

**ANNUAL GENERATIONS, PREFERABLE SURFACE
AND HORIZONTAL DISTRIBUTION OF
HEMIBERLESIA LATANIAE (SIGNORET) AND ITS
ASSOCIATED PARASITIDS ON GUAVA TREES**

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Received 8 / 9 / 2003

Accepted 17 / 11 / 2003

ABSTRACT: Field studies were conducted at Hannout village, Kafr Saker district, Sharkia Governorate during three successive years (1999, 2000 and 2001) with the aim of studying the annual number of generations, their durations, preferable surface and horizontal distribution of *Hemiberlesia lataniae* and its associated parasitoids on guava trees. The obtained results revealed that:

- 1. *H. lataniae* had two generations annually in both inner and outer zones of guava trees during each year.**
- 2. The generation durations were varied according to the year and tree zones, lasting 2 – 6 months.**
- 3. The insect pest and its associated parasitoids preferred the upper surface of guava leaves than the lower one.**
- 4. The general total numbers of alive stages in different directions of the tree and central core during the three years could be arranged descendingly according to their relative densities as follow: north (26.55 %), central core (26.35 %), east (17.56 %), south (14.94 %) and west (14.60 %).**
- 5. The relative densities of parasitoids appeared similar trend during the three years showing 25.91, 24.58, 24.19, 14.96 and 10.36 % in north direction, central core, east, south and west directions, respectively.**

6. Mathematical calculation showed that the insect pest occurs almost in north-eastern direction during the second and third years, while during the first one it occurs in north-western direction. The parasitoids were more abundant in eastern direction during the first year and in north-eastern direction during the second and third ones.

Key words: *Hemiberlesia lataniae*, parasitoids, generations, preferable surface, horizontal distribution.

INTRODUCTION

The lataniae scale insect, *Hemiberlesia lataniae* (Signoret) (Homoptera: Diaspididae) is one of the most important scale insects. It infests certain fruits and other ornamental trees in Egypt, including guava, fig, pear, apple, grapevines, navel orange, sacchari orange, olive and *Ficus nitida* trees (El-Minshawy *et al.*, 1972; Salama and Hamdy, 1974; Hassanein-Fawzia and Hamed, 1985; Shahein *et al.*, 1987; Mansour *et al.*, 1991; Hassan, 1998 and Hassan *et al.*, 2001). According to its economic importance especially on guava trees, the present investigation was conducted to study the following points:

1. The number of the pest generations and their durations on guava trees under field conditions.
2. Preferable surface of the pest and its parasitoids.

3. Horizontal distribution of the pest and its parasitoids.

MATERIALS AND METHODS

The field experiment was carried out in an area of about half feddan cultivated with guava trees (*Psidium guajava* L.) variety Balady located in Hannout village, Kafr Saker district, Sharkia Governorate. The farm received normal agricultural practices and no chemical control was applied. The study was continued for three successive years, from January 1999 until the end of December 2001. Five guava trees which nearly were similar in size, age and vegetation were chosen for conducting the experiment. Each tree was divided into peripheral (outer) and inner zone. The outer one was divided into main directions (east, west, north and south) and inner zone represented central core.

For sampling, five leaves were picked up at random twice a month from each direction and inner zone, i.e. 125 leaves per each sample (5 trees \times 5 directions \times 5 leaves). The samples were put in polyethylene bags and transferred to the laboratory for carefully inspection. These samples were examined on the same day using a stereomicroscope, where the different stages of *H. lataniae* and the parasitized ones on the upper or / and lower surface of the leaves in each direction were counted and recorded. The parasitoids were identified with helping of Dr. A.R. Hamed, Chief Researcher, Biological Control Department, Plant Protection Research Institute, Agricultural Research Center, Giza, Egypt.

For estimating the number of *H. lataniae* generations and their durations, the formula proposed by Audemard and Milaire (1975) and emended by Jacob (1977) was used. The data of monthly counts of nymphal stage were indicated on millimeter papers.

RESULTS AND DISCUSSION

1. Number of generations:

Data given in Figs. (1 - 3) indicated that *Hemiberlesia*

lataniae (Signoret) had two generations per year in both inner and outer zones of guava trees during the three years of study.

During the first year (1999), each generation took about two months. The first generation from the beginning of January till the end of February and the second one from the beginning of November to the end of December.

During the second year (2000), each generation extended five months. The first one from the beginning of January till the end of May and the second generation from the beginning of August till the end of December.

During the third year (2001), the first generation in inner zone took about three months, from the beginning of January to the end of March. The second one lasted about six months, from the beginning of July till the end of December. In outer zone, the first generation took about five months, from the beginning of January, to the end of May. The second one lasted about six months, from the beginning of July till the end of December.

El- Minshawy *et al.* (1972) reported that *H. lataniae* appeared three generations per year on fig trees. The first began in

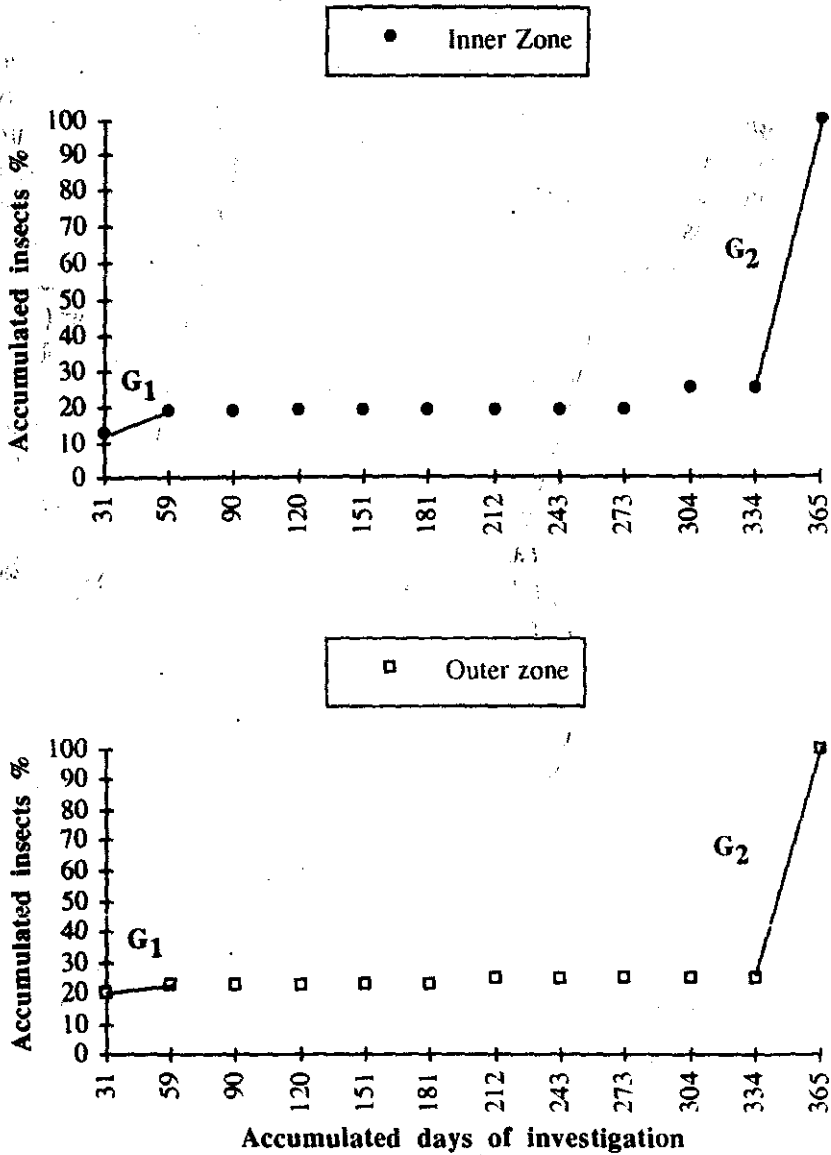


Fig.(1): Annual generations and duration of *H.lataniae* under field conditions of guava trees in Hannout village during the first year (1999).

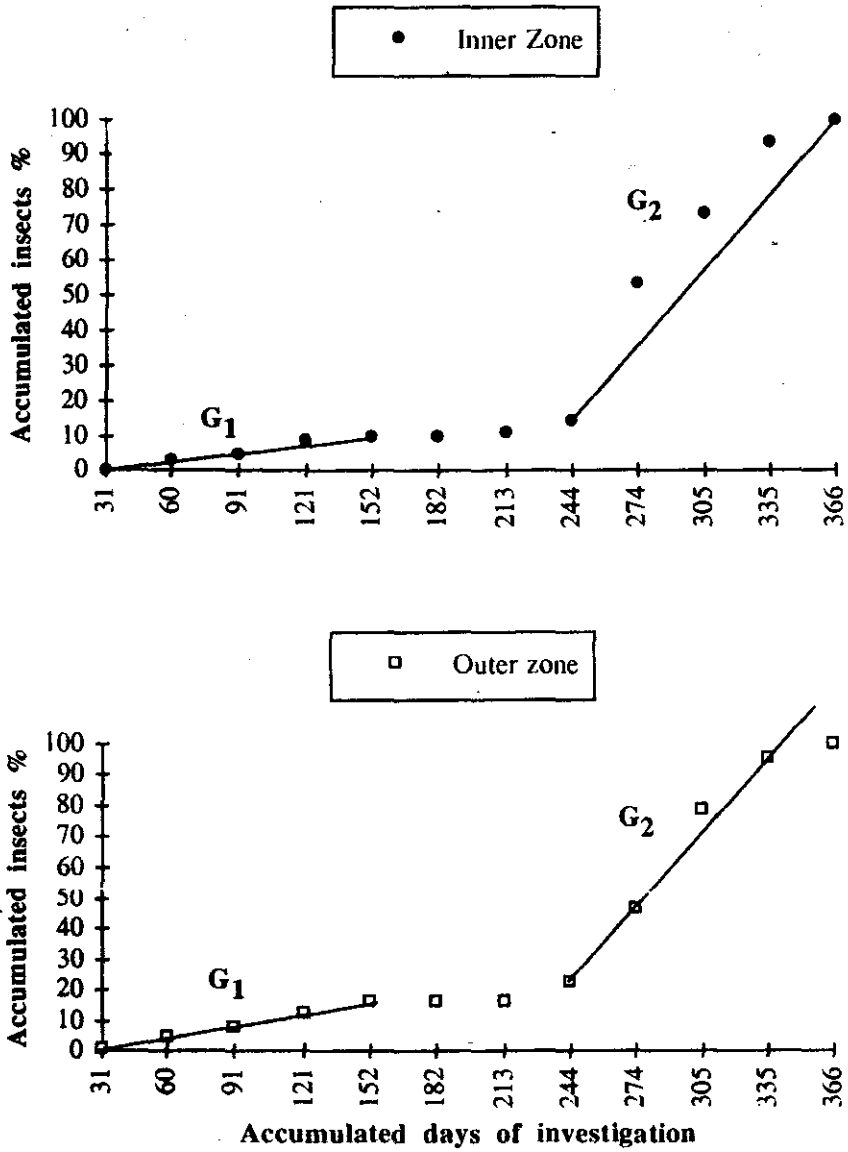


Fig.(2): Annual generations and duration of *H.lataniae* under field conditions of guava trees in trees in Hannout village during the second year (2000).

individuals were parasitized by parasitoids *Aphytis* sp. and *Aspidiotiphagus* sp. (Hymenoptera: Aphelinidae). The mean percentage of parasitism appeared

sample and 100% in the other one, respectively.

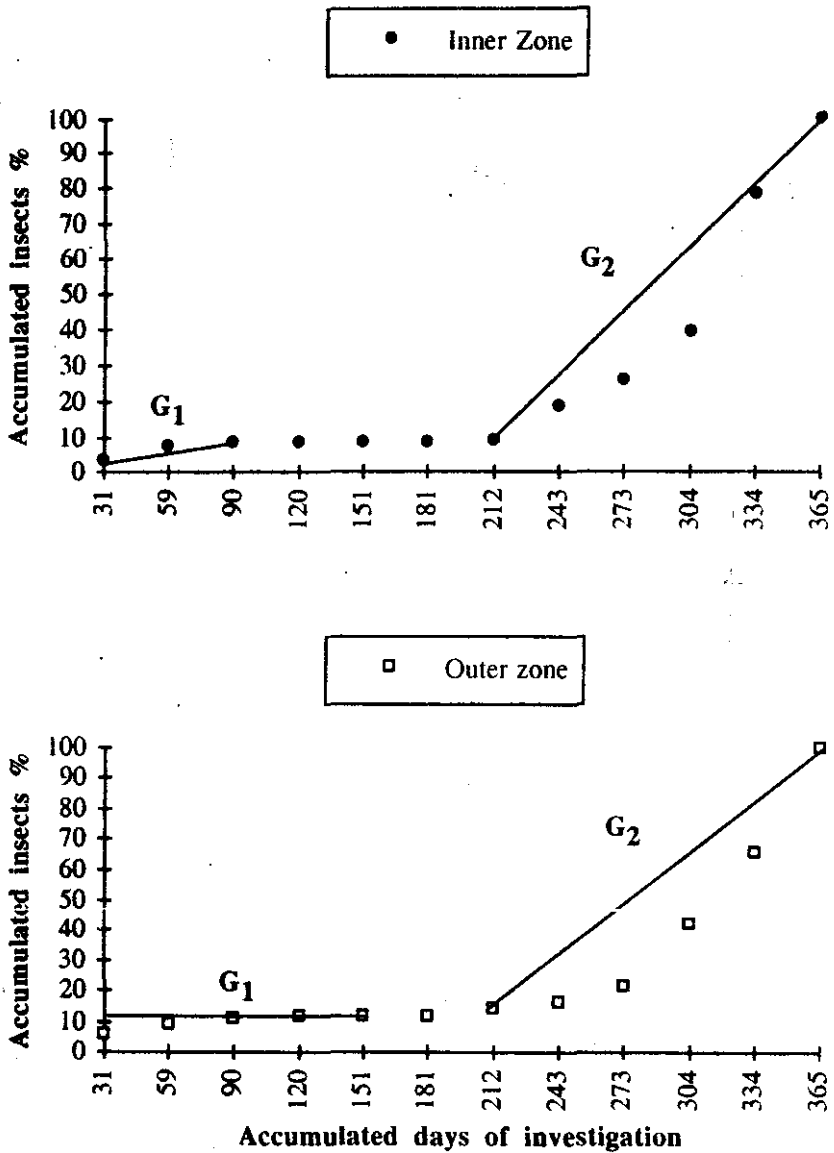


Fig.(3): Annual generations and duration of *H.lataniae* under field conditions of guava trees in Hannout village during the third year (2001).

September, the second in March and the third in June. According to Hassan (1998), *H. lataniae* had three overlapping generations per year on fig trees. Obtained results are in accordance with those of Hassan *et al.* (2001) who mentioned that there were two generations of *H. lataniae* per year on pear trees in Sharkia Governorate and the duration of all generations took about two to six months. The strongest generations were in autumn.

2. Preferable surface:

As shown in Table (1), the total number of alive insect stages in inner zone of guava trees along the first year (1999) was higher on the upper surface of leaves than the lower one where 712 and 360 individuals / sample (200 leaves monthly) were recorded, respectively. The same record was observed in outer zone showing total numbers of 507 and 244 individuals / sample on the two surfaces, successively.

During the course of the study, it was found that *H. lataniae* individuals were parasitized by the parasitoids *Aphytis* sp. and *Aspidiotiphagus* sp. (Hymenoptera: Aphelinidae). The mean percentage of parasitism appeared

similar trend such as insect occurrence. The mean percentages of parasitism were 6.731 and 4.712 % in inner zone and 5.508 and 3.901 % in outer zone on the upper and lower surfaces of leaves, respectively.

Concerning the insect abundance and percentages of insect parasitism during the second and third years (2000 and 2001), the same trend was noticed (Tables 2 and 3).

Generally, the total number of alive insect stages in inner zone during the whole period of study (Table 4) was considerably higher on the upper surface of leaves (4860 individuals / 7200 leaves) than that on the lower one (2348 individuals/ 7200 leaves). Also, the mean percentage of insect parasitism was higher on the upper surface (12.249 %) than that on the lower one (9.611 %). Similar trend was observed in outer zone, where the total number of alive stages was 3420 individuals / sample (7200 leaves) and the mean percentage of parasitism was 12.085 % on the upper surface, opposed to 1618 individuals / sample and 10.989 % on the lower one, respectively.

3. Effect of tree directions (Horizontal distribution):

3.1. On the total number of alive stages:

Data given in Tables (5 - 7) showed the total number of alive stages of *H. lataniae* which was estimated in the four directions (east, west, north and south), in addition to the central core of guava trees.

As shown in Table (5) during the first year, it was clearly noticed that in east, north and south directions there were two peaks of abundance in January (37 individuals / 50 leaves) and September (12 individuals); in January (24 individuals) and April (20 individuals) and in January (42 individuals) and April (24 individuals), respectively. The highest peak in all these directions was noticed in January. In west direction and central core, three peaks were obtained in January (49 individuals), April (15 individuals) and December (58 individuals) and in January (52 individuals), September (30 individuals) and December (65 individuals), successively. The highest peak in west direction and central core occurred in December. Generally, it was noticed that the highest total number of alive stages through the

year was found in central core (268 individuals), followed by west (206 individuals), north (198 individuals), south (191 individuals) and east (156 individuals) directions.

During the second year, data in Table (6) cleared that two peaks were recorded in each of west, north and south directions and central core occurring in February (53 individuals / 50 leaves) and October (79 individuals); in February (77 individuals) and October (200 individuals); in February (48 individuals) and November (57 individuals) and in September (142 individuals) and November (107 individuals), consecutively. The last peak in all previously mentioned directions was the highest one, while in central core the highest peak was the first one. In east direction, three peaks were observed in January (37 individuals), March (58 individuals) and October (92 individuals). It is obvious that the highest insect population density was found in north direction (797 individuals), followed by central core (589 individuals), east (475 individuals), west (375 individuals) and south (343 individuals) directions.

During the third year, data presented in Table (7) indicated that in each of east and west directions and central core only one peak was recorded in November (179 individuals / 50 leaves), December (130 individuals) and November (343 individuals), respectively. In north and south directions, two peaks were recorded in January (58 individuals) and December (252 individuals) and in March (28 individuals) and November (172 individuals), successively. The highest total number of alive stages occurred in central core (945 individuals), followed by north, east, south and west directions where 821, 570, 488 and 418 individuals were recorded, respectively.

The general total numbers of alive stages in different directions and central core during the three years (Table 8) could be arranged descendingly according to their relative densities as follow: north (26.55 %), central core (26.35 %), east (17.56 %), south (14.94 %) and west (14.60 %).

Hassan (1998) mentioned that the highest number of *H. lataniae* alive stages on fig trees during the first season was recorded in north direction, followed by east, west

and south directions. While during the second year, the highest number of alive stages was found in east direction, followed by north, west and south ones. Also, the least number of alive stages was recorded in the middle level of the trees.

3.2. On the percentage of parasitism:

Data of the first year (Table 5) cleared that in east direction five peaks were noticed in January (10.294 % parasitism), March (14.286 %), May (11.765 %), October (8.333 %) and December (15.152 %). In each of north and south directions, three peaks were recorded in January (9.091 %), March (9.259 %) and May (11.111 %) and in March (8.929 %), May (15.385 %) and October (6.667 %), respectively. Two peaks were attained in each of west direction and central core, in January (2.542 %) and May (11.111 %) and in March (14.516 %) and November (7.813 %), successively.

During the second year, two peaks were recorded in each of east, south directions and central core (Table 6). They were recorded in April (22.989 %) and December (29.268 %); in May (33.333 %) and November (24.747 %) and in

Table (1): Monthly numbers of *Hemiberlesia lataniae* / 200 leaves and percentage of parasitism on upper and lower surfaces of guava trees in Hannout village, Kafr Saker district, Sharkia Governorate during the first year (1999).

Month	Inner zone								Outer zone							
	Upper surface				Lower surface				Upper surface				Lower surface			
	No. of			Parasitism%	No. of			Parasitism%	No. of			Parasitism%	No. of			Parasitism%
	Alive stages	Dead stages	Parasitoids		Alive stages	Dead stages	Parasitoids		Alive stages	Dead stages	Parasitoids		Alive stages	Dead stages	Parasitoids	
Jan.	128	80	4	1.923	80	60	4	2.857	107	127	16	6.838	45	68	6	5.310
Feb.	108	208	20	6.329	32	104	8	5.882	46	114	5	3.125	32	71	4	3.883
Mar.	56	320	56	14.894	28	92	16	13.333	41	113	17	11.038	26	51	6	7.792
Apr.	40	64	4	3.846	16	56	0	0.000	62	138	11	5.500	19	48	1	1.493
May	0	16	0	0.000	0	4	0	0.000	6	28	5	14.706	8	15	2	8.696
Jun.	4	0	0	0.000	0	0	0	0.000	0	0	0	0.000	0	0	0	0.000
Jul.	0	4	0	0.000	0	0	0	0.000	5	0	0	0.000	1	0	0	0.000
Aug.	4	4	0	0.000	0	0	0	0.000	6	3	0	0.000	8	6	0	0.000
Sep.	116	52	0	0.000	4	20	0	0.000	24	20	0	0.000	7	2	0	0.000
Oct.	52	36	4	4.545	20	12	4	12.500	28	17	1	2.222	4	8	1	8.333
Nov.	68	92	16	10.000	56	40	4	4.167	72	54	2	1.587	35	27	0	0.000
Dec.	136	76	8	3.774	124	16	0	0.000	110	41	7	4.636	59	24	2	2.410
Total	712	952	112		360	404	36		507	655	64		244	320	22	
Mean				6.731				4.712				5.508				3.901

Table (2): Monthly numbers of *Hemiberlesia lataniae* / 200 leaves and percentage of parasitism on upper and lower surfaces of guava trees in Hannout village, Kafr Saker district, Sharkia Governorate during the second year (2000).

Month	Inner zone								Outer zone							
	Upper surface				Lower surface				Upper surface				Lower surface			
	No. of			Parasitism%	No. of			Parasitism%	No. of			Parasitism%	No. of			Parasitism%
	Alive stages	Dead stages	Parasitoids		Alive stages	Dead stages	Parasitoids		Alive stages	Dead stages	Parasitoids		Alive stages	Dead stages	Parasitoids	
Jan.	144	28	16	9.302	52	100	20	15.152	142	114	18	7.031	54	36	2	2.222
Feb.	124	212	36	10.714	52	68	4	3.333	134	139	38	13.919	75	72	22	14.966
Mar.	96	92	32	17.021	68	68	20	14.706	108	98	26	12.621	65	52	13	11.111
Apr.	76	88	44	26.829	84	56	28	20.000	89	84	50	28.902	34	23	10	17.544
May	24	12	8	22.222	4	0	0	0.000	25	16	5	12.195	10	6	0	0.000
Jun.	4	0	0	0.000	0	0	0	0.000	0	0	0	0.000	0	0	0	0.000
Jul.	24	8	0	0.000	8	0	0	0.000	2	0	0	0.000	1	0	0	0.000
Aug.	64	40	0	0.000	12	4	0	0.000	70	18	1	1.136	17	3	0	0.000
Sep.	464	108	44	7.692	104	28	8	6.061	249	90	22	6.490	49	20	3	4.348
Oct.	272	192	56	12.069	72	48	12	10.000	316	184	38	7.600	107	57	13	7.927
Nov.	232	596	144	17.391	196	172	48	13.043	208	417	156	24.960	80	109	44	23.280
Dec.	160	436	116	19.463	40	124	24	14.634	89	321	90	21.951	66	78	29	20.139
Total	1684	1812	496		672	668	164		1432	1481	444		558	456	136	
Mean				14.188				12.231				15.242				13.412

Table (3): Monthly numbers of *Hemiberlesia lataniae* / 200 leaves and percentage of parasitism on upper and lower surfaces of guava trees in Hannout village, Kafr Saker district, Sharkia Governorate during the third year (2001).

Month	Inner zone								Outer zone							
	Upper surface				Lower surface				Upper surface				Lower surface			
	No. of			Parasitism%	No. of			Parasitism%	No. of			Parasitism%	No. of			Parasitism%
	Alive stages	Dead stages	Parasitoids		Alive stages	Dead stages	Parasitoids		Alive stages	Dead stages	Parasitoids		Alive stages	Dead stages	Parasitoids	
Jan.	136	416	132	23.913	40	72	20	17.857	108	446	144	25.993	47	93	30	21.429
Feb.	68	892	228	23.750	116	440	96	17.266	71	426	90	18.109	51	156	35	16.908
Mar.	32	340	88	23.656	48	92	40	28.571	42	197	50	20.921	39	116	43	27.742
Apr.	20	76	12	12.500	4	60	20	31.250	16	128	34	23.611	17	78	23	24.211
May	0	0	0	0.000	0	4	0	0.000	3	6	1	11.111	2	10	1	8.333
Jun.	4	0	0	0.000	12	0	0	0.000	6	2	1	12.500	6	3	0	0.000
Jul.	16	4	0	0.000	16	4	0	0.000	18	4	0	0.000	8	4	0	0.000
Aug.	88	16	0	0.000	44	4	0	0.000	26	8	0	0.000	15	4	0	0.000
Sep.	204	112	36	11.392	176	40	4	1.852	78	34	3	2.679	62	19	2	2.469
Oct.	316	192	60	11.811	132	68	4	2.000	285	298	70	12.007	137	90	22	9.692
Nov.	964	508	160	10.870	408	152	60	10.714	428	372	112	14.000	209	186	59	14.937
Dec.	616	616	176	14.286	320	204	48	9.160	400	345	76	10.201	223	220	66	14.898
Total	2464	3172	892		1316	1140	292		1481	2266	581		816	979	281	
Mean				15.827				11.889				15.506				15.655

Table (4): The general total numbers of alive stages of *Hemiberlesia lataniae* and mean percentage of parasitism on upper and lower surfaces of guava leaves in Hannout village, Kafr Saker district, Sharkia Governorate during the three successive years (1999, 2000 and 2001).

year	Inner zone				Outer zone				General total			
	Upper surface		Lower surface		Upper surface		Lower surface		Upper surface		Lower surface	
	Alive stages	Parasitism %	Alive stages	Parasitism %	Alive stages	Parasitism %	Alive stages	Parasitism %	Alive stages	Parasitism %	Alive stages	Parasitism %
1999	712	6.731	360	4.72	507	5.508	244	3.901	1219	12.239	604	8.613
2000	1684	14.188	672	12.231	1432	15.242	558	13.412	3116	29.430	1230	25.643
2001	2464	15.827	1316	11.389	1481	15.506	816	15.655	3945	31.333	2132	27.544
Total	4860	36.746	2348	28.332	3420	36.256	1618	32.968	8280	73.002	3966	61.800
Mean	1620	12.249	783	9.511	1140	12.085	539	10.989	2760	24.334	1322	20.600

Table (5): Monthly numbers of alive stages of *Hemiberlesia lataniae*, and its associated parasitoids on guava trees in different directions and central core in Hannout village, Kafr Saker district, Sharkia Governorate during the first year (1999).

Month	Number of insects / 50 leaves														
	Sunny zone												Shady zone		
	East			West			North			South			Central core		
	Alive stages	Parasitoids Number	%	Alive stages	Parasitoids Number	%	Alive stages	Parasitoids Number	%	Alive stages	Parasitoids Number	%	Alive stages	Parasitoids Number	%
Jan.	37	7	10.294	49	3	2.542	24	6	9.091	42	6	6.316	52	2	2.299
Feb.	29	3	4.348	9	0	0.000	23	3	2.970	17	3	6.250	35	7	6.195
Mar.	21	12	14.286	10	1	2.703	14	5	9.259	22	5	8.929	21	18	14.516
Apr.	22	8	8.421	15	3	5.882	20	1	1.351	24	0	0.000	14	1	2.273
May	4	2	11.765	3	1	11.111	5	2	11.111	2	2	15.385	0	0	0.000
Jun.	0	0	0.000	0	0	0.000	0	0	0.000	0	0	0.000	1	0	0.000
Jul.	0	0	0.000	0	0	0.000	5	0	0.000	1	0	0.000	0	0	0.000
Aug.	2	0	0.000	2	0	0.000	1	0	0.000	9	0	0.000	1	0	0.000
Sep.	12	0	0.000	2	0	0.000	7	0	0.000	10	0	0.000	30	0	0.000
Oct.	2	1	8.333	8	0	0.000	11	0	0.000	11	1	6.667	18	2	6.667
Nov.	7	0	0.000	50	0	0.000	24	0	0.000	26	2	5.128	31	5	7.813
Dec.	20	5	15.152	58	0	0.000	64	3	3.797	27	1	2.326	65	2	2.273
Total	156	38		206	8		198	20		191	20		268	37	

Table (6): Monthly numbers of alive stages of *Hemiberlesia lataniae*, and its associated parasitoids on guava trees in different directions and central core in Hannout village, Kafr Saker district, Sharkia Governorate during the second year (2000).

Month	Number of insects / 50 leaves														
	Sunny zone												Shady zone		
	East			West			North			South			Central core		
	Alive stages	Parasitoids Number	%	Alive stages	Parasitoids Number	%	Alive stages	Parasitoids Number	%	Alive stages	Parasitoids Number	%	Alive stages	Parasitoids Number	%
Jan.	37	7	10.606	47	4	4.762	76	5	3.650	36	4	6.780	44	9	11.842
Feb.	31	5	9.259	53	22	17.742	77	14	10.687	48	19	17.117	44	10	8.772
Mar.	58	6	7.229	34	11	16.418	57	8	7.547	24	14	20.896	41	13	16.049
Apr.	47	20	22.989	12	6	21.429	37	17	27.869	27	17	31.481	40	18	23.684
May	16	3	10.714	6	0	0.000	10	0	0.000	3	2	33.333	7	2	20.000
Jun.	0	0	0.000	0	0	0.000	0	0	0.000	0	0	0.000	1	0	0.000
Jul.	0	0	0.000	2	0	0.000	1	0	0.000	0	0	0.000	8	0	0.000
Aug.	12	0	0.000	8	0	0.000	58	1	1.408	9	0	0.000	19	0	0.000
Sep.	45	7	10.938	70	3	3.226	131	13	6.842	52	2	3.279	142	13	7.386
Oct.	92	19	11.656	79	1	1.000	200	22	7.190	52	9	9.474	86	17	11.644
Nov.	80	49	22.791	34	10	14.925	117	92	27.545	57	49	24.747	107	48	16.054
Dec.	57	60	29.268	30	19	16.814	33	26	19.403	35	14	13.725	50	35	18.421
Total	475	176		375	76		797	198		343	130		589	165	

Table (7): Monthly numbers of alive stages of *Hemiberlesia lataniae*, and its associated parasitoids on guava trees in different directions and central core in Hannout village, Kafr Saker district. Sharkia Governorate during the third year (2001).

Month	Number of insects / 50 leaves														
	Sunny zone											Shady zone			
	East			West			North			South			Central core		
	Alive stages	Parasitoids Number	%	Alive stages	Parasitoids Number	%	Alive stages	Parasitoids Number	%	Alive stages	Parasitoids Number	%	Alive stages	Parasitoids Number	%
Jan.	59	74	25.965	29	11	11.957	58	79	31.102	9	10	15.873	44	38	22.892
Feb.	46	52	21.577	27	22	14.667	32	41	17.227	17	10	13.333	46	81	21.372
Mar.	14	19	18.627	13	16	29.091	26	34	24.818	28	24	24.000	20	32	25.00
Apr.	10	28	25.000	4	10	27.778	9	13	24.074	10	6	16.216	6	8	20.00
May	1	0	0.000	0	1	14.286	0	0	0.000	4	1	10.000	0	0	0.000
Jun.	3	0	0.000	3	0	0.000	3	1	12.500	3	0	0.000	4	0	0.000
Jul.	7	0	0.000	5	0	0.000	9	0	0.000	5	0	0.000	8	0	0.000
Aug.	21	0	0.000	8	0	0.000	10	0	0.000	2	0	0.000	33	0	0.000
Sep.	32	0	0.000	33	1	2.222	49	2	3.077	26	2	5.128	95	10	7.519
Oct.	73	27	17.881	68	13	11.927	185	31	9.309	96	21	9.677	112	16	9.040
Nov.	179	36	11.842	98	25	13.514	188	67	18.306	172	43	12.647	343	55	10.827
Dec.	125	40	16.667	130	27	11.842	252	39	8.571	116	36	13.585	234	56	12.756
Total	570	276		418	126		821	307		488	153		945	296	

Table (8): The general total numbers of alive stages of *Hemiberlesia lataniae* and its associated parasitoids on guava trees in different directions and central core in Hannout village, Kafr Saker district, Sharkia Governorate during 1999, 2000 and 2001 years.

Year	Total number of insects									
	Sunny zone								Shady zone	
	East		West		North		South		Central core	
	Alive stages	Parasi-toids	Alive stages	Parasi-toids	Alive stages	Parasi-toids	Alive stages	Parasi-toids	Alive stages	Parasi-toids
1999	156	38	206	8	198	20	191	20	268	37
2000	475	176	375	76	797	198	343	130	589	165
2001	570	276	418	126	821	307	488	153	945	296
General total	1201	490	999	210	1816	525	1022	303	1802	498
Relative density %	17.56	24.19	14.60	10.36	26.55	25.91	14.94	14.96	26.35	24.58

January (11.842 %) and April (23.684 %), respectively.

Data of the third year (Table 7) indicated that three peaks occurred in each of east, south directions and central core. They took place in January (25.965 %), April (25.000 %) and October (17.881 %) in east direction and in January (15.873 and 22.892 %), March (24.000 and 25.000 %) and December (13.585 and 12.756 %) in south direction and central core, successively. In north direction, four peaks were recorded in January (31.102 %), March (24.818 %), June (12.500 %) and November (18.306 %). Two peaks were noticed in west direction occurring in March (29.091 %) and November (13.514 %).

The general total numbers of the parasitoids in different directions of the tree and central core during the three years of study showed similar trend such as insect population density (Table 8). They could be arranged descendingly according to their relative densities as follow: north (25.91 %), central core (24.58 %), east (24.19 %), south (14.96 %) and west (10.36 %).

4. The preferable direction for the insect and parasitoids:

The effect of cardinal directions on the distribution of *H. lataniae* and its parasitoids was determined mathematically using the following formula:

$$H = \sqrt{F_1^2 + F_2^2 + 2F_1 F_2 \cos Q}$$

The angle was calculated by dividing F_2 / F_1 , according to Mahmoud (1981) and Hassan (1998) where:

H = Powers summation

F_1 = The population on the east minus the population on the west if the former is higher, and reversed it if the latter is higher.

F_2 = The population on the north minus the population on the south if the former is higher, and the reverse is applied if the population on the south is higher. The figure obtained represents the tangent, the corresponding values of which was obtained from the mathematical.

$$F_1 = E - W$$

$$F_2 = N - S$$

$$\tan Q = F_2 / F_1$$

Results illustrated in Fig. (4) revealed that during the first year the insect occurs almost in the north -western direction of the

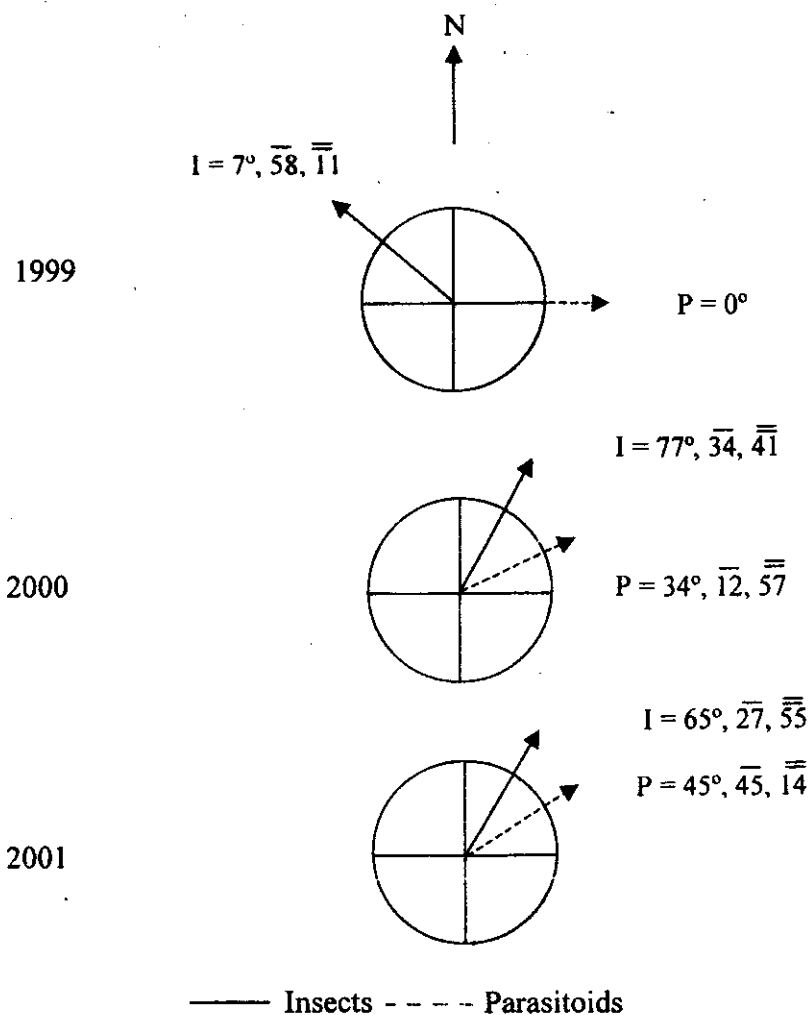


Fig. (4): The calculated directions of *H. lataniae* and its associated parasitoids on guava trees during the three successive years (1999, 2000 and 2001) in Hannout village, Kafr Saker district, Sharkia Governorate.

trees making an angle 7° , 58 and 11 . In the second year, the insect occurs in the north-eastern direction making an angle 77° , 34 and 41 . Also, in the third year the insect prefer north-eastern direction forming an angle 65° , 27 and 55 .

Fig. (4) clarify that the parasitoids were found almost in eastern direction of the trees during the first year, while during the second and third years, parasitoids were more abundant in north-eastern directions of the trees making angles 34° , 12 , 57 and 45° , 45 , 14 , respectively.

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الأجيال السنوية والتفضيل السطحي والتوزيع الأفقي لحشرة اللاتانيا القشرية والطفيليات المرتبطة بها على أشجار الجوافة

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تم دراسة عدد أجيال حشرة اللاتانيا القشرية وفتراتها، التفضيل السطحي والتوزيع الأفقي لآفة والطفيليات المرتبطة بها على أشجار الجوافة بقرية حانوت - مركز كفر صقر - محافظة الشرقية خلال ثلاثة أعوام متتالية (١٩٩٩، ٢٠٠٠ و ٢٠٠١) وقد لخصت النتائج كما يلي:

- ١- وجد أن للحشرة جيلين سنوياً في كل من المحيطين الخارجي والداخلي للشجرة خلال سنوات الدراسة الثلاثة. واختلفت فترات الأجيال من ٢ - ٦ شهور حسب سنوات الدراسة ومنطقة الشجرة.

- ٢- وجد أن الحشرة والطفيليات المرتبطة بها خلال سنوات الدراسة الثلاث تفضل السطح العلوي لأوراق الجوافة مقارنة بالسطح السفلي. وأمكن ترتيب الأعداد الكلية لأطوار الآفة الحية خلال سنوات الدراسة الثلاث حسب كثافتها النسبية في الاتجاهات المختلفة ومركز الشجرة كما يلي: الشمال (٢٦,٥٥%)، مركز الشجرة (٢٦,٣٥%)، للشرق (١٧,٥٦%)، الجنوب (١٤,٩٤%) والغرب (١٤,٦٠%).
- ٣- أظهرت الطفيليات ميل مشابه حيث كانت كثافتها النسبية خلال سنوات الدراسة الثلاث ٢٥,٩١، ٢٤,٥٨، ٢٤,١٩، ١٤,٩٦ و ١٠,٣٦ % في إتجاه الشمال، مركز الشجرة، إتجاهات الشرق والجنوب والغرب على التوالي.
- ٤- أوضح التقدير الرياضي أن لحشرة تواجدت بأعداد كبيرة في الإتجاه الشمالي الغربي خلال العام الأول والإتجاه الشمالي الشرقي خلال العامين الثاني والثالث. وتواجدت الطفيليات بأعداد كبيرة في الاتجاه الشرقي خلال العام الأول والإتجاه الشمالي - الشرقي خلال العامين الثاني والثالث.