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**Biological notes on *Copidosoma* sp. (Hym., Encyrtidae),
an egg-larval parasite of *Heliothis armigera* Hb.
(Lep., Noctuidae) in Egypt**

By A. H. EL-HENEIDY and M. S. T. ABBAS

Abstract

The egg-larval parasite *Copidosoma* sp. is one of the recorded parasites of the american bollworm *Heliothis armigera* Hb. in Egypt. Some biological studies were carried out at $25 \pm 2^\circ\text{C}$ and $60 \pm 5\%$ R.H. Rearing of the parasite and its host is described. Developmental period of *Copidosoma* from egg to prepupa lasted 21–30 days with an average of 25 days. The prepupae remained inside the host larvae, which reached maturity, in diapause about 10–11 months (May–March), then pupated and issued as adult wasps. The pupal stage lasted 3–7 days with an average of 4.7 days. Mating occurred few hours after emergence of adults. Sex ratio was found to be 2 ♂♂ : 3 ♀♀ and 1 ♂ : 2 ♀♀ under field and laboratory conditions, respectively. Longevity of

both males and females of the parasite ranged 3–7 days under the same laboratory conditions. The parasite has only one generation annually. Number of parasites emerged from a single host larve reached 615 adults. Parasitised larvae by *Copidosoma* were collected only from Egyptian clover, Alfalfa and some weeds during March–May.

1 Introduction

Copidosoma sp. has a polyembryonic mode of reproduction. The parasite's egg multiplies within the host's egg into a varying number of cells, forming an embryo chain, which breaks up into its component parts, develops into large number of embryos and finally into larvae (CLAUSEN 1940).

MEGAHED et al. (1977) recorded *Copidosoma* sp. as an egg-larval parasite of the American Bollworm *Heliothis armigera* Hb. in Egypt. They reported that the percentages of parasitism by these species ranged between 3.3 % and 50 % with an average of 23.2 % during 1976.

It is noteworthy to indicate that, according to available literature, only one species belonging to genus *Copidosoma* (*C. obscurus* Nik.) was recorded as a parasite of *H. armigera* eggs (BOGUAH and RECHETNIKOVA 1973) in USSR.

The present study concerns with certain biological aspects of *Copidosoma* sp. when parasitising *H. armigera* under laboratory conditions.

2 Material and methods

To secure large numbers of *Copidosoma*, the following methods proved satisfactory for rearing the parasite and its host *H. armigera* in the laboratory. Rearing took place at $25 \pm 2^\circ\text{C}$ and $65 \pm 5\%$ R.H.

2.1 Host rearing

Samples of *H. armigera* larvae were collected biweekly from different localities and different host plants: cotton, tomato, clover and weeds. The larvae were fed on a semi-synthetic diet (SHOERY and HALE 1965) until pupation. The pupae were kept in glass jars (13×7 cm) until emergence of adults. Each three pairs of moths were confined in an oviposition cage consisted of a glass chimney, 17 cm long and 8 cm diameter, settled on a half petri-dish and its top was covered with muslin. Inside each cage, the moths were provided with honey as food and a strip of toilet tissue paper was hanged and fixed to the top of the chimney for egg-laying.

2.2 Parasite rearing

The adults of *Copidosoma* were obtained from parasitised larvae of *Heliothis* collected from the fields. The adults were paired and each five pairs were confined in glass jar covered with muslin and fixed with rubber band. Droplets of honey were scattered on the jar's wall to serve as food.

Paper strips carrying *Heliothis* eggs were introduced to the mated parasite females for 24 h after which the strips were removed. Then fresh eggs were introduced and so on until the death of adult parasites.

The parasitised eggs were kept in glass jars until they hatched. The hatched larvae were reared on the semi-synthetic diet, in glass jars, until reaching the 3rd instar and then reared individually in glass vials (7×2 cm), stoppered with cotton-wool until the emergence of adult parasites.

3 Results

3.1 Total developmental period

At $25 \pm 2^\circ\text{C}$ and $65 \pm 5\%$ R.H. the duration of *Copidosoma* sp. from egg to pre-pupa lasted 21–30 d with an average of 25 d. The prepupae of the

parasite remained inside the host larvae, which reached the 6th instar and became dry, swollen and with mummified appearance, in diapause. This diapause extended 10–11 months, under laboratory conditions, when they pupated and issued as adult wasps. The pupal stage lasted 3–7 d with an average of 4–7 d.

3.2 Mating

The two sexes of *Copidosoma* could be differentiated during the adult stage by the evidence of the female's ovipositor which appears clearly at the end of its abdomen. Mating took place within few hours after emergence of adults. The mating process lasted 2–8 min with an average of 3–7 min.

3.3 Sex ratio

The sex ratio between the emerged adults of *Copidosoma* collected from the fields was 2 ♂♂ : 3 ♀♀, while it was 1 ♂ : 2 ♀♀ under the laboratory conditions.

3.4 Longevity

Under laboratory conditions ($25 \pm 2^\circ\text{C}$ and $65 \pm 5\%$ R.H.) longevity of the parasite female ranged between 3 and 6 d with an average of 5 d and that of the male 3–7 d with an average of 6 d.

3.5 Annual generations

The parasitised larvae of *H. armigera* were obtained from the fields only during March–May and the adult parasites emerged from these larvae during March or April next year, then it could be deduced that *Copidosoma* sp. has only one complete generation annually. The same result was obtained under laboratory conditions. Such result agrees with the mentioned facts of CLAUSEN (1940).

3.6 Number of parasites emerged from a single host larva

CLAUSEN (1940) mentioned that the number of parasites that are able to complete development in a single host is dependent upon the size of the latter, sometimes it reaches 3000 individuals. He noted also that the large number of brood may arise from a single parasite egg, or it may be the result of several ovipositions. Under the prevailing laboratory conditions the number of *Copidosoma* adults emerged from a single *Heliothis* larva ranged between 20 and 615 with an average of 347 adults. The emergence holes per larva reached 39 holes in our study.

3.7 Host plants

It was observed that the parasitised larvae of *Heliothis* by *Copidosoma* sp. were collected only from Egyptian clover (*Trifolium alexandrinum* L.), Alfalfa (*Medicago sativa* L.) and the weeds Barnoof (*Conyza dioscoridis*), Molheih (*Cressa cretica*) and Oqhowaan (*Chrysanthemum coronarium*) during March–May. The collected samples of *Heliothis* from the other host plants such as cotton (June–August) or tomato (September–December) were not parasitised by *Copidosoma* sp. This matter of fact may be due to, as mentioned before, the diapause period of the parasite (May–March) as pre-pupae inside the host larvae.

Zusammenfassung

Zur Biologie von *Copidosoma* sp. (Hym., Encyrtidae), einem Ei-Larven-Parasiten von *Heliothis armigera* Hb. (Lep., Noctuidae) in Ägypten

Labor- und Freilanduntersuchungen ergaben, daß die Entwicklungszeit von *Copidosoma* sp. in *Heliothis*-Eiern und Raupen vom Ei bis zur Vorpuppe 21 bis 30 Tage (m = 25 Tage) dauerte. Die Vorpuppen blieben im Inneren der Wirtsraupen 10 bis 11 Monate (Mai bis März) in Diapause; danach verpuppten sie sich und wurden zu Schlupfwespen. Das Puppenstadium dauerte 3 bis 7 Tage (m = 4,7 Tage). Die Kopulation fand einige Stunden nach dem Schlüpfen der Imagines statt. Als Geschlechterverhältnis wurden im Freiland 2 ♂♂ : 3 ♀♀ und im Labor 1 ♂ : 2 ♀♀ festgestellt. Die Lebensdauer der Schlupfwespen beider Geschlechter betrug 3 bis 7 Tage unter Laborbedingungen. Der Parasit hat eine Generation jährlich. Die Zahl der Nachkommen eines Parasiten-Weibchens betrug maximal 615. Parasitierte *Heliothis*-Raupen wurden nur an Ägyptischem Klee, Alfalfa und einigen Unkräutern während der Monate März bis Mai gefunden.

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Authors' addresses: Dr. A. H. EL-HENEIDY and Dr. M. S. T. ABBAS, Department of Biological Control Research, Institute of Plant Protection Research, Ministry of Agriculture, Dokki, Giza/Egypt