

# THE POPULATION DYNAMICS OF *HEMIBERLESIA LATANIAE* SIGNORET (HOMOPTERA: DIASPIDIDAE) AND ITS PARASITOIDS IN MIDDLE EGYPT

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## INTRODUCTION

The cosmopolitan and polyphagous latania scale insect, *Hemiberlesia lataniae* Signoret is known on some hundreds of host plants. It is a principle scale pest of *Ficus* sp., orchard plants like fig, guava, pear, apple, grapevine, olive, mango, banana, avocado, loquat and other ornamental trees.

Reviewed researches in the available literature showed little work on the fluctuation and seasonal abundance of the latania scale insect (El- Minshawy *et al.*, 1972; Hassanien and Hamed, 1984; Morales, 1988; Abd-Rabou, 2004 and Verma and Dinabandhoo, 2005).

Natural enemies of the latania scale insect and their role in regulating its population was reported by some authors (Agwlera, 1970; Drea, 1978; Hassanien and Hamed, 1984; Waite, 1988 and Abd-Rabou, 1999).

The present work declaring the following studies:

- 1- The seasonal fluctuation of the latania scale insect in Beni-suif Governorate.
- 2- Survey of *H. lataniae* natural enemies.
- 3- The role of parasitoids in suppressing the population of the latania scale insect.

## MATERIAL AND METHODS

### Survey of *H. lataniae* natural enemies

Leaves of olive, *Olea europea* L. infested with the latania scale insect were randomly collected from different orchards throughout two years, extending from Jun. 2004 till May 2006. The samples were packed in paper pages and transferred to

the laboratory for examination. The specimens were carefully examined and all insects except only the latania scale insect were removed to survey its natural enemies. The examined leaves were enclosed in plastic jars of 15 cm. diameter and 20 cm. height covered with muslin, held in position by a rubber band and kept under preferential conditions for securing any emerged parasitoids.

The parasitoids were collected, sorted into species and preserved in vials containing 70% ethanol and glycerin, in addition to slide mounted specimens for identification. The predaceous insects were separated from the collected leaves during the initial examination. Feeding tests were run to ensure that predators were natural enemies of this scale insect. The parasitoids and predators species were identified in Biological Control Res. Dept., Plant Prot. Res. Institute, Agric. Res. Center, Giza, Egypt.

#### **Seasonal fluctuations of *H. lataniae***

Olive trees, infested with *H. lataniae* located at Beni-suif district, were used for this purpose. An orchard about 3 feddans 12 years old cultivated with olive trees and heavily infested with the latania scale insect was chosen for this study. The orchard was not exposed to any chemical treatments before or during the investigations.

At 15-day intervals, 100 leaves with different stages of *H. lataniae* were collected at random from different directions of the orchard. The leaves represented different sides, peripheral, inner zones, lower and middle strata of the tree. These leaves were kept in paper pages and transferred to the laboratory for careful examination and counting of the latania scale insect. The stages of scale insect considered in counting process were:

a- Nymphs (1<sup>st</sup> and 2<sup>nd</sup> instars).

b- Adult females (gravid and non- gravid females).

c- Half-monthly percentages of nymphs helped in estimating the number of generations. Which indicated by the peaks of nymphs throughout the two consecutive years. This method was followed according to Amin, 1970 and Morsi, 1999.

The simple correlation between climatic factors (mini. temp., maxi. temp. and relative humidity (R.H. %) and total population of *H. lataniae* were calculated at the level 0.01 and 0.05.

#### **The role of parasitoids as mortality factor of *H. lataniae***

The rates of parasitism in different stages of *H. lataniae* infesting olive trees were estimated throughout two successive years extending from the beginning

of Jun. 2004 to May 2006. Heavily infested leaves from the olive trees were selected at random from cardinal directions and central cores of the trees.

Half- monthly sample (100 randomly selected scales) was chosen. This sample represented the second nymphal instars, the newly developed adult females and the full grown adult females. This sample was divided into 4 replicates with 25 scales each. Each scale was removed, transferred by lifting the scales cover and mulched on a slide in water film. Scales in each sample were dissected under a binocular microscope, and classified as follows, alive unparasitized individuals, parasitized individuals having (larvae, pupae and emerging holes). Total percentage of parasitism of the latania scale insect was estimated.

The simple correlation between climatic factors (mini. temp., maxi. temp. and R.H. %) and total percentage of parasitism were calculated at the level 0.01 and 0.05.

## RESULTS AND DISCUSSION

### Survey of the natural enemies

The obtained results showed that, the natural enemies of *H.lataniae* are

#### a. Parasitoids

Three primary parasitoid species were recorded on *H. lataniae*; two species belong to family Aphelinidae and one species belong to family Encyrtidae, names of respective the species were *Aphytis mytilaspidis* Le Baron, *Aspidiotiphagous citrinus* Craw and *Habrolepis aspidioti* Compere & Annecke, one species of Aphelinidae namely: *Marietta picta* Andree was recorded as hyperparasitoid.

The obtained results are in full agreement with those obtained by Abd-Rabou, (1999), who mentioned that two species of aphelinid were recorded from samples of *H. lataniae*, these species are *Aphytis mytilaspidis* and *Habrolepis aspidioti*, also Hassanien, and Hamid, 1984 reported the aphelinid species, *H.aspidioti* associated with *H. lataniae*.

#### b. Predators

Larvae and adults of two species of Coccinellidae: *Pharoscymnus ovoids* Sicard and *Cybocephalus tumidus* Endrody-Younga, were found feeding on different stages of this pest. In this respect, Drea, 1978 and Waite, 1988 recorded *Chilocorus* sp. (Coleoptera: Coccinellidae) larvae to attack the mature stage of the latania scale.

### Seasonal fluctuations of *H. lataniae*

Half- monthly counts of *H. lataniae* on leaves of olive trees are given in tables 1 and 2. It is obvious that this insect species had five annual peaks of abundance in the first year of study by first Aug., mid-Oct., mid-Feb., first April and mid-May where the total population reached 1955, 1567, 1809, 1822 and 1909 individuals per 100 leaves, respectively. The highest peak was recorded in August. A sharp decline in the population index occurred in Jan. (table 1). In the second year of investigation 2005/06, the four peaks of 1568, 1535, 1010 and 2206 scales per 100 leaves were observed on mid-Aug., mid-Oct., mid-Feb. and mid-May, respectively (table 2). In this respect, Hassanien and Hamid, 1984 in the Nile Delta, mentioned that population occurred in three peaks of abundance at 2 monthly intervals from mid- April to mid-Dec.

TABLE (I)

Population of the latania scale insect, *H. lataniae* per 100 olive leaves in Beni-suif Governorate during the first season (2004/2005).

Sampling date	Nymphs			Non- gravid females	Gravid females	Total population	% Nymphs	Max temp.	Min temp.	R.H. %
	1 <sup>st</sup>	2 <sup>nd</sup>	Total							
1/6/2004	297	356	653	265	316	1234	52.9	35.5	21.0	44
15/6	234	306	540	321	165	1026	52.6	36.1	21.4	47
1/7	156	382	538	191	90	819	65.7	37.2	24.9	48
15/7	307	483	790	451	352	1593	49.6	37.4	24.3	51
1/8	296	550	846	492	617	1955	43.3	36.8	21.9	50
15/8	325	267	592	139	398	1129	52.4	33.7	21.3	51
1/9	291	115	406	197	186	789	51.5	34.4	20.4	53
15/9	161	146	307	190	193	690	44.5	30.9	21.9	48
1/10	87	139	226	197	405	828	27.4	35.2	19.8	47
15/10	359	325	684	402	481	1567	43.7	31.3	19.2	48
1/11	169	145	314	156	172	642	48.9	33.2	19.1	49
15/11	98	73	171	193	198	562	30.4	31.4	17.0	48
1/12	119	147	266	154	211	631	42.2	21.7	9.6	48
15/12	187	198	385	218	189	792	48.6	22.7	9.4	53
1/1/2005	92	117	209	176	145	530	39.4	21.7	9.3	55
15/1	128	65	193	128	83	404	47.8	20.2	9.6	58
1/2	147	83	230	192	175	597	38.3	21.8	9.5	47
15/2	506	313	819	490	500	1809	45.3	17.5	7.7	52
1/3	274	60	314	212	611	1137	27.6	25.2	13.7	52
15/3	189	165	354	177	218	749	47.3	24.1	13.5	48
1/4	420	285	705	617	500	1822	38.7	25.9	12.5	48
15/4	416	315	731	368	491	1590	45.9	32.1	14.1	50
1/5	334	413	747	305	391	1443	51.8	31.8	19.5	47
15/5	463	491	954	290	665	1909	50.0	31.9	15.1	53

During the first season, 2004/05, the correlation between climatic factors and total population of *H. lataniae* was insignificant, positive with temperature and negative with R.H.%, while during the second season, 2005/06, the correlation between the population of latania scale and temperature was significantly high and non significant with R.H.%.

Concerning the population dynamics, our results are in agreement with those obtained by Tawfik and Mohammad (2001) in Egypt, they found that the latania scale insect more abundant on *Morus alba* and had four population peaks during the year.

**TABLE (II)**  
Population of the latania scale insect, *H. lataniae* per 100 olive leaves in Beni-suif Governorate during the second season (2005/2006).

Sampling date	Nymphs			Non- gravid females	Gravid females	Total population	% Nymphs	Max temp.	Min temp.	R.H. %
	1 <sup>st</sup>	2 <sup>nd</sup>	Total							
1/6/2005	246	142	388	305	597	1290	30.1	39.2	18.2	50
15/6	134	239	373	274	282	929	40.2	34.7	22.8	47
1/7	75	89	164	185	290	639	25.7	35.8	24.6	41
15/7	190	134	324	196	442	962	35.0	36.2	24.1	42
1/8	219	397	616	161	384	1161	53.1	36.2	21.1	50
15/8	593	194	787	298	483	1568	50.2	33.5	20.5	52
1/9	265	187	452	277	634	1363	33.2	33.2	18.2	54
15/9	305	117	422	105	604	1131	37.3	31.2	20.6	47
1/10	124	98	222	147	491	860	25.8	34.1	20.2	48
15/10	380	160	540	205	631	1376	39.2	32.1	19.1	49
1/11	424	345	769	431	335	1535	51.2	32.0	18.1	51
15/11	360	187	547	364	385	1296	42.1	30.6	19.2	49
1/12	156	200	356	200	189	745	47.8	26.7	10.6	50
15/12	183	170	353	165	240	758	46.6	23.8	8.2	51
1/1/2006	98	116	214	150	167	531	40.3	21.3	9.0	57
15/1	105	95	200	167	210	577	34.7	21.2	9.2	55
1/2	149	125	274	234	167	665	41.2	22.8	10.9	56
15/2	186	182	368	450	192	1010	36.4	20.8	9.6	60
1/3	167	114	281	304	256	841	33.4	25.9	10.5	52
15/3	132	169	301	257	178	736	40.9	26.9	13.5	53
1/4	130	162	292	200	245	737	39.6	29.4	14.5	55
15/4	135	155	290	277	421	988	29.3	29.9	15.6	47
1/5	283	290	573	591	314	1478	38.8	33.0	16.1	51
15/5	583	300	883	586	737	2206	40.0	36.1	18.9	44

#### The role of parasitoids as mortality factor of *H. lataniae*

Percentages of parasitism, table (3) showed five peaks during the first season 2004/05, the peaks were 65, 47, 47, 40 and 26 individuals/100 scale insect in mid-Jun., mid-Oct., mid-Nov., mid-Jan. and mid-March, respectively. During the second season

2005/06, the percentages of parasitism were 75, 55, 30 and 32% on July, Aug., Jan. and May, respectively. The lowest percentages of parasitism (4 and 5%) were recorded by Sep. 2004 and mid-March. 2006 during the respective years of study.

**TABLE (II)**

Total percentages of parasitism among the latania scale insect, *H. lataniae* infesting olive trees during 2004/2005&2005/2006 season. (Based on 100 dissected scale insects)

2004/2005					2005/2006				
Sampling date	Larvae	pupae	Emergence holes	Total (% Parasitism)	Sampling date	Larvae	pupae	Emergence holes	Total (% Parasitism)
1/6/2004	15	10	7	32	1/6/2005	9	15	11	35
15/6	22	25	18	65	15/6	13	22	34	69
1/7	7	8	23	38	1/7	35	16	24	75
15/7	12	4	10	26	15/7	15	8	15	38
1/8	10	11	4	25	1/8	18	12	16	46
15/8	7	8	5	20	15/8	27	13	15	55
1/9	3	6	9	18	1/9	8	13	10	31
15/9	2	1	1	4	15/9	18	9	6	33
1/10	12	10	4	26	1/10	20	14	5	39
15/10	23	14	10	47	15/10	6	7	15	28
1/11	5	10	14	29	1/11	3	3	12	18
15/11	21	12	14	47	15/11	10	3	1	14
1/12	4	5	9	18	1/12	4	2	3	9
15/12	5	4	3	12	15/12	2	2	5	9
1/1/2005	9	7	3	19	1/1/2006	3	9	6	18
15/1	15	19	6	40	15/1	15	3	2	20
1/2	2	11	7	20	1/2	10	13	7	30
15/2	10	3	2	15	15/2	2	10	4	16
1/3	1	2	4	7	1/3	3	2	5	10
15/3	15	9	2	26	15/3	0	0	5	5
1/4	1	2	7	10	1/4	12	4	4	20
15/4	8	3	2	13	15/4	2	15	12	29
1/5	3	5	4	12	1/5	3	13	16	32
15/5	2	5	5	12	15/5	13	6	2	21

During the two seasons, 2004/05 and 2005/06, the correlation between percentages of parasitism and the other factors (climatic factors and total population of *H. lataniae*) were non-significant with population of latania scale and significantly high with climatic factors.

These results are also in agreement with those obtained by Hasaanin and Hamid in Egypt (1984) who mentioned that, the encyrtid parasitoid, *Habrolepis aspidioti* was the only significant natural enemy and reached peak abundance in mid-June, parasitizing 58% of scales.

## SUMMARY

Studies on the seasonal fluctuations of the population of *Hemiberlesia lataniae* Signoret (Homoptera: Diaspididae) and its parasitoids were conducted in Beni-suif Governorate during the period extending from Jun. 2004 until May 2006. The latania scale insect, *H. lataniae* have four or five peaks of abundance on olive trees throughout the years of study. The number of nymphs reached its maximum during the second week of May. The parasitoid species, *Asidiotiphagus citrinus* Crow., *Habrolepis aspidioti* Compere & Annecke, *Aphytis mytilaspidis* Le Baron and *Marietta picta* Andree were found associated with *H. lataniae*. The role of parasitoids in regulating the abundance of populations of this scale insect was evaluated.

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