

**COMPARATIVE STUDY OF THE PARASITISM BY
MICROPLITIS RUFIVENTRIS KOK. (HYMENOPTERA :
BRACONIDAE) and *PERIBOEAE ORBATA* WIED. (DIPTERA :
TACHINIDAE) ON MAIN LEPIDOTEROUS PESTS IN
VEGETABLE CROP FIELDS IN EGYPT**

by FAWZIA A. HASSANEIN and A.H. EL-HENEIDY

Dept. of Biological Control, Plant Protection Research
Institute, A R C, Dokki, Giza, EGYPT.

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INTRODUCTION

In recent years, there is growing evidence that natural balance between pests and their natural enemies has been upset, largely due to the expanded application of pesticides, mainly in cotton fields.

A change of pattern of parasitism during the last three decades has taken place in Egypt by the occurrence of *Microplitis rufiventris* Kok. as the most efficient parasitoid of the cotton leafworm, *Spodoptera littoralis* Boisd., in place of tachinid parasitoids which had prevailed earlier (Kamal, 1951; Hafez, 1972 and Hafez et al, 1981).

In Egypt, *M. rufiventris* as well as the tachinids, especially *Periboea orbata* Wied. (*Strobliomyia aegyptia* (Villen), were recorded by several authors (Hammad et al., 1965; Hegazi et al., 1977; Megahid et al., 1977; Hafez et al, 1981; Assal & Kolaib, 1984 and Hassanein & El-Heneidy, 1985) as efficient parasitoid species on the larvae of *S. littoralis*, *Spodoptera exigua* (Hubner) and *Heliothis armigera* Hb.

According to the fact that vegetable fields are mostly not subjected to insecticidal applications, therefore, vegetable agroecosystems are considered convenient media to evaluate the role of parasitoids.

The present study was conducted to evaluate the efficiency of each parasitoid species on its main hosts to compare between their parasitic role in the eighties.

METHODS

Throughout 6 years (1982-1987), bi-weekly extensive samples (519 samples) of larvae of *S. littoralis*, *S. exigue* and *H. armigera* were collected from certain infested vegetable fields in most of the Governorates of lower — and middle Egypt. The Governorates surveyed were Fayoum, Beni-Suef and Giza (middle Egypt), Qalubia, Menoufia, Gharbia, Sharkia, Dakahlia, Kafr El Sheikh and Behera (lower Egypt) and the vegetable crops were cabbage, Jew's mallow (mloukia), okra, tomato, cowpes, eggplant, lettuce and green pepper.

After being counted, larvae of different species were reared under laboratory conditions on the semi-synthetic diet of Shorey and Hale (1965) till emergence of the adults of either hosts or parasitic species. Parasitoids were identified and counted and the percentage of parasitism by each parasitoid species was estimated.

RESULTS

Larvae of *S. littoralis*, *S. exigua* and *H. armigera* represented 83, 10 & 7% of the collected samples, respectively. The following is a discussion of each species :

Spodoptera littoralis Boisd.

Number of collected larvae of *S. littoralis* fluctuated from year to another and even during the same year according to the rate of infestation, kind of vegetable crop and date and place of sampling.

As shown in Table (I), the total number of collected larvae reached 30467 larvae. The greatest numbers were represented by 7270 and 7991 larvae during 1984 and 1985 seasons, while the lowest was 2116 larvae collected in 1986.

In general, highest numbers of larvae were collected during the period July — October. Among these months, August ranked first (7882 larvae). However, least numbers of larvae were collected during the period from December to April.

TABLE I

Number of *S. littoralis* larvae and percentages of parasitism by *M. rufiventris* and *P. orbata* in vegetable fields during the period 1982 - 1987.

Year	No. of host larvae	<i>M. rufiventris</i>		<i>P. orbata</i>	
		No. of parasitized larvae	%	No. of parasitized larvae	%
1982	6081	307	5.0 (0.0—20.0)	136	2.2 (0.0—4.2)
1983	2602	66	2.5 (0.0—20.0)	60	2.3 (0.0—3.8)
1984	7270	99	1.4 (0.0—6.0)	42	0.6 (0.0—2.7)
1985	7991	144	1.8 (0.0—10.4)	126	1.6 (0.0—8.2)
1986	2116	19	0.9 (0.0—2.0)	41	1.9 (0.0—5.6)
1987	4402	14	0.3 (0.0—2.5)	54	1.2 (0.0—1.6)
Total	30467	649	2.1 (0.0—9.9)	459	1.5 (0.0—2.8)

Highest numbers of *S. littoralis* larvae were collected from cabbage, mloukia and okra, especially from Fayoum, Beni-Suef and Qalubia Governorates.

Obtained data indicate that in the six years of study, percentage of parasitism by the two parasitoid species was zero during the period from January till April.

The total percentage of parasitism increased to reach 3.4% by *Microplitis* during May and 1.5% by *Periboaea* during June; followed by sharp decreases to 0.2 and 0.9% by the two parasitoids, respectively, in August (Fig. I).

Starting from September, gradual increase in the percentages of parasitism was observed again to reach the maxima of 9.3 and 9.9% during November and December, respectively, by *Microplitis* and 2.8 and 2.7% during October and November, respectively, in case of *Periboaea*.

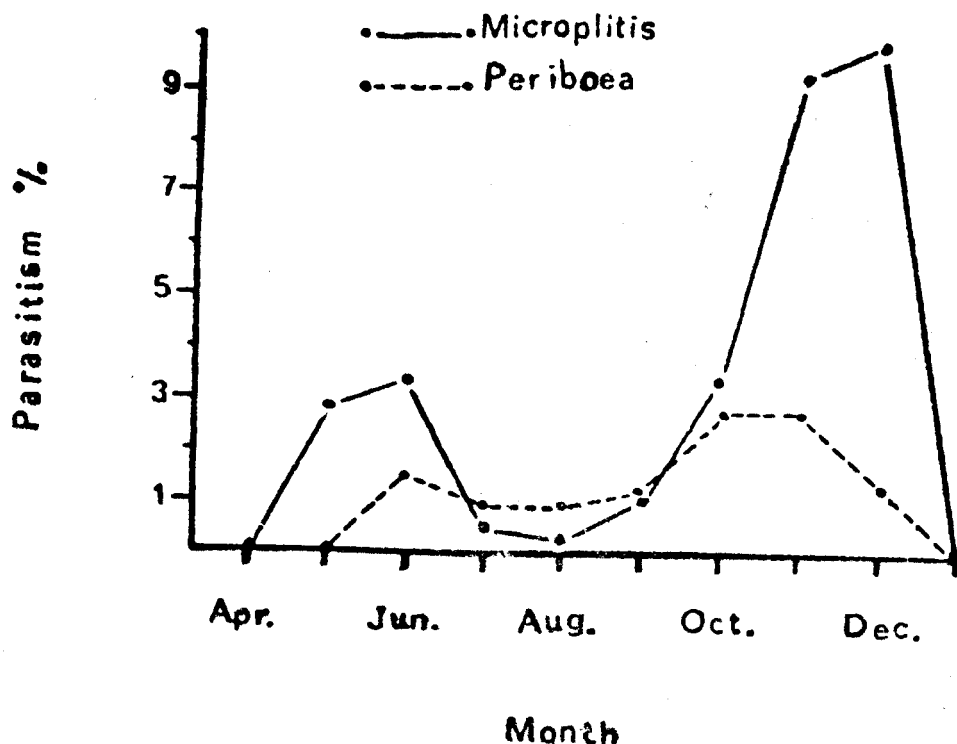


Fig. 1. Monthly averages of the percentages of parasitism by *M. rufiventris* and *P. orbata* on *S. littoralis* in vegetable fields for the period 1982 - 1987.

It was also observed that the monthly percentage of parasitism by *Microplitis* mostly exceeded that of *Periboea* in all months except July and August and reached about three folds in November and five folds in December.

Highest monthly percentages of parasitism by *Microplitis* were recorded during May, 1982 (15.2%), May, 1982 (20.0%) and December, 1982 (20.0%). Therefore, the year 1982 represented the highest rate of parasitism during the six years of study.

Highest monthly percentages of parasitism by *Periboea* was recorded in June, 1985 (8.2%).

In general, the parasitism by *Periboea* increased during the period June-September; this period is laid between the two recognized periods of *Microplitis*'s activity, May - June and October - December (Fig. 1).

In case of *Microplitis*; a gradual decrease in the total yearly percentage of parasitism was observed, being from 5.0% in 1982 to 0.3% in 1987. However, in case of *Periboea*, more or less equivalent percentages of parasitism (1.2-2.3%) were recorded, except in 1984 (0.6%) (Table I).

Relatively low rates of parasitism was obtained in the total evaluation of the parasitism on *S. littoralis* by the two considered parasitoid species; it was 2.1, 1.5% in case of *Microplitis* and *Periboea*, respectively. On the other hand, the total percentages of parasitism by *Microplitis* exceeded that of *Periboea* in the first four years of study and then reversed in the last two years.

Spodoptera exigua Hubner

The total number of *S. exigua* larvae collected from different vegetable crops throughout the period 1983-1987 reached 950 larvae, the greatest number was collected during 1986 (Table II).

Microplitis rufiventris was recorded yearly during the study, while *Periboea orbata* was recorded only once in 1986, 1.7% parasitism.

Total percentage of parasitism was 2.9% by *Microplitis* and 0.9% by *Periboea*.

TABLE II

Number of collected *S. exigua* larvae and percentage of parasitism by *M. rufiventris* and *P. orbata* in vegetable fields during the period 1983-1987.

Year	No. of host larvae	<i>M. rufiventris</i>		<i>P. orbata</i>	
		No. of parasitized larvae	%	No. of parasitized larvae	%
1983	24	1	4.2	0	0.0
1984	72	8	11.1	0	0.0
1985	52	2	3.9	0	0.0
1986	289	3	1.1	5	1.7
1987	153	3	2.0	0	0.0
Total	590	17	2.9	5	0.9

The highest percentage of parasitism (11.1%) by *Microplitis* was recorded in 1984, while the least percentage (1.1%) was reported in 1986.

Microplitis activity on *S. exigua* was observed during the months May, November and December, while that of *Periboea* occurred only in December.

Cabbage, mloukia and cowpea were the most infested vegetable crops by *S. exigua*, especially at Fayoum, Giza and Qalubia, from where most of the collections were taken.

Heliothis armigera Hubner

H. armigera was a secondary pest during the years of study, compared to its status in the seventies.

The total number of *H. armigera* larvae collected during the six years of the study reached 387 larvae, the greatest number was 155 larvae in 1983 (Table III).

M. rufiventris was recorded parasitizing *H. armigera* only in the two years 1983 and 1985; the respective rates 1.3 and 1.2% were recorded. Generally, the total percentage of parasitism by this parasitoid in the whole years of study was relatively very low (0.8%). On the other hand, *P. orbata* was not secured on *H. armigera* during the present investigation.

TABLE III

Number of *H. armigera* larvae and percentage of parasitism by *M. rufiventris* and *P. orbata* in vegetable fields during the period 1982 - 1987.

Year	No. of host larvae	<i>M. rufiventris</i>		<i>P. orbata</i>	
		No. of parasitized larvae	%	No. of parasitized larvae	%
1982	15	0	0.0	0	0.0
1983	155	2	1.3	0	0.0
1984	108	0	0.0	0	0.0
1985	83	1	1.2	0	0.0
1986	6	0	0.0	0	0.0
1987	20	0	0.0	0	0.0
Total	387	3	0.8	0	0.0

M. rufiventris was reported on *H. armigera* during May and June and most of the host individuals were collected from tomato at Fayoum Governorate.

DISCUSSION

Total number of samples collected during the six years of study reached 519 samples. They were represented by 431, 52 and 36 samples for the lepidopterous larvae, *S. littoralis*, *S. exigua* and *H. armigera*, respectively.

Vegetable crops highly infested with *S. littoralis* and *S. exigua* were cabbage (190 samples), mloukia (135 samples) and okra (59 samples), while tomato (25 samples) was the most infested vegetable crop with *H. armigera*.

Most of the collections were from Fayoum, Beni-Suef and Qalubia Governorates, where 190, 101 and 59 samples were collected, respectively. These samples showed also the highest percentages of parasitism.

Samples of *S. littoralis* outnumbered those of the other two pests. Although the highest population of *S. littoralis* was reported in August, the rate of parasitism was represented by the lowest figure (0.2 - 0.9%). This fact could be interpreted to the seasonal insecticidal spraying of cotton fields that is usually carried out during this month. Actually, this spraying has direct harmful effect on the natural enemies in vegetable fields (Hassanein et al, 1985).

Microplitis rufiventris Kok. was secured on *S. exigua* all over the six years of study, while *Periboëa orbata* Wied. was recorded only once in 1986, with 1.7% parasitism.

M. rufiventris was recorded on *H. armigera* only in the two years, 1983 and 1985, with 1.3 and 1.2% parasitism, respectively, while *P. orbata* was not secured at all on this pest throughout the whole period of study.

Highly parasitic role of *M. rufiventris* on the three lepidopterous pests was observed during two main periods; May - June and October - December, while that of *P. orbata* was observed during the period July - September. This might be due to a type of competition between both parasitoid species.

Generally, the total percentage of parasitism by the two parasitoids were relatively low throughout the six years of study, but the role of *M. rufiventris* was comparatively higher than that of *P. orbata*. Total percentages of parasitism were 2.1, 2.9 and 0.8% by *Microplitis*, compared to 1.5, 0.9 and 0.0% by *Periboëa* on the larvae of *S. littoralis*, *S. exigua* and *H. armigera*, respectively.

This conclusion is in agreement with the previous findings of Hafez et al. (1981), Hassanein and El-Hencidy (1985) and Hassanein et al. (1985), that the parasitic role of *M. rufiventris* still exceeds that of *P. orbata* on the main lepidopterous pests in vegetable fields in Egypt.

SUMMARY

Comparative study of the parasitism by the braconid, *Microplitis rufiventris* Kok. and the tachinid, *Periboea orbata* Wied. on the main lepidopterous pests in vegetable fields was carried out for six years; 1982 - 87.

Bi-weekly samples of the larvae of *Spodoptera littoralis* Boisd., *S. exigua* and *Heliothis armigera* Hb. were collected from 10 vegetable crop fields in 10 Governorates. Emerged parasitoid species were identified and their percentages of parasitism were estimated.

Collected samples were 431 of *S. littoralis*, 52 of *S. exigua* and 36 of *H. armigera*. Cabbage, mloukia and okra were the most infested vegetable crops with *S. littoralis* and *S. exigua*, while tomato was preferable to *H. armigera*.

Total percentages of parasitism were 2.1, 2.9 and 0.8% by *M. rufiventris* compared to 1.5, 0.9 and 0.0% by *P. orbata* on *S. littoralis*, *S. exigua* and *H. armigera*, respectively.

Generally, the parasitic role of *M. rufiventris* was comparatively higher than that of *P. orbata* on the main lepidopterous pests in vegetable fields in Egypt.

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