied either as enhancement, inoculative or inundative releases of parasitoids. Whichever technique to use, the developmental period of the natural enemy and its adaptability to different ecosystems have to be well understood. A sufficient knowledge of these aspects is a pre-requisite in mass rearing or enhancing the field population of this, or any natural enemy, towards a more effective and efficient biological control.
The study was conducted to determine the occurrence, host-age preference and development period of the Braconid wasp*, Microgaster manilae* (Ashmead) in the common cutworm, S. litura.

Methodology

Production of test insects

The stock parasitoids (19) were collected in the field as pupae with their cocoon glued on tobacco leaves where the host-cutworm hatched or adjacent hills where the pest migrated. In the laboratory, these cocoons were kept inside "Gerber" bottles covered with a fine mesh cloth until emergence of the adults. Meantime, the host-cutworm was reared continuously in the laboratory to have a ready supply of larvae for parasitization whenever there were parasitoids available. Adult cutworms were kept imide rearing cages (92 cm x 60 cm x 60 cm) with a potted tobacco plant at vegetative stage for oviposition. Potted plants with egg masses of the cutworm-were transferred daily to another cage and replaced with an egg-free plant.

Preference test

Two potted tobacco plants at maximum vegetative stage were placed inside a rearing screen cage lined with a fine mesh cloth. These plants were infested with 40 cutworm larvae; 20 were at first instar and the other 20 at second instar. Regardless of sex, ten newly-emerged parasitoids reared in the laboratory or collected from the field were released inside the cage for two days to test their host-age preference. Based on their instar, the larvae exposed to the I parasitoid were later collected and reared separately in acrylic rearing pans (18.3 cm dia x 8 cm height) to facilitate observation and for easy collection of pupae in cocoon.

Parasitoid development

Egg and larval development of the parasitoids were based on larvae parasitized in the laboratory. Observation on the pupal period included those that emerged from larvae that were collected in the field.

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Field collection/observation

Field population of cutworm larvae on any host plant, but mostly on Cruciferae, Fabaceae, and Solanaceae, were also noted or collected for observation to determine the occurrence of the parasitic wasp. Larvae showing symptoms of parasitization such as: thin, pale yellowish, very sluggish and undersized (Torreno 1990), were collected and reared in the laboratory for probable emergence of the parasitoid. The cutworm larvae that were encountered in the field to be bearing the typical cocoon of the parasitoid were simply recorded.

Results and Discussion

Oviposition preference

Microgaster manilae had parasitized both the first and second instar larvae of the cutworm, S. litura, but showed higher success and/or preference for the latter based on the percent emergence of full-grown, parasitic larvae from the Noctuid host (Table 1). The unidentified species of *Microgaster* attacking the same species of cutworm in China showed similar preference for second instar host-larva (Xu and Yang 1983). Similarly, *Microgaster croceipes* preferred the third instar larvae of *Heliothis* followed by the second and fourth instars and; the first and last instars as the least (Hopper and King 1984). However, *Microgaster brassicae* was observed• by Browning and Oatman (1985) to show equal preference on the first and second instars (0 — 6 days) of *Trichoplusia ni*, also a Noctuid.

Table 1. Ovipositional preference of *M. manilae* on two instars of *S. Litura* in the laboratory

Instar	*S. litura* Larvae Exposed	*S. litura* Larvae Parasitized	Percentage Parasitization	Percentage Mortality*
First	20	2	10[a]	90[b]
Second	20	13	65[b]	35[a]

t – test
* cause of death not determined

The lesser preference for the first instar could be due to its size that was too small to support the parasitoid. This probably explains why some of the specimens exposed to parasitization died before emergence of the parasitic larva. Hegazi et al., (1981) also observed some premature death of *spodoptera littoralis* attacked as first instar by *Microgaster rufiventris*.

Developmental period

The development period from oviposition to emergence of the full-grown larva of the parasitic wasp, in the host-cutworm was determined to be longer in the first instar (3 days or younger) as shown in Table 2. Hopper and King (1984) reported similar result on *M. croceipes* against *Heliothis zea* and *Heliothis virescens* in which the wasp's developmental time in an instar was inversely correlated with preference for that instar, suggesting that selection for rapid development has contributed to the observed p

Table 2. Development of *M. manilae* from oviposition to emergence of full-grown larva from *S. litura* larvae exposed at different instars, and the former's pupation period in the laboratory.

Instar/Stage	Number of Observations	Development (days) Duration (mean)	Range	Usual
First	14	12.71	11-13	13
Second	16	7.94	7-8	8
Pupa	56	5.52	4-7	5

The longer duration of development manifests the less suitability of the small and very young larva for parasitization. It is probable that either the small quantity of available food because of the larval-host size or the young larval-host could delay or even prevent hatching of the parasitoid's egg by encapsulation, it being in a stage of most rapid morpho-physiological development. The possibility of the latter is supported by the report of Hegazi et al., (1981) claiming that *S. littoralis* larva which was parasitized only once by *M. rufiventris* was often able to suppress the development of the parasitoid.

The difference in the developmental periods of the parasitoids in the two instars was however, within the range reported by Xu and Yang (1983) on the same pest-host.

Pupal period of *M. manilae* that were collected in the field or parasitized in the laboratory was 5.5 days based on 56 specimens which were kept at room temperature ranging from 21 to 3 I OC (Table 2). This is just a little longer than the three-to-five-day pupation of the Microgaster, also from cutworm as reported by Xu and Yang (1983) in China.

The wasp emerged mostly in the morning confirming further the previous

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report of Torreno (1990) on this Braconid species. Browning and Oatman (1985) suspected the event in M. brassicae Muesebeck to be light-stimulated.

Distribution

The Braconid wasp, *M. manilae*, could be considered to be well distributed in the Philipines. It was studied in the northwest (Ilocos Norte) and noted/collected in the central-east (Samar) and southeast. (Davao) areas of the country (Table 3). The occurrence of this parasitoid across the islands strengthens the earlier thesis of Torreno (1990) that M. manilae has a considerably wide range of adaptation. Considering its prevalence even during the long, dry and less humid conditions of Ilocos, it is not a surprise that it is also a biotic factor regulating the larval population of *S. litura* in th… st isl… *M.* *m*…

Table 3. Occurrence of *M. manilae* in three locations in the Philippines

Date	Place	No. of Specimens Collected
April 1990	Batac, Ilocos Norte	4
October 1991	Batac, Ilocos Norte	3
May 1994	Catarman, Northern Samar	5
October 1994	Catarman, Northern Samar	2
July 1995	Mati, Davao Oriental	1
March 1996	Mati, Davao Oriental	2

Literature Cited

Ashmead, W.H. 1904. A list ofthe Hymenoptera ofthe Philippine Islands, with description of new species. N.Y. Entomol. Soc. J. 12:1-22.

Browning, H.W. and E.R. Oatman. 1985. Reproductive biology of Microplitis brassicae (Hymn.:Braconidae), parasite of the cabbage looper, Trichoplusia ni (Lepidoptera:Noctuidae). Ann. Entomol. Soc. Canad.78(3):369-372.

Edrozo L.B. 1918. A study of tobacco worms and methods of control. Philipp. Agric. and Forest. 6(7):195-209.

Hegazi, E.M., I. Abdel-Fattah and M. Kolaib. 1981. Laboratory studies on supernumerary parasitism by Chelonus inatitus L. and Microplitis rufiventris. Ann. Rev. Entomol. 69:716-17.

Hopper, K R. and E.G: King 1984. Frequency of Microplitis croceipes (Hymenopetra: Braconidae) from instar and species of Heliothis. Environ. Entomol. 3(4): 1145-1150.

Torreno, H. S. 1990. Parasitization behaviour and efficiency of the Braconid, Microgaster manilae (Ashmead) against the cutworm, Spodoptera litura (F.). Tropical Pest Management 36(2):128-130.