

NATURAL ROLE OF *ERETMOCCERUS MUNDUS* MERCET  
AND *PROSPALTELLA LUTEA* MASI ON POPULATION OF  
*BEMISIA TABACI* GENN.

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Abstract

Field experiments were conducted throughout 1983/84 and 1984/85 seasons to study the role of *Eretmocerus mundus* Mercet and *Prospaltella lutea* Masi, in suppressing *Bemisia tabaci* Genm. populations on 15 host plants.

Percentages of parasitism were estimated for each parasite, in different host plants infested with *B. tabaci* larvae and pupae. Positive correlation was detected between the population density of *B. tabaci* larvae and pupae and the number of parasitized individuals. The highest percentages of parasitism occurred one or two months before harvesting of summer crops and at the early months after cultivation of winter crops. *P. lutea* was more abundant on early summer plantations, while *E. mundus* was more abundant on winter plantations.

The percentages of parasitized *B. tabaci* differed on the different host plants. Data on the fluctuations of *E. mundus* and *P. lutea* indicated that the role of both parasites against *B. tabaci* was generally more pronounced during August, September, and October. The highest ratio of *E. mundus* males was obtained in October and January (53.22 and 60.32% in 1983/84 and 1984/85, respectively). For *P. lutea*, the highest ratio of males was obtained in January and February (59.26 and 57.14% in 1983/84 and 1984/85, respectively).

INTRODUCTION

The two aphelinid parasitoids, *Eretmocerus mundus* Mercet and *Prospaltella lutea* Masi were surveyed by el-Sayed (1981) as the most common on larvae and pupae of the cotton whitefly, *Bemisia tabaci* Genm. at Shebin-el-Kom district, Menoufia Governorate. The host range and morphology of *E. mundus* immature forms were given by Hafez *et al.*

Table 4. Sex-ratio of *E. mundus* and *P. lutea* under field conditions throughout two successive seasons (percentage of males in the total population).

Months	1983/84 season		1984/85 season	
	<i>E. mundus</i>	<i>P. lutea</i>	<i>E. mundus</i>	<i>P. lutea</i>
June	23.08	18.00	56.10	49.28
July	43.60	29.92	40.74	37.80
August	20.60	52.41	18.06	44.65
September	52.60	53.28	37.16	18.85
October	53.22	57.83	32.09	45.58
November	49.32	48.61	47.11	47.51
December	48.51	47.31	56.47	44.83
January	49.53	59.26	60.32	25.00
February	53.06	52.38	50.00	57.14
March	44.44	45.45	50.00	33.33
April	42.86	55.56	100.00	50.00
May	42.86	56.41	36.84	30.77
Overall	39.88	53.10	35.33	42.80

August in the first season and 60.32% in January and 18.06% in August during the second season. In case of *P. lutea*, the sex-ratio varied from 59.26% in January to 28.00% in June in the first season, while it was 57.14% in February and 18.85% in September during the second season.

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**INTRODUCTION**

The two aphelinid parasitoids, *Eretmocerus mundus* Mercet and *Prospaltella lutea* Masi were surveyed by el-Sayed (1981) as the most common on larvae and pupae of the cotton whitefly, *Bemisia tabaci* Genn. at Shebin-el-Kom district, Menoufia Governorate. The host range and morphology of *E. mundus* immature forms were given by Hafez *et al.*

As shown in Table 2, parasitism by *E. mundus* and *P. lutea* on *B. tabaci* larvae and pupae occurred in the majority of samples collected from all the winter host plants except broad bean and peas. This may be due to the absence or low rates of infestation on the different host plants were lower than those estimated for *E. mundus*. The highest percentages of parasitism were observed during early winter and gradually decreased during the succeeding months of the season. During the first season (1983/84), the highest parasitism percentages by *E. mundus* were detected during October on cabbage (10.3%), cauliflower (14.9%) and cucumber (14.2%), during November on potato (25.8%), during December on bean (15.0%) and vegetable marrow (11.0%), and during January on tomato (9.1%). However, nearly similar percentages were recorded during the second season (1984/85) in October on cauliflower and bean, November on vegetable marrow and cucumber, December on tomato and during January on potato and cabbage.

### (B) Winter plantation:

Irrespective of the host plant species, the percentages of parasitism by *E. mundus* during summer plantation reached 3.7-18.9% and 0.1-28.8% during the first and second seasons, respectively. Those for *P. lutea* ranged between 4.5 to 19.6% and 4.1 to 37.8%, respectively (Table 1).

The overall percentages of parasitism by *E. mundus* on different host plants varied between 7.1% on tomato to 19.3% on bean, and 6.8% on pepper to 24.2% on eggplant during the first and second seasons, respectively. However the corresponding percentages by *P. lutea* ranged between 6.2 to 20.9% and 16.9 to 36.3% in both seasons, respectively.

During the first season the highest parasitism by *P. lutea* occurred during August on vegetable marrow and cucumber (22.8 and 22.2%, respectively); during September on pepper (21.9%), on okra (22.7%) and on cowpea (17.5%). During October, parasitism occurred on eggplant (22.6%), soybean (23.6%) and bean (22.5%). In 1984 summer season, the maximum percentages of parasitism were observed during September on different summer host plants (Table 1).

During the first season the highest parasitism by *E. mundus* occurred during September on tomato, eggplant, pepper, okra, bean, and cowpea (12.3, 21.6, 14.4, 16.1, 22.6, and 11.0%, respectively). However, parasitism occurred during August on vegetable marrow (22.5%) and cucumber (19.6%), and during October on soybean (14.6%). In the second season, high percentages were detected in September on eggplant (28.4%), pepper (12.1%), okra (24.8%), soybean (32.1%), vegetable marrow (29.2%), and cucumber (32.5%).



Table 1. Percentages of parasitism on *Bemisia tabaci* larvae and pupae infesting different host plants during summer plantations throughout 1983 and 1984 successive seasons.

Host plant	Months			2nd season: June 1984												1st season: May 1983											
	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C									
Tomato	2	0.0	0.0	70	0.0	4.3	80	0.0	5.0	3	0.0	0.0	62	0.0	0.0	62	0.0	0.0									
	20	0.0	0.0	68	2.9	5.9	760	0.0	11.8	24	0.0	20.8	221	1.4	5.9	268	2.2	11.9									
	21	0.0	16.7	76	0.0	7.9	373	6.2	29.8	36	8.3	11.1	184	3.3	13.6	286	6.3	18.2									
Eggplant	72	1.4	4.2	349	16.9	22.6	3582	28.4	38.3	58	12.1	22.4	863	24.8	37.1	1277	32.1	42.1									
	21	0.0	37	76	0.0	7.9	373	6.2	29.8	36	8.3	11.1	184	3.3	13.6	286	6.3	18.2									
	763	12.3	7.9	349	16.9	22.6	3582	28.4	38.3	58	12.1	22.4	863	24.8	37.1	1277	32.1	42.1									
Pepper	72	1.4	4.2	349	16.9	22.6	3582	28.4	38.3	58	12.1	22.4	863	24.8	37.1	1277	32.1	42.1									
	21	0.0	37	76	0.0	7.9	373	6.2	29.8	36	8.3	11.1	184	3.3	13.6	286	6.3	18.2									
	763	12.3	7.9	349	16.9	22.6	3582	28.4	38.3	58	12.1	22.4	863	24.8	37.1	1277	32.1	42.1									
Okra	72	1.4	4.2	349	16.9	22.6	3582	28.4	38.3	58	12.1	22.4	863	24.8	37.1	1277	32.1	42.1									
	21	0.0	37	76	0.0	7.9	373	6.2	29.8	36	8.3	11.1	184	3.3	13.6	286	6.3	18.2									
	763	12.3	7.9	349	16.9	22.6	3582	28.4	38.3	58	12.1	22.4	863	24.8	37.1	1277	32.1	42.1									
Soybean	72	1.4	4.2	349	16.9	22.6	3582	28.4	38.3	58	12.1	22.4	863	24.8	37.1	1277	32.1	42.1									
	21	0.0	37	76	0.0	7.9	373	6.2	29.8	36	8.3	11.1	184	3.3	13.6	286	6.3	18.2									
	763	12.3	7.9	349	16.9	22.6	3582	28.4	38.3	58	12.1	22.4	863	24.8	37.1	1277	32.1	42.1									
Bean	2	0.0	0.0	70	0.0	4.3	80	0.0	5.0	3	0.0	0.0	62	0.0	0.0	62	0.0	0.0									
	20	0.0	0.0	68	2.9	5.9	760	0.0	11.8	24	0.0	20.8	221	1.4	5.9	268	2.2	11.9									
	21	0.0	16.7	76	0.0	7.9	373	6.2	29.8	36	8.3	11.1	184	3.3	13.6	286	6.3	18.2									
Cowpea	72	1.4	4.2	349	16.9	22.6	3582	28.4	38.3	58	12.1	22.4	863	24.8	37.1	1277	32.1	42.1									
	21	0.0	37	76	0.0	7.9	373	6.2	29.8	36	8.3	11.1	184	3.3	13.6	286	6.3	18.2									
	763	12.3	7.9	349	16.9	22.6	3582	28.4	38.3	58	12.1	22.4	863	24.8	37.1	1277	32.1	42.1									
Vegetable marrow	72	1.4	4.2	349	16.9	22.6	3582	28.4	38.3	58	12.1	22.4	863	24.8	37.1	1277	32.1	42.1									
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	763	12.3	7.9	349	16.9	22.6	3582	28.4	38.3	58	12.1	22.4	863	24.8	37.1	1277	32.1	42.1									
Overall	72	1.4	4.2	349	16.9	22.6	3582	28.4	38.3	58	12.1	22.4	863	24.8	37.1	1277	32.1	42.1									
	21	0.0	37	76	0.0	7.9	373	6.2	29.8	36	8.3	11.1	184	3.3	13.6	286	6.3	18.2									
	763	12.3	7.9	349	16.9	22.6	3582	28.4	38.3	58	12.1	22.4	863	24.8	37.1	1277	32.1	42.1									
2nd season: Overall	2	0.0	0.0	70	0.0	4.3	80	0.0	5.0	3	0.0	0.0	62	0.0	0.0	62	0.0	0.0									
	20	0.0	0.0	68	2.9	5.9	760	0.0	11.8	24	0.0	20.8	221	1.4	5.9	268	2.2	11.9									
	21	0.0	16.7	76	0.0	7.9	373	6.2	29.8	36	8.3	11.1	184	3.3	13.6	286	6.3	18.2									
1st season: Overall	1	0.0	0.0	32	0.0	3.1	4	0.0	0.0	14	21.4	21.4	76	2.6	4.0	134	3.7	4.5									
	32	0.0	3.1	74	0.0	4.1	29	0.0	6.9	122	4.9	9.8	151	4.6	8.6	414	3.1	6.3									
	74	0.0	4.1	500	16.0	4.4	228	3.1	6.6	4659	22.5	22.8	5844	19.6	22.2	12610	7.3	10.5									
2nd season: June 1984	85	0.0	4.7	197	1.5	17.8	78	2.6	15.4	234	1.7	17.5	676	0.7	7.3	1842	1.5	10.9									
	207	2.4	28.5	207	2.4	28.5	84	3.6	28.6	1628	28.5	33.7	6487	18.3	27.8	9361	18.3	28.7									
	2418	27.1	35.5	2418	27.1	35.5	142	12.7	38.7	614	29.2	40.6	943	32.5	41.3	10246	28.8	37.8									
1st season: May 1983	1	0.0	0.0	32	0.0	3.1	4	0.0	0.0	14	21.4	21.4	76	2.6	4.0	134	3.7	4.5									
	32	0.0	3.1	74	0.0	4.1	29	0.0	6.9	1250	5.4	6.6	1394	10.3	13.3	2909	7.3	10.5									
	74	0.0	4.1	500	16.0	4.4	228	3.1	6.6	4659	22.5	22.8	5844	19.6	22.2	12610	7.3	10.5									
2nd season: Overall	85	0.0	4.7	197	1.5	17.8	78	2.6	15.4	234	1.7	17.5	676	0.7	7.3	1842	1.5	10.9									
	207	2.4	28.5	207	2.4	28.5	84	3.6	28.6	1628	28.5	33.7	6487	18.3	27.8	9361	18.3	28.7									
	2418	27.1	35.5	2418	27.1	35.5	142	12.7	38.7	614	29.2	40.6	943	32.5	41.3	10246	28.8	37.8									
Overall	2985	22.9	32.8	2985	22.9	32.8	361	7.8	28.9	3062	21.1	29.7	8738	17.1	26.0	24972	19.9	29.7									
	78	23.1	26.9	78	23.1	26.9	37	13.5	29.7	*	*	*	*	*	*	336	17.8	25.9									
	2418	27.1	35.5	2418	27.1	35.5	142	12.7	38.7	614	29.2	40.6	943	32.5	41.3	10246	28.8	37.8									

\* Data of removing plants from soil, A = number of individuals parasitized with *E. mundus*, B = % of individuals parasitized with *E. mundus*, C = % of individuals parasitized with *P. lutea*.

Table 2. Percentages of parasitism on *Bemisia tabaci* larvae and pupae infesting different host plants during winter plantations throughout 1983/84 and 1984/85 seasons.

Host plant	1st season: Oct. 1983			2nd season: Oct. 1984			1st season: Oct. 1983			2nd season: Oct. 1984		
	Nov.	Dec.	Jan. 1984	Nov.	Dec.	Jan. 1984	Nov.	Dec.	Jan. 1984	Nov.	Dec.	Jan. 1985
Tomato	A	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	B	3.4	2.5	3.2	2.0	9.1	5.5	2.0	3.7	6.0	4.3	9.1
	C	18	31	164	50	209	248	209	1020	427	12.5	15.0
Potato	A	6.7	0.0	6.8	8.0	3.1	22.6	0.0	0.0	3.3	11.0	5.3
	B	25.8	9.7	6.7	8.0	5.7	12.1	0.0	2.8	6.1	6.1	3.6
	C	31	645	923	8.0	29	24	17	1612	276	276	1916
Cabbage	A	10.3	2.2	3.8	5.6	3.5	0.0	17.7	3.1	3.3	3.3	3.3
	B	3.6	3.6	5.8	5.7	8.3	6.7	17.7	3.7	3.6	3.6	3.8
	C	2.2	10.3	17.3	5.7	0.0	6.7	17.7	4.841	3.7	3.7	3.8
Cauliflower	A	47	628	1031	76	16	38	181	4841	1555	2226	10430
	B	6.2	7.9	4.4	5.3	0.0	2.6	7.7	8.6	8.6	4.8	5.4
	C	14.9	3.0	2.6	5.3	0.0	10.5	7.7	6.1	6.1	2.4	3.7
Beans	A	49	49	31	49	55	31	49	605	287	90	1661
	B	2.0	2.0	3.2	2.0	5.5	3.2	2.0	9.1	15.0	11.1	8.0
	C	0.0	0.0	6.5	0.0	0.0	0.0	0.0	4.3	12.5	6.7	6.6
Vegetable marrow	A	17	0.0	248	50	209	248	17	1020	427	1638	1638
	B	8.0	8.0	3.1	8.0	3.1	22.6	8.0	3.3	11.0	5.3	5.3
	C	0.0	0.0	12.1	0.0	5.7	12.1	0.0	2.8	6.1	6.1	3.6
Cucumber	A	96	29	923	96	54	24	96	1612	276	1916	1916
	B	10.3	3.6	5.8	5.6	8.3	6.7	17.7	3.1	3.3	3.3	3.3
	C	2.2	10.3	17.3	5.7	0.0	6.7	17.7	4.841	3.7	3.7	3.8
Overall	A	236	22	160	49	55	31	49	605	287	90	1661
	B	3.4	9.1	6.8	2.0	5.5	3.2	2.0	9.1	15.0	11.1	8.0
	C	3.0	4.6	6.7	0.0	9.1	6.5	0.0	4.3	12.5	6.7	6.6
Overall	A	193	5	524	49	55	31	49	605	287	90	1661
	B	2.6	0.0	14.5	2.0	5.5	3.2	2.0	9.1	15.0	11.1	8.0
	C	4.2	0.0	8.8	0.0	9.1	6.5	0.0	4.3	12.5	6.7	6.6
Overall	A	312	84	610	96	92	84	96	903	903	361	312
	B	9.9	8.3	9.9	14.6	8.7	8.3	14.6	8.0	7.3	6.8	6.8
	C	6.1	4.0	6.1	7.3	9.0	4.0	7.3	8.0	5.2	7.3	5.2
Overall	A	312	84	610	96	92	84	96	903	903	361	312
	B	9.9	8.3	9.9	14.6	8.7	8.3	14.6	8.0	7.3	6.8	6.8
	C	6.1	4.0	6.1	7.3	9.0	4.0	7.3	8.0	5.2	7.3	5.2

\* Data of removing plants from soil, A = number of collected *B. tabaci* larvae and pupae, B = % of individuals parasitized with *E. mundus*, C = % of individuals parasitized with *P. lutea*.



bage (Table 2).

As for parasitism by *P. lutea* in the first season, the highest percentages were detected during October on cauliflower (12.8%), November on potato (9.7%) and cucumber (3.7%), December on bean (12.5%) and vegetable marrow (6.1%) and during January on tomato (4.6%) and cabbage (17.3%). During the second season the highest rates of parasitism were detected during October on cabbage, November on bean, vegetable marrow and cucumber, December on tomato and January on potato and cauliflower (Table 2).

In both seasons and during winter plantations, parasitism by *E. mundus* on most host plants (3.3-8.2% and 2.6-14.1%) was more than that of *P. lutea* (2.2-6.6% and 3.4-9.4%) (Table 2).

**(C) Early summer plantation:**

Data presented in Table 3 show that on most host plants, the parasitoids *E. mundus* and *P. lutea* started their activity about 1-3 months after infestation of plants with *B. tabaci*. The periods of occurrence of these parasitoids were generally shorter than those recorded during summer and winter plantations. Percentages of parasitism reached their maximum either at the time of harvesting or about one and two months before harvesting. In addition, *P. lutea* appeared to play a more effective role than *E. mundus*.

During the first season (1984), the highest percentages of parasitism by *E. mundus* occurred during June on potato (6.5%), July on pepper (9.1%) and bean (4.2%), and August on tomato, eggplant, okra, cotton, and soybean (27.0, 20.4, 25.9, 16.0, and 21.0%, respectively). With regard to *E. mundus* the same trend occurred during 1985 growing season but with lower percentages of parasitism (Table 3).

In case of *P. lutea*, the highest percentages of parasitism in the first season occurred during August on eggplant, okra, cotton, and soybean (24.5, 32.0, 26.2, and 35.9%, respectively) and during July on pepper (18.2%) and bean (15.6%). Also, lower rates of parasitism by the same parasite were detected on the different host plants during the second season.

Parasitism percentages by *E. mundus* on *B. tabaci* on different host plants ranged between 1.1-19.2% and 4.1-5.9% in both seasons, respectively. However, the corresponding percentages for *P. lutea* were 4.4-26.1% and 7.0-11.2%.

As a general conclusion, an initial rate of infestation by *B. tabaci* on host plants occurred early in the season, and a positive correlation was noticed between the numbers of *B. tabaci* individuals and the population of *E. mundus* and *P. lutea*. In both seasons, the percentages of parasitism reached their peaks about one or two months before harvesting during summer and early plantations. However, in winter plantations, the percentages of parasitism were generally higher during the early months after planting. The para-

Table 3. Percentages of parasitism on *Bemisia tabaci* larvae and pupae infesting different host plants during early summer plantations throughout 1984 and 1985 seasons.

Months	1st season: Mar. 1984			2nd season: Mar. 1985			Overall		
	A	B	C	A	B	C	A	B	C
Tomato	0	0	0	1	0	0	121	4.1	8.3
Apr.	44	2.3	4.6	4	0	0	45	6.7	11.1
May	27	3.7	3.7	11	0	0	24	4.2	12.5
June	19	5.3	15.8	36	2.8	5.6	36	2.8	5.6
July	105	3.8	8.6	11	0	0	24	4.2	12.5
Aug.	226	27.0	2.7	45	6.7	11.1	45	6.7	11.1
Overall	421	16.2	18.3	121	4.1	8.3	121	4.1	8.3
Eggplant	2	0	0	1	0	0	4.4	10.7	10.7
Apr.	26	3.9	0.0	6	0	0	59	5.1	8.5
May	44	8.7	0.0	3	0	0	24	4.6	13.6
June	35	10.3	0.0	10	0	0	22	4.6	13.6
July	130	3.9	10.0	22	4.6	13.6	24	4.6	13.6
Aug.	204	24.5	2.1	59	5.1	8.5	24	4.6	13.6
Overall	1107	16.8	21.1	41	2.4	7.3	59	5.1	8.5
Pepper	0	0	0	0	0	0	192	5.7	9.9
Apr.	23	4.4	0.0	0	0	0	192	5.7	9.9
May	44	0.0	0.0	18	5.6	5.6	143	4.9	9.8
June	56	5.4	7.1	31	9.7	12.9	143	4.9	9.8
July	184	6.5	7.6	0	0	0	192	5.7	9.9
Aug.	263	6.1	6.8	0	0	0	192	5.7	9.9
Overall	526	19.2	26.1	0	0	0	192	5.7	9.9
Potato	2	0	0	3	0	0	146	4.1	10.3
Apr.	7	0.0	0.0	3	0	0	69	4.4	11.6
May	17	0.0	0.0	5	0	0	32	3.1	6.3
June	71	2.8	9.9	37	5.4	13.5	32	3.1	6.3
July	68	7.4	19.9	32	3.1	6.3	69	4.4	11.6
Aug.	363	25.9	32.0	32	3.1	6.3	69	4.4	11.6
Overall	526	19.2	26.1	146	4.1	10.3	146	4.1	10.3
Okra	0	0	0	0	0	0	2120	21.4	14.1
Apr.	0	0	0	0	0	0	2120	21.4	14.1
May	10	0.0	0.0	5	0	0	736	3.7	11.1
June	47	2.1	6.7	9	0	0	736	3.7	11.1
July	15	0.0	0.0	48	4.2	10.4	1177	3.6	6.0
Aug.	237	16.0	56.2	42	4.7	11.2	1177	3.6	6.0
Overall	386	10.4	18.4	42	4.7	11.2	2120	21.4	14.1
Cotton	0	0	0	0	0	0	745	12.6	21.0
Apr.	0	0	0	0	0	0	745	12.6	21.0
May	10	0.0	0.0	2	0	0	401	21.0	35.9
June	26	3.9	0.0	6	0	0	186	3.8	10.8
July	23	4.4	8.7	13	0	0	186	3.8	10.8
Aug.	130	3.9	10.0	11	0	0	95	2.1	3.1
Overall	1107	16.8	21.1	41	2.4	7.3	95	2.1	3.1
Bean	0	0	0	0	0	0	41	2.4	7.3
Apr.	0	0	0	0	0	0	41	2.4	7.3
May	18	0.0	11.1	18	5.6	5.6	40	0.0	2.5
June	46	4.6	11.1	39	3.9	5.3	40	0.0	2.5
July	111	0.0	11.1	9	0.0	11.1	143	4.2	7.0
Aug.	299	3.3	9.4	21	4.8	9.5	21	4.8	9.5
Overall	299	3.3	9.4	21	4.8	9.5	21	4.8	9.5
Cowpea	0	0	0	0	0	0	63	0.0	4.7
Apr.	0	0	0	0	0	0	63	0.0	4.7
May	46	4.4	2.2	46	4.4	2.2	63	0.0	4.7
June	132	3.0	5.3	132	3.0	5.3	132	3.0	5.3
July	202	3.0	5.0	202	3.0	5.0	202	3.0	5.0
Aug.	458	3.3	4.6	458	3.3	4.6	458	3.3	4.6
Overall	458	3.3	4.6	458	3.3	4.6	458	3.3	4.6
Vegetable marrow	3	0	0	3	0	0	3	0	0
Apr.	3	0	0	3	0	0	3	0	0
May	23	0.0	10.0	23	0.0	10.0	23	0.0	10.0
June	89	7.9	10.1	89	7.9	10.1	89	7.9	10.1
July	317	4.7	9.2	317	4.7	9.2	317	4.7	9.2
Aug.	432	5.1	8.8	432	5.1	8.8	432	5.1	8.8
Overall	432	5.1	8.8	432	5.1	8.8	432	5.1	8.8
Cucumber	3	0	0	3	0	0	3	0	0
Apr.	3	0	0	3	0	0	3	0	0
May	28	0.0	28	28	0.0	28	28	0.0	28
June	154	5.2	7.1	154	5.2	7.1	154	5.2	7.1
July	412	4.6	7.5	412	4.6	7.5	412	4.6	7.5
Aug.	597	4.5	7.0	597	4.5	7.0	597	4.5	7.0
Overall	597	4.5	7.0	597	4.5	7.0	597	4.5	7.0
Soybean	0	0	0	0	0	0	0	0	0
Apr.	0	0	0	0	0	0	0	0	0
May	22	0.0	4.6	22	0.0	4.6	22	0.0	4.6
June	41	2.4	7.3	41	2.4	7.3	41	2.4	7.3
July	95	2.1	3.1	95	2.1	3.1	95	2.1	3.1
Aug.	186	3.8	10.8	186	3.8	10.8	186	3.8	10.8
Overall	186	3.8	10.8	186	3.8	10.8	186	3.8	10.8
Overall	745	12.6	21.0	745	12.6	21.0	745	12.6	21.0
Overall	339	5.6	8.9	339	5.6	8.9	339	5.6	8.9
Apr.	3	0	0	3	0	0	3	0	0
May	17	5.9	5.9	17	5.9	5.9	17	5.9	5.9
June	169	5.3	8.9	169	5.3	8.9	169	5.3	8.9
July	48	6.2	8.3	48	6.2	8.3	48	6.2	8.3
Aug.	102	5.9	9.8	102	5.9	9.8	102	5.9	9.8
Overall	339	5.6	8.9	339	5.6	8.9	339	5.6	8.9

\* Data of removing plants from soil, A = number of collected *B. tabaci* larvae and pupae, B = % of individuals parasitized with *E. mundus*, C = % of individuals parasitized with *P. lutea*.



stoid *P. lutea* was more abundant than *E. mundus* during summer and early summer plantations, while the contrary was noticed during winter plantations as *E. mundus* was more efficient in controlling *B. tabaci* (Tables 1-3). At any rate of infestation by *B. tabaci* larvae or pupae, the host plants seem to attract one or both parasitoids.

In this regard, Azab *et al.* (1969) mentioned that the rate of parasitism by *Eretmocerus* sp. and *Encarsia* sp. varied considerably among pupae on different host plants. The degree of parasitism on pupae was highest on *Euphorbia* (48.73%), followed by sweet potato (17.45%), tomato (13.65%), then cauliflower (8.63%). Hafez *et al.* (1979) found that the rate of parasitism by *E. mundus* on *B. tabaci* varied according to the host plant (*Lantana camara*, cotton, and cabbage). They indicated that the maximum percentage of parasitism on *B. tabaci* infesting cotton and cabbage occurred during October (88 and 92%, respectively).

#### Fluctuations in numbers of *E. mundus* and *P. lutea* on *B. tabaci* under field conditions:

As shown in Fig. 1, the *B. tabaci* parasitoids, *E. mundus* and *P. lutea* were detected during June then continued throughout both seasons. The numbers of *E. mundus* adults counted throughout the first year of study (1983/84) indicated four peaks of abundance, the highest was on 20 August (1952 adults), followed by 17 September (114 adults), 5 November (115 adults), and 14 January (70 adults). In the second season (1984/85) four peaks were detected on 28 July, 8 September, 26 January, and 18 May (19, 1562, 33, and 15 adults, respectively).

As for *P. lutea*, the first year showed four peaks of abundance, 1976 adults on 20 August, 1078 adults on 17 September, 35 adults on 14 January, and 17 adults on 19 May. In the second season, three peaks of *P. lutea* abundance were detected on 16 June, 8 September, and 18 May (31, 1974, and 21 adults, respectively).

During the course of this study, the natural role played by both parasites against *B. tabaci* was more pronounced during August, September, and October. Accordingly, it seems necessary to put this role into consideration when planning for any control management against this pest. In this respect, Azab *et al.* (1969) recorded that the maximum rate of total parasitism occurred in December (61.68%) and the minimum rate (1.92%) in April at Qalubia Governorate. However, el-Sayed (1981) found that the total rate of parasitism reached its highest level in August 1978 (68.3%) and May 1979 (78.4%).

#### The sex-ratios of *B. tabaci* parasitoids under field conditions:

As shown in Table 4, the sex-ratio of *E. mundus* and *P. lutea* were influenced by the different months of the year during both seasons. The sex-ratio of *E. mundus* (percentage of males in the total population) ranged between 53.22% in October to 20.60% in



Fig. 1. Fluctuations in population of *B. tabaci* (larvae and pupae) and its parasitoids, *E. mundus* and *P. lutea* under field conditions.

