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Authors' address: J. MARGALIT (Director) and H. BOBROGLO (Res. Assistant), Center for Biological Control of Mosquitoes, Department of Biology, Ben-Gurion University of the Negev, Beer Sheva, Israel

Ministry of Agriculture, Plant Protection Research Institute, Biological Control Research Section, Dokki, Cairo, Egypt

Assessment of the role of *Coccinella undecimpunctata* L. (Col., Coccinellidae) as a biological control agent against *Spodoptera littoralis* Boisid.

By A. R. HAMED and FAWZIA A. HASSANEIN

Abstract

In order to contribute the results obtained previously by the authors on the role of *C. undecimpunctata* as a biological control agent, a series of laboratory experiments were conducted in prey preference of the adults of *C. undecimpunctata*. The results indicated that the beetle prefers aphids as prey over eggs and larvae of the cotton leaf worm. The daily mean of prey consumptions of six groups of insects were 55.3 ± 13.2 *S. littoralis* eggs; 5.1 ± 1.9 first instar larvae of *S. littoralis*; 18.7 ± 7.1 eggs plus 6.3 ± 2.4 larvae; 70.3 ± 16.5 *A. punicae* nymphs; 69.1 ± 10.1 nymphs plus 1.5 ± 0.7 eggs and 74.9 ± 15.3 nymphs plus 1.2 ± 1.0 larvae.

The longevity of adults fed on eggs or larvae of *S. littoralis* seem even to approach the case of total starvation (5.4 ± 1.9 ; 8.7 ± 5.0 and 3.6 days, respectively).

1 Introduction

A series of field and laboratory experiments were conducted in the biological control research section and sacha agric. experim. station, Nile delta with the aim of evaluation of the role of *C. undecimpunctata* as a biological control

agent against *S. littoralis* in Egypt. The results of the studies on the abundance of *C. undecimpunctata*, effect of insecticides on its abundance, its natural enemies, feeding capacity and prey preference of its different larval instars were published or under publication (HAMED and HASSANEIN 1979, 1983; HASSANEIN and HAMED 1983). The present work deals with the feeding capacity and prey preference of adults of *C. undecimpunctata*.

2 Materials and methods

Six groups of newly emerged beetles of *C. undecimpunctata* each composed of thirty beetles were used.

The beetles were isolated individually immediately after emerging and were provided daily with a certain number of prey till they died. The preys tested were: eggs of *S. littoralis*; first instar larvae of *S. littoralis*; combination of eggs and 1st instar larvae of *S. littoralis*, nymphs of *Aphis punicae*; combination of nymphs of *A. punicae* and eggs of *S. littoralis* and combination of *A. punicae* and 1st instar larvae of *S. littoralis*.

It was assured that the amount of food given daily to each beetle was always in excess. The number of preys consumed daily by the beetles was determined. The longevity of beetles, fed on different types of preys, was also studied.

The experiments were conducted at average temperature of 25 °C and 70 % R. H.

3 Results and discussion

The results obtained indicate the following:

3.1 Eggs of *S. littoralis* as a prey

The average total number of eggs consumed throughout the life span of the adult beetles was 309.8. The average number consumed per day was 55.3 ± 13.2 eggs. The average longevity of the adult was 5.4 ± 1.9 days.

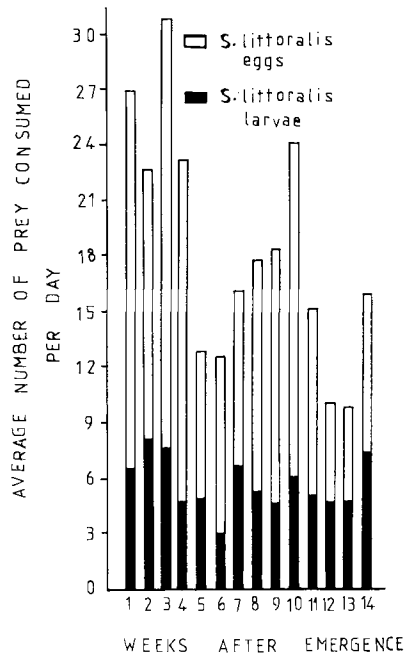
3.2 First instar larvae of *S. littoralis* as a prey

The adult of *C. undecimpunctata* consumed a rather small number of larvae in comparison to the eggs of *S. littoralis*. The average total number of larvae consumed was 49.1 during the adults life, which was very short. The average number of larvae consumed by beetles per day 5.1 ± 1.9 . The average longevity was 8.7×5.0 days.

3.3 Combination of eggs and first instar larvae of *S. littoralis* as a prey

When combination of eggs and first instar larvae of *S. littoralis* was offered,

Average numbers of *S. littoralis* eggs and first instar larvae consumed daily by a single adult of *C. undecimpunctata* during its life span



the total average consumption during the adults life was 210.2 eggs and 61.5 larvae. The average number consumed per day was 18.7 ± 7.1 eggs and 6.3 ± 2.4 larvae. The figure summarized graphically the average numbers of eggs and larvae of *S. littoralis* consumed daily by a single larvae during its life span. The average longevity of the adult was 9.7 ± 6.7 days (figure).

3.4 *Aphis punicae* nymphs as a prey

C. undecimpunctata beetle consumed an average total number of 5403.3 *A. punicae* nymphs throughout its life. The average number consumed per day was 70.3 ± 16.5 nymphs. The average longevity of the adult was 81.5 ± 6.2 days.

3.5 Combination of *S. littoralis* eggs and *A. punicae* nymphs as a prey

The adults of *C. undecimpunctata* prefer to fed on *A. punicae* nymphs more than on *S. littoralis* eggs. The average total number consumed by the adult throughout its life was 142 eggs and 6839.8 nymphs. The average number consumed daily was 1.5 ± 0.7 eggs and 69.1 ± 10.1 nymphs. The average longevity of the adult was 99 ± 10.5 days.

3.6 Combination of *S. littoralis* larvae and *A. punicae* nymphs as a prey

In case of offering a combination of *S. littoralis* first instar larvae and *A. punicae* nymphs as a prey, the average total number of prey consumed by one adult throughout its life was 406 larvae and 3251.8 nymphs. An average number of 1.2 ± 1.0 larvae and 74.9 ± 15.3 nymphs was consumed daily.

4 Conclusion

It is obvious that the beetle of *C. undecimpunctata* prefers aphids as prey over eggs and larvae of the cotton leaf worm. On the other hand, eggs of *S. littoralis* seem to be more preferred than first instar larvae of the same insect.

The longevity of adults seems to be highly affected by the kind of prey. The longevity of adults fed on eggs or larvae of *S. littoralis* seem even to approach the case of total starvation.

The results obtained may contribute the results obtained previously by the authors on the feeding capacity and prey preference of the larvae of *C. undecimpunctata*. It may clarify also the statement previously mentioned (HAMED and HASSANEIN 1979, 1983) that the numbers of *C. undecimpunctata* in cotton fields during June and July rather small in comparison to the numbers of other species of predators, which prefer *S. littoralis* eggs and larvae as a prey.

Zusammenfassung

Untersuchungen über die Rolle der Adulten von Coccinella undecimpunctata L. (Col., Coccinellidae) als Mittel zur biologischen Bekämpfung von Spodoptera littoralis Boisid.

Laborexperimente mit *C. undecimpunctata* zeigten, daß die Käfer Blattläuse als Beute gegenüber Eiern und Larven von *S. littoralis* vorzogen. Das Tagesmittel des Beuteverzehr aus 6 Gruppen Käfern betrug: $55,3 \pm 13,2$ *S. littoralis*-Eier, $5,1 \pm 1,9$ Erstlarven von *S. littoralis*, $18,7 \pm 7,1$ Eier

plus $6,3 \pm 2,4$ Larven, $70,3 \pm 16,5$ *Aphis punicae*-Nymphen, $69,1 \pm 10,1$ Nymphen plus $1,5 \pm 0,7$ Eier sowie $74,9 \pm 15,3$ Nymphen plus $1,2 \pm 1,0$ Larven. Die Lebensdauer von Käfern, die sich nur von Eiern oder Larven von *S. littoralis* ernährten, schien sich sogar jener bei völligem Hungern zu nähern: $5,4 \pm 1,9$ (Eier), $8,7 \pm 5,0$ (Larven), $3,6$ (Hunger) Tage.

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Authors' address: Dr. A. R. HAMED and Dr. FAWZIA A. HASSANEIN, Ministry of Agriculture, Plant Protection Research Institute, Biological Control Research Section, Dokki, Cairo, Egypt

Insect Biocontrol Unit, Plant Protection Department, and College of Agriculture, University of Assiut, Egypt

Studies on certain factors affecting the egg deposition of the parasitoid, *Bracon brevicornis* Wesm. (Hym., Braconidae)

By S. A. TEMERAK

Abstract

Four factors affecting eggs deposition of *Bracon brevicornis* were undertaken: 1. Five host species exposed separately and three exposed jointly to determine ovipositional preference and distribution pattern of eggs on body segments of larvae. 2. Age of parasitoid female. 3. Size of host larvae within a species and, 4. *Sesamia cretica* larvae exposed under three cases of host manipulations.

Ephestia cautella larvae received the lowest number of eggs deposited by the parasitoid. Females of *Bracon* showed ovipositional preference to deposit more eggs on the abdominal segments, especially 3, 4, 5, and 6, per any tested species. Females of the parasitoid also showed preference to deposit more eggs on *S. cretica* than on *Ostrinia nubilalis* when these larvae were exposed in combination to the parasitoid.

A 2 day old of parasitoid female had the ability to deposit the higher number of eggs than other ages. Ovipositional preference was recorded on large *S. cretica* larvae than small when exposed jointly to the parasitoid. Female of the parasitoid supplied daily with fresh *S. cretica* larva deposited significantly the greatest number of eggs than when kept with the "unchanged" larva (associated or not with daily elimination of possible eggs).

1 Introduction

The braconid, *Bracon brevicornis* Wesm. is a native, gregarious, and larval ectoparasitoid of many destructive insect pests in Egypt. Among its more important hosts are the pink bollworm, *Pectinophora gossypiella* Saund., the