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Scale insects infesting guava trees and control measure of *Pulvinaria psidii* (Hemiptera: Coccidae) by using the alternative insecticides.

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ABSTRACT

Nine scale insect species (Hemiptera: Coccoidea) belongs to four families were collected during updated survey at Qaliobiya Governorate for two successive years. A key with photographs and illustrations are introduced; the seasonal fluctuation and the population density of all stages of the most serious soft scale insect, *Pulvinaria psidii* Maskell (Hemiptera: Coccidae) were studied in relation to five main weather factors. Three predators, *Rodalia cardinalis* Mulsant, *Chilocorus bipustulatus* L. (Coleoptera: Coccinellidae) and *Amblyserius swiriskii* (Athias-Henriot) (Acari: Phytoseiidae) were collected associated with *P. psidii* and their effect with the other meteorological factors are analyzed statistically using partial regression method to decide their contemporary effect. The half monthly variation was calculated and the number of generations of this soft scale per year were estimated throughout the two successive years of investigation to indicate the high infestation of this pest to reach 327 insect/ leaf at 1st may, the lowest population density were during winter season. The efficacy of the alternative pesticides (Biological insecticides, mineral oils, IGRs) and organophosphorus insecticides for controlling this serious pest different stages during summer and winter field sprayings were applied to insure that: the summer spray was more effective than the winter spray, the mineral oils and soap gave high efficacy after two weeks of spraying and still increasing till the end of the experiment, without observed phytotoxicity; IGRs and biological insecticides started to give good efficacy after one month of spraying and also still to increase till the end, in addition to their safety effect, opposite to the synthetic insecticides that gave a very good efficacy at the beginning of the experiment and decreased gradually. Finely the application time is very important; the organophosphorus compounds must be replaced by these other friendly alternatives; rearing and releasing these predators must be used in this pest control management.

Keywords: Scale insects, serious soft scales, guava trees, *Pulvinaria psidii*, seasonal fluctuation, predators, alternative pesticides, mineral oils, biological insecticides, IGRs.

INTRODUCTION

Scale insect (Hemiptera: Coccoidea) styles branched up to three times in the sheath to reach the phloem (intracellular or intercellular), likely come into contact with the secondary metabolites in vacuoles; leaves are first penetrated, in high temperature, the crawlers move to the aerial portions, settled on buds, causing dangerous loss (annual loss by pink hibiscus mealybug only in Grenado Island was 3.5 million dollars before establishing the biological control), especially through their toxic saliva, secondary infection and associated insects (Newberg *et al*. 1983 and Baker *et al.*, 2009). Most scales are sensitive to the meteorological changes, agriculture activities and host preferable, so updated survey was required after the

previous survey of El Minshawy *et al*. (1974) in Alexandria. The identification of scale insects must be accompanied with figures and illustrations to decrease confusion (Hamon and William, 1984 and Bakr *et al*. 2010). Extensive ecological study to the pest and their natural enemies is the first step toward the progress of the integrated pest control management (Hassan and Radwan, 2008).

Present control procedures are mainly through insecticides, in some instances some formula of mineral oils are employed, besides the releasing of few predators and parasites with rarely safe procedures (Abd-Rabou, 2003). So this work explains the efficacy of the alternative insecticides (biological insecticides, IGRs, mineral oils), comparing with the efficacy of chemical insecticides, during summer and winter field evaluations to the most serious soft scale attacking seven economic crops (Abd El-Razak, 2000; Helmy *et al.,* 2001 and Hariss *et al*., 2006).

The aim of the present work is to study the survey of scale insects infested guava trees and the control measure of *P. psidii* in Egypt.

MATERIALS AND METHODES

I. Ecological studies:-

1. Survey of scale insects infesting guava trees at Qaliobiya Governorate:

Three orchards of guava trees (*Psidium guajava*) at (El-Khanka, Shebeen El-Qanater and Benha) were chosen for collecting its scale insects. The collection was carried out monthly for two successive years from August 2005 to July 2007 in each area. Ten infested guava leaves were collected and examined through the binocular microscope and the microscopic slides for detailed characters. Identification of insects was done by using different keys as: (Ezzat, 1958; Ezzat and Husein, 1967; Hamon and Williams, 1984 and Miller *et al.*,(2006). The main climatic factors: maximum temperature (Max.Temp.), minimum temperature (Min.Temp.), relative humidity (R.H. %), rain fall and wind speed were recorded at Qaliobiya governorate with the aid of Meteorological Agency.

2. Seasonal fluctuation of the most serious soft scale insect on guava trees, *Pulvinaria psidii*

The selected locality was (about 3 Feddans) at Shebein El-kanater at Qaliobiya Governorate to study the seasonal fluctuation of *P.psidii* on guava orchard, throughout the two studied seasons (from 1st April 2005 to mid March 2007).The selected orchards for present investigation don't receive any chemical control at least for two years before this study; also through the duration of the present study but received agricultural practices only. In each of three aforementioned localities, five trees were selected with the same age, height, size, vigor and size of canopy, as well as homogenous in their insect infestation. Successive fortnight samples of 30 leaves (10 leaves X 3 replicates) were picked out from the trees. Alive individuals on the leaves, insect stages, (pre-adult, adult females, gravid females and ovisacs in case of *P. psidii*) were calculated through the two successive years. The half monthly variation (H. M.V.) was calculated by (Bodenhimer, 1951). Number of generations of *P. psidii* per year was estimated from the changes in the half monthly nymphal stage number throughout the two successive years of investigation. The seasonal fluctuation in the population density of the studied pest in relation to five main weather factors [day maximum temperature (D. Max. T.), day minimum temperature (D. Min. T.), daily mean relation humidity (D.M.R.H.), rainfall and wind speed] was carried out; the partial regression (p. reg.) method termed "C" multipliers according to Sendecor and Cochran (1989) were estimated.

The natural enemies (predators) were collected, the identification by using the different keys, the diagnosis and illustrations were added.

II. Toxicological studies:

1. Field evaluation of the tested treatments on *Pulvinaria psidii* infesting guava trees:

For controlling *P. psidii* on guava trees at Sheibeen El-kanater Qaliobiya governorate, two experiments were carried out in July (2005) and February (2006) in case of summer and winter spraying of the tested alternative pesticides (Biofar, mineral oils) and organophosphorus insecticides. Fifteen trees divided into three rows for each replicate whereas, each treatment had three replicates (45 trees/ treatment) in addition to fifteen trees as control for each experiment divided also into three replicates, then sprayed with the tested treatments by means of 6 horse–power motor sprayer, with 600 liters tank. Samples of 10 infested leaves were collected from each replicates after spraying in all directions and level of the tree (10 leaves X 3 replicates) 30 leaves per treatment and before spraying as a pre-treatment count. Data of the pre-treatment, control and post-treatment samples were recorded for the alive stages (per-adult nymphal stage, adult female and gravid female stages) to calculate reduction percentage in population. The total number of all stages was used as index to the population density of the insect over particular period of time. Four post-treatment counts were taken at 2, 4, 6 and 8 weeks after spraying.

Statistical analysis: Percentage of reduction in each stage and population was estimated according to Henderson and Tilton equation, (1955).The percentage of reduction for all treatments was subjected to a simple analysis of variance by the aid of a computing and model design in an IBM compatible computer to show the efficiency of the tested insecticides and their residual effect of tested compounds against the pest different stages; (ovisacs stage, nymphs, adult female, gravid female stages and total population). The "F" values were calculated and the least against insect population and different stages significant difference (L.S.D) between treatments were considered when. "F" value was significant Also, L.S.D between the residual effects of the post treatment counts were studied.

2. The tested treatments and their usage doses:

2.1. Biological insecticide: Biovar: *Beauvaria bassiana* (32000 viable spores/ mg). Active Ingredient 10%, Inert Ingredient 90 % Used with concentration of 200 gm / 100L water.

2.2. Mineral oils: Super misrona oil: In miscible type formulated by Misr Petroleum local company. The active ingredient produced by El America Petroleum Company. The rate of use was 1.5L/100L water. K.Z oil: In Miscible type formulated by Kafr El-Zayat Co. The rate of use was 1.5 L / 100 L water. Misrona oil: In mayonnaise type formulated by Misr Petroleum Co. Egypt containing 80% mineral oil. The rate of use was 2 – 2.5L / 100L water. Diver oil: A light mineral oil (summer oil) produced by El-Helb pesticides and chemical Co. as emulsified concentrate formulation. It was used at a rate of 1.5%. Albolium oil: In mayonnaise type formulated by kafr El-Zayat Co. containing 80% mineral oil. The rate of use was 2 L oil / 100L water.

2.3. Insect growth regulator) IGRs: Pyriproxyfen (Admiral 10%): Ec-formulated by sumitomo chemical Co., Osaka, Apploud: Apploud 25 Sc (Buprofezin) at the rate of 50ml / 100L water.

2.4. Organophosphorus insecticides (for comparison). Sumithion 50% Ec: Formulated by sumitomo Co. Osaka, Japan, containing 50% ai O, O dimetheyl-O-(3 methyl-4- mitrophenyl) Phosphorothioate. Actellic 50% Ec: Emulsifible insecticide contains 500 gm primiphos methyl per litter. Chemical name O, O dimethyl O-2-diethyl amino-6-methyl pyrimidin-4-yl Phosphorothioate. Active Ingredient, 50%

wt/vol**.,** Inert Ingredient 50% wt/vol., Produced by Siyngeneta Co. for Plant Protection / Bazel Suis.

RESULTS

I. Ecological studies:

1. Survey of scale insects infesting guava trees at Qaliobiya Governorate

This work was carried out during the two studied years, from August 2005 to July 2007, as a visit monthly to the three areas from (EL-Khanka, Shebeen EL-Qanater and Benha orchards). The collected species were listed in Table (1) & Figs (1-2).

1.1. EL-Khanka orchard as shown in the previous Table and Figures, included 1950 individuals in 8 species, where *P. psidii* was the most abundant one with 90.3%, then *Aspidiotus nerii* Bouche (5.54%) and *Ceroplastes cirripediformis* Comstock (2.82%). *Saissetia oleae* Oliver were the least abundant species forming (0.1%) of the all collected species.

1.2. Shebeen EL-Qanater: nearly gave the same picture except *Coccus hespridum* L. collected in few numbers forming (0.06%). On the hand, *Ceroplastes cirripediformis* Comstock represented the second highly abundant species after *P. psidii* forming (28.3%). Finally *Maconellicoccus hirsutus* (Green) was not detected.

Table 1: The collected scale insects on guava trees at Qaluobiya Governorate

No.	Insect Scientific Name	El-Khanka		Shebeen El-Qanater		Benha		Total	
		No.	%	No.	%	No.	%	No.	%
1	***Lepidosaphes ulmi* L.**	13	0.667	2	0.056	101	4.31	116	1.477
2	***Aspidiotus nerii* Bouche**	108	0.538	64	1.798	84	7.85	356	4.533
3	***Pulvinaria psidii* (Maskel)**	1761	90.307	2481	69.691	2056	87.8	6298	80.2
4	***Kilifia acuminata* (Signoret)**	3	0.154	2	0.056	0	0	5	0.064
5	***Saissetia oleae* Oliver**	2	0.103	2	0.056	0	0	9	0.051
6	***Ceroplastes cirripediformis* Comstock**	55	2.821	1006	28.258	0	0	1061	13.51
7	***Coccus hesperidum* L.**	0	0	2	0.056	0	0	2	0.025
8	***Icerya seychellarum* (Westwood)**	3	0.154	1	0.028	0	0	4	0.051
9	***Maconellicoccus hirsutus* (Green)**	5	0.256	0	0	2	0.09	7	0.089
	Total	1950		3560		2343		7853	100
	%	24.83		45.333		29.84			

1.3. Benha guava trees survey as clear in the Table and Figures gave different picture, where *Lepidosaphes ulmi* (L.) (4.31%) came after the first hard scale *A. nerii* (7.85%). The previous Table (1) showed that, Benha was the lowest infested area but the highest infested one is Shebeen EL-Qanater. The most serious pests on guava trees were *P. psidii* then *C. cirripediformis, A. nerii* and *L.ulmi* . The other species still represented with low density.

2. Key to guava scales at Qaliobiya Governorate

1-The scale is elongated, triangular, strongly tapered toward the exuvial end, light brown to grey, most found on trunk, may appeared banded. Microscopically, adult yellowish, head rounded, eye not developed into a spur sharply pointed laterally pygidium with median lobes, with a pair of gland spine between them, without club – shaped basal scleroses and with many similar dorsal macroductes (Figs 3 and 4)..…… ……..……...…. ***Lepidosaphes ulmi* L**.

-The scale neither elongated nor triangular, with other colors, without these combinatio of characters……..…..….**2**

2- Hard scale covered with flattish armored, circular with central yellowish pellicles and naked, abdominal female microscopically with reddish pygidium, without abdominal spiracles, without a rigid anal ring and anal plate (Figs. 5 and 6) ……..……..…..***Aspidiotus nerii* Bouche**

- Without hard armored scale, without naked yellow pellicles, without reddish pygidium ……..…… **3**

3- Pink in color, with pink body fluids, covered with short filamentous white waxy secretion, microscopically with stout body dorsal setae at basal half and flagellate at apex, with few shorter setae between them; ventral setae longer and less stout, more flagellate; adult male pink with one pair of very simple wing and long antennae, with reduced mouth parts (Fig.7).……...……***Maconellicoccus hirsutus* (Green)**

-Without pink color, without these waxy secretion, body setae not as the above..…**4**

4- Without soft scale, with tough cyst, spherical cyst, composed of very thin layers, female looks like a hairy ball, eyes well-developed (Fig.8)……...…….....***Iceya seychelarum* (Westood)**

- With soft scale, without cyst, not like spherical ball, with 2-5 pairs of simple eyes……..……**5**

5- Thin and flat, yellowish-green in color, triangular with blunt pointed front tip; mesothoracic and metathoracic coxae different in shape than prothoacic coxae, with thin tibia and very short tarsi (Fig.9)…….……***Kilifia acuminate* (Signoret)**

- Oval or globular, with different color, meso and metathoracis coxae similar in shape to from prothoracic coxea, with normal tibia and tarsi…….…….…….……...**6**

6- Yellowish brown, with transparent area and brown spots with variable dorsal setae; spine – shape, cylindrical, capitate and clavate; with many preoperculer pores and four apical satae at anal plate …….……...…....……..***Coccus hespridium* L.**

- With other colors, without transparent area and brown spots …….……...**7**

7- Flat, greenish color, with large discoidal pares extending form anterior of anal plates to head (Figs 12 and 13)……..***Pulvinaria psidii* Maskell**

-With other colors, not flat, without these discoidal pores ……..…..…..**8**

8-Dark brownish with clear H – shaped ridges, microscopically with oval cell – like clear areas, numerous spine – like dorsal setae, anal plate with large discal setae (Fig.10)…….……..……..….***Saissetia oleae* (Oliver)**

-Grayish white, without these H – shaped ridges; oval in dorsal view, hemispherical laterally, with one dorsal six lateral plates, with one pair of long setae between antenna (Fig.11)……...…***Ceroplastes cirripediformis* Comstock**

3. Seasonal abundance of *Pulvinaria psidii* stages and its total population infesting guava trees at Qaliobiya governorate:

Seasonal abundance were carried out from 1st April 2005 till mid March 2007 were investigated and tabulated in Tables (2 and3) and graphically illustrated in Figs (18-22).

3.1. Seasonal fluctuation of ovisacs: The results in the Tables (2 and 3) and Fig. (18) showed that, the *P. psidii* ovisacs had a regular occurrence all over the year, except during the end of each year (from 1st January till 1st April) where the number was very low. Also, there were three peaks of egg sacs per year after that the number was decreased. The highest peak were at mid June and mid September (19, 18 ovisacs/leaf) respectively.

3.2. Seasonal fluctuation of Nymphs: The obtained data as shown in the same tables, Fig. (19) indicated that: the nymphal stage had three peaks per year, the highest one was in1st May with 320 nymphs / leaf and decreased from mid January till mid March.

3.3. Seasonal fluctuation of adult females: AS presented in the same Tables (1 and 2) and Fig. (20) gave the same picture, the highest peak was at 1st September (40 adult females /leaf), there were three depression periods the deepest one at mid March (1 adult females /leaf).

3.4. Seasonal fluctuation of the gravid females: From the fortnightly obtained data, the graved females had vacillating elevation but it revealed three tips which climbs during 1st October and mid November to 7 Gravid females / leaf as shown in table (2 and 3) and Fig. (21). On contrary the minimum graved females occurred at many times, the lowest and longest depression of gravid females occurred during the 1st December till mid March with 1-2 insect /leaf during winter season.

3.5. Seasonal fluctuation of total population: Total population of *P. psidii* different stages; (ovisacs, eggs – nymphs, adult and gravid females) / leaf during 2005-2006 was shown in Tables (2 and 3) and illustrated in Fig. (22), where the prevalence curve indicated that there were three annual peaks per year. The highest occurrence achieved at 1st May with (327, 283 insect / leaf)during the two years; on the other hand, there were depression periods occurred per year, the deepest one was during January, February and in the early March reached (3 insects / leaf).

3.6. The rate of half monthly variation (H. M. V.): Data given in the same Tables (2and 3) and Fig.(23) indicated that the highest maximum monthly variation was at 1st December (3.06). The minimum monthly variation was recorded at mid November (0.26).

3.7.Number and duration of the annual generations: As presented in Tables (2, 3 and 4) recorded that there were three annual generations; The 1st generation with highest density, the third was the longest with high representation at the beginning, then clearly depression from mid December till mid March; with minor differences in some generation's time.

3.8. Effect of climatic factors on *Pulvinaria psidii* total population.

3.8.1. Effect of daily maximum temperature (D.Mx.T.). Statistical analysis of (D.Mx.T.) data in Table (5) showed a positive highly significant correlation where(r) value was (0.521).

Table 2: Seasonal abundance of *Pulvinaria psidii* and total population on guava tree; the half monthly variations in relation to climatic factors from 1st April 2005 till mid March 2006.

season	Sampling dates	No. of individuals /leaf					H.M.V	Climatic Factors				
		Eggs sacs	Nymph	Ad. Female	Gravid	Total pop.		Temprature		R.H.	Rain fall	wind speed
								Min	Max			
Spring	**01/04/2005**	6	91	13	1	111	0.00	9.79	23.3	52.95	6	18.11
	15/04/2005	6	170	8	2	180	1.62	13.83	27.63	53.61	0	14.64
	01/05/2005	9	320	6	1	327	1.82	15.68	26.19	53.11	4	11.3
	15/5/2005	2	227	9	5	241	0.74	17.57	31.72	50.4	0	11.54
	01/06/2005	7	156	16	2	174	0.72	19.3	31.29	51.59	0	12.28
	15/6/2005	19	87	24	1	112	0.64	22.45	32.46	53.36	0	9.93
Summer	**01/07/2005**	11	92	17	2	111	0.99	20.59	33.52	52.26	0	11.51
	15/7/2005	7	132	11	5	148	1.33	21.93	33.09	56.4	0	8.96
	01/08/2005	13	285	10	2	297	2.01	22.19	33.59	58.15	0	12.47
	15/8/2005	15	133	13	2	148	0.50	21.71	33.23	59.22	0	8.61
	01/09/2005	8	71	27	1	99	0.67	20.47	32.44	60.9	0	12.91
	15/9/2005	3	16	10	3	29	0.29	19.57	33.14	58.68	0	14.26
Autumn	**01/10/2005**	5	120	5	7	132	4.55	17.49	32.23	56.47	0	10.99
	15/10/2005	7	223	6	3	232	1.76	15.43	25.67	55.36	0	12.98
	01/11/2005	14	120	8	2	130	0.56	12.62	22.78	57.82	0	9.55
	15/11/2005	7	16	17	1	34	0.26	12.57	25.19	58.02	4	12.99
	01/12/2005	3	67	36	1	104	3.06	13.25	20.25	60.22	0	10.55
	15/12/2005	1	42	29	2	73	0.70	7.94	22.25	59.5	0	13.12
Winter	**01/01/2006**	1	14	14	1	29	0.40	8.49	20.34	61.9	3	9.87
	15/1/2006	1	1	12	3	16	0.55	7.27	18.47	59.33	0	7.83
	01/02/2006	2	4	17	3	24	1.50	8.05	19.55	56.02	4	12.8
	15/2/2006	2	8	5	1	14	0.58	10.85	18.83	60.36	0	10.67
	01/03/2006	2	4	3	1	8	0.57	11.29	22.36	58.79	6	13.98
	15/3/2006	3	1	1	1	3	0.38	11.61	24.76	49.54	0	10.35
	Total	**154.00**	**2400.00**	**317.00**	**53.00**	**2776.00**	**26.20**	**361.94**	**644.28**	**1353.96**	**27.00**	**282.20**

Table 3: Seasonal abundance of *Pulvinaria psidii* stages and the total population on guava tree; the half monthly variation in relation to climatic factors from 1st April 2006 till mid March 2007.

Season	Sampling dates	No. of individuals / leaf					H.M.V	Climatic Factors				
		Eggs sacs	Nymph	Ad. Female	Gravid	Total pop.		Temperature		R.H.	Rain fall	Wind speed
								Min	Max			
Spring	**01/04/2006**	1	90	12	2	105	0.00	15.17	22.20	54.25	6.00	82.45
	15/04/2006	3	154	14	1	169	1.61	15.97	27.70	52.50	0.00	80.20
	01/05/2006	7	277	5	1	283	1.67	13.93	29.30	53.90	4.00	87.20
	15/5/2006	2	160	11	4	175	0.62	18.26	27.20	49.47	0.00	76.67
	01/06/2006	4	140	25	2	167	0.95	19.32	33.50	63.93	0.00	97.43
	15/6/2006	7	48	26	1	75	0.45	20.68	32.60	47.40	0.00	80.00
Summer	**01/07/2006**	12	88	39	3	130	1.73	22.68	32.90	48.93	0.00	81.83
	15/7/2006	9	147	28	2	177	1.36	23.10	35.60	66.14	0.00	101.74
	01/08/2006	8	61	18	2	81	0.46	25.40	36.20	58.19	0.00	94.39
	15/8/2006	3	93	38	6	137	1.69	24.30	36.50	63.61	0.00	100.11
	01/09/2006	5	99	40	2	141	1.03	19.85	33.50	63.75	0.00	97.25
	15/9/2006	18	290	13	3	306	2.17	19.19	30.30	52.49	0.00	82.79
Autumn	**01/10/2006**	1	197	2	1	200	0.65	18.17	31.00	45.75	0.00	76.75
	15/10/2006	3	148	34	2	184	0.92	15.23	28.60	46.00	0.00	74.60
	01/11/2006	3	135	35	3	173	0.94	14.40	24.90	59.71	0.00	84.61
	15/11/2006	4	132	36	7	175	1.01	12.05	19.50	54.56	0.00	74.06
	01/12/2006	13	130	33	2	165	0.94	10.84	19.30	59.94	2.00	81.24
	15/12/2006	6	72	31	2	105	0.64	6.70	14.30	56.23	0.00	70.53
Winter	**01/01/2007**	2	53	26	1	80	0.76	7.72	17.60	56.34	3.00	76.94
	15/1/2007	2	23	28	1	52	0.65	10.25	19.70	54.17	0.00	73.87
	01/02/2007	1	29	20	2	51	0.98	8.57	18.20	53.57	0.00	71.77
	15/2/2007	2	38	16	1	55	1.08	12.43	23.20	49.59	0.00	72.79
	01/03/2007	2	49	10	1	60	1.09	11.67	23.00	50.19	0.00	73.19
	15/3/2007	2	13	6	2	21	0.35	11.81	23.70	51.00	0.00	74.70
	Total	**120**	**2666**	**546**	**54**	**3267**	**23.7657**	**377.69**	**640.5**	**1311.6**	**15**	**1967.11**

Table 4: Number and duration of *Pulvinaria psidii* generations under field conditions during 2005-2007 on guava trees at Qaliobiya Governorate.

Generations	Data from — to	Duration in months	Number of nymphs/leaf at the peak of generation
2005 – 2006 Season			
1st Generation	From 1st April to mid June	2.5 months	320
2nd Generation	From mid June to mid September	3 months	285
3rd Generation	From mid September to mid March 2006	6 months	223
2006 – 2007 Season			
1st Generation	From 1st April to mid June	2.5 months	277
2nd Generation	From mid June to1 st September	2.5 months	147
3rd Generation	From to1 st September to mid March 2007	6.5 months	290

Table 5: Simple correlation and partial regression of six abiotic and biotic factors with their significant level and percentage of explained variance on the population density of *Pulvinaria psidii* population at Qaliobiya governorate during the two studied years.

Year	Source of variation	Simple correlation		Partial regression		"F"value	E.V.%
		R	p	b	t		
2005-2006	MAX. Temp	0.521**	16.58	0.149	1.506	2.068	36.50%
	Min. Temp	0.485**	-8.115	0.45	-0.772		
	daily mean R.H%	-0.367	-7.775	0.164	-1.451		
	Rainfall	-	0.921	0.933	-0.085		
	wind speed	0.045	5.356	0.588	0.552		

r = Simple correlation
p = Probability
b = regression
t = T test
E.V. = Explained variance

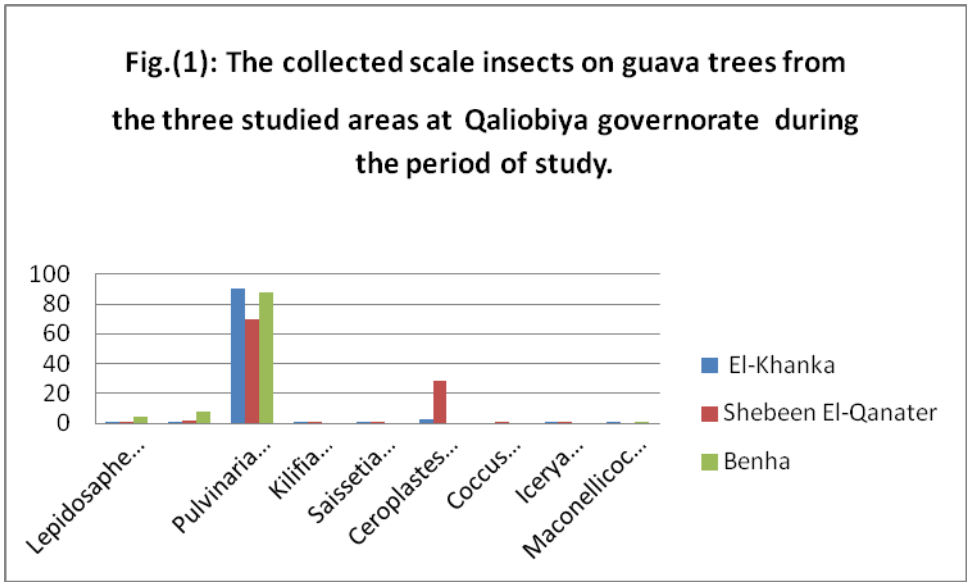
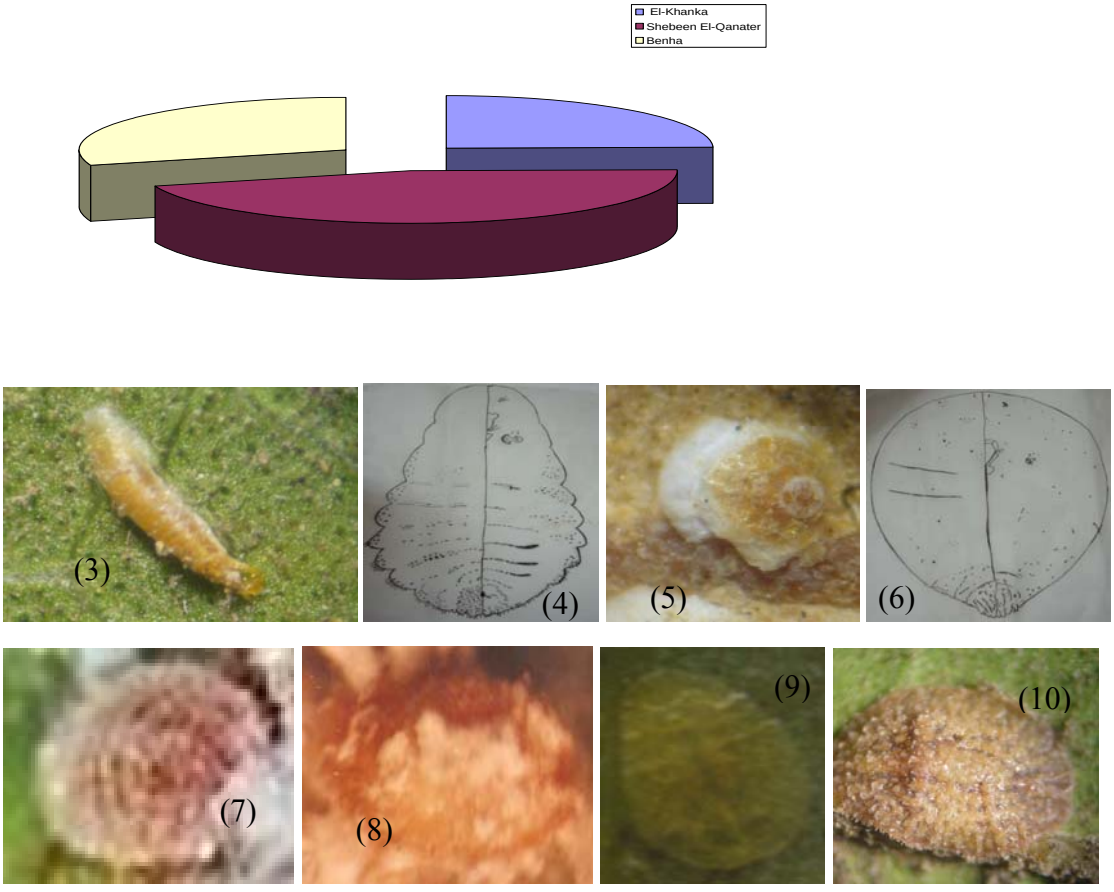
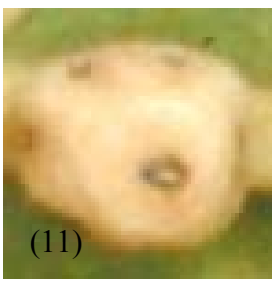


Fig. (2): The relative abundance of the all collected scale insects on guava trees from the three studied areas.

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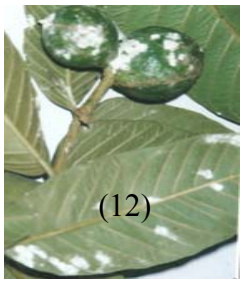
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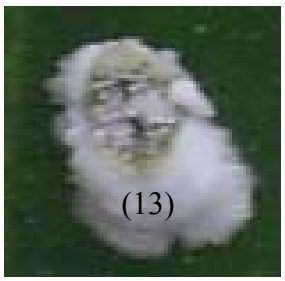
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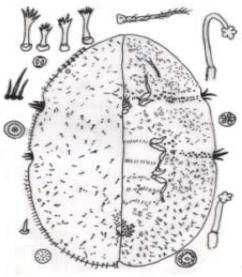

(14)


(15)


(16)

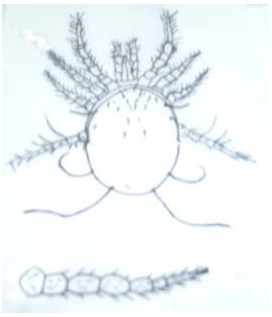
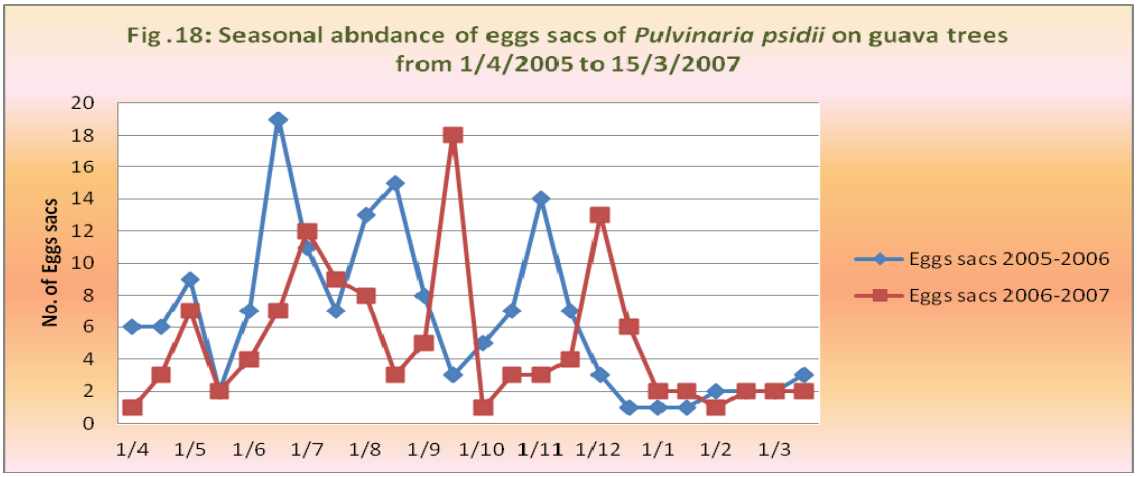

(17)

Fig.(3&4): *Lepidosaphes ulmi,* (3): scale, (4): adult female; Fig. (5&6)*: Aspidiotus nerii* 5: scale, (6): adult female; Fig.(7): *Maconellicoccus hirsutus;* Fig.(8): *Icerya seychellarum*; Fig.(9): *Kilifi acuminata;* Fig.(10): *Saissetia oleae*: Fig. (11): *Ceroplastes cirripediformis;* Figs.(12,13&14): *Pulvivaria psidii,* (12): preadult, (13): scale, (14): adult female; Fig.(15) *Rodalia cardinalis*; Fig.(16) *Chilocorus bipustulatus* Fig.(17): *Amblyserius swiriskii.*



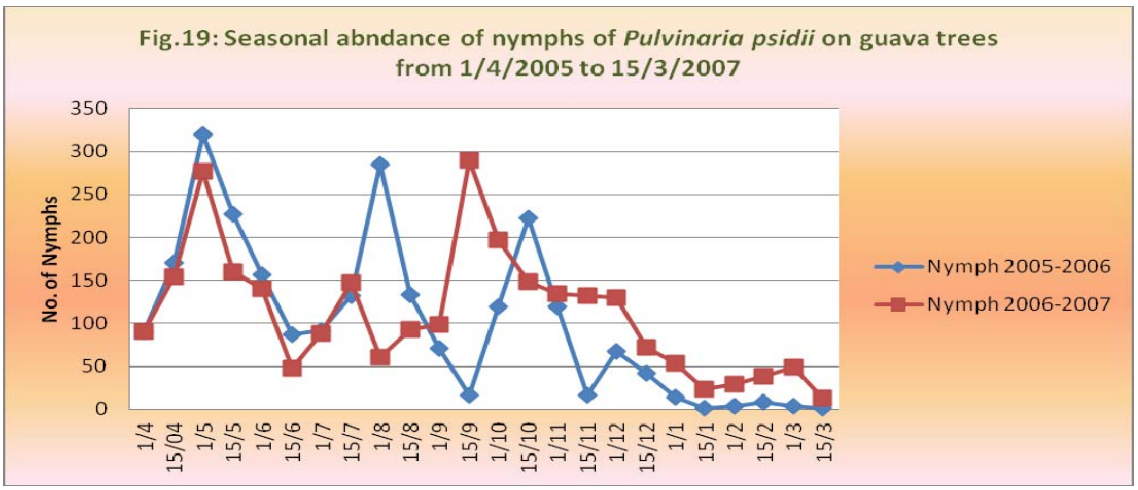


Fig.20: Seasonal abndance of Ad.female of *Pulvinaria psidii* on guava trees from 1/4/2005 to 15/3/2007

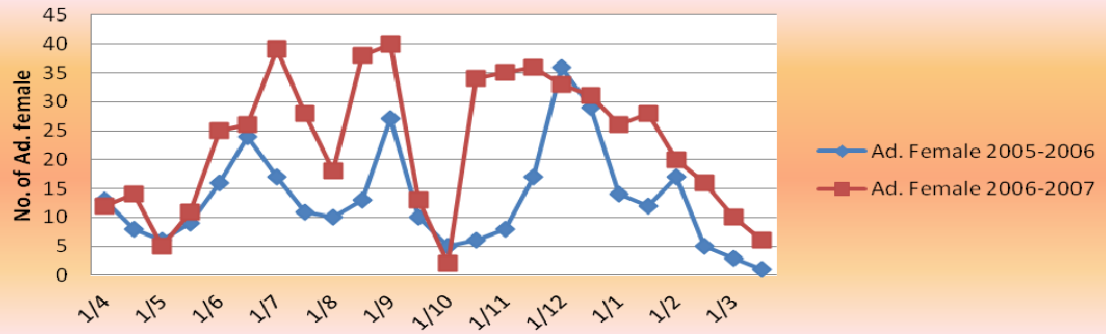


Fig.21: Seasonal abndance of gravid female of *Pulvinaria psidii* on guava trees from 1/4/2005 to 15/3/2007

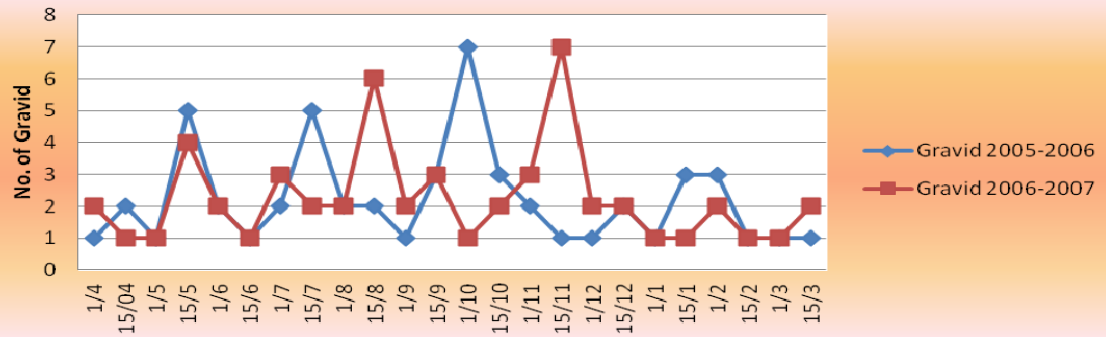


Fig.22: Seasonal abndance of Total population of *Pulvinaria psidii* on guava trees from 1/4/2005 to 15/3/2007

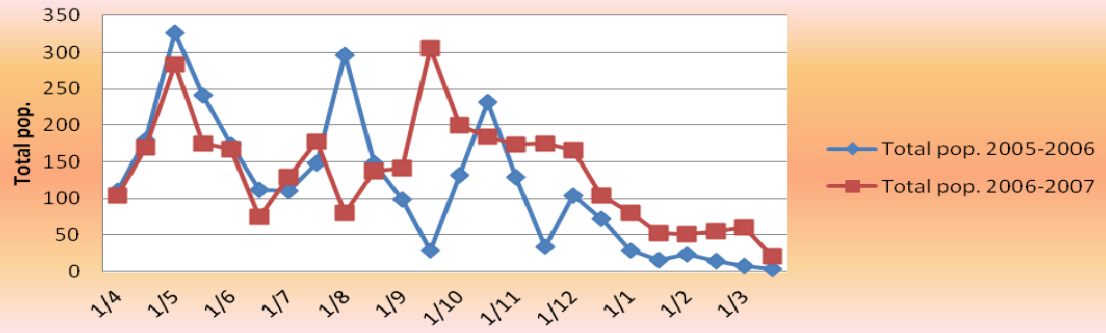
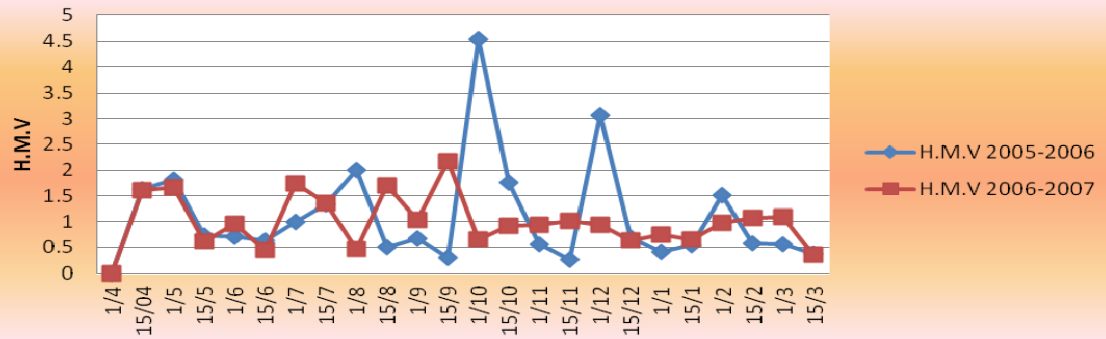


Fig.23: H.M.V of *Pulvinaria psidii on guava trees* from 1/4/2005 to 15/3/2007



However the partial regression indicate a positive slightly significant relation during the two studied years with (P.reg.) value equal to (0.149).

3.8.2. Effect of the night minimum temperature (N. Mn. T.). Statistical analysis of (N.Mx.T.) on the same table indicated a highly significant positive simple correlation where (r.) value was (0.485). The partial regression showed positive slightly significant relation with (P. reg.) 0.450 during the two years.

3.8.3. Effect of the daily mean relative humidity (D.M.R.H.): The simple correlation was negative slightly significant relation with (r.) value was -0.367. However the partial regression showed positive slightly significant relations during the two year of study with (P.reg.) values (0.164).

3.8.4. Effect of rain fall. Statistical analysis of rain fall showed that, the simple correlation indicated no relation in the two years. The partial regression showed a positive slightly significant relation during the two years of study with (P.reg.) value equal (0.933).

3.8.5. Effect of wind speed. Statistical analysis of data in this table showed slightly significant positive simple correlation relation (r.= 0.045) and also positive slightly significant relation where (P. reg.) value (0.588) during the two years of study.

3.8.6. The combined effect of the five studied factors. The combined effect of the abiotic five main factors on *P. psidii* total population revealed slightly significant effect where F value equal (2.068) during the two years . Analysis of variance clearly indicated that the low effect of the explained variance (E.V) which recoded (36.50) during the two successive years of study as shown in the Table (5).

3.9. Biotic factor (the natural enemies associated with *Pulvinaria psidii*:

3.9.1. *Rodalia cardinalis* Mulsant (Fig. 15) (Coleoptera: Coccinellidae) Oval, convex pubescent ladybird, ground color reddish with black markings, with small size, 2.5-5.5 mm in length, its antenna is short,8-segmented, basal segment enlarged. The eyes are faceted& hairy; the apical segment of the maxillary palpi is securiform. Pronotum broadest subbasally, with curved margins, anterior angels are broadly rounded; elytra broader than pronotum at base, punctuation dense, elytral marking of variable size and shape, elytral epipleura is broad, without foveae; the suture between meso and metasternum is narrow; prosternum very short, prosternal process prominent between procoxae. Tibiae somewhat flattened and expanded near basal third, capable of receiving tarsi when legs retracted, tarsi trimerous and the abdomen has six visible sternites.

3.9.2. *Chilocorus bipustulatus* L. (Fig. 16) (Coleoptera: Coccinellidae), can be distinguished from other scale predator by its very convex body, shiny colored, head reddish-brown, deeply inserted; the pronotum covering a posterior portion of eyes, clypeus with marginal ridge, elevated at its middle and depressed on both sides; epistoma dilated, concealing the base of antennae and subdividing the eyes; antenna 8-segmented, clavate, the terminal joint tapering; labrum dark brown& hairy; mandible with two teeth only. Pronotum reddish-brown, meso& metathorax dark brown; elytra reddish-brown and shining, with three red spots on each elytron, the two inner spots united; the outer side of the tibia at the basal third with tooth-like extension, claws toothed. Abdominal segments are five visible in female & six in male.

3.9.3. *Amblyserius swiriskii* (Athias-Henriot) (Acari :Phytoseiidae) (Fig. 17) It can be distinguished from other related species by its body which is compressed dorsally, brownish in color, with dorsal shield large.

II. Toxicological studies:

Field evaluation of the tested treatments on *P. psidii* infesting guava trees was conducted. Two experiments were conducted in one district, Shebeen El-Kanater at Qaliobiya Governorate.

1. The summer field evaluation of the tested treatments on *Pulvinaria psidii* :

1.1. The first post treatment count after two weeks from spraying:

Statistically analysis of variance of data presented in Table (6) and histogramatically illustrated in Figs (24 and 25) Revealed, that the efficiency of treatment showed that, Sumithion was the highly effective one (83.7%), followed by actellic (81.8), KZ oil (79.7%), Misrona oil (77.8), Apploud (61.9%) Biofar (57.2%) then Admiral (53.1%) with significant difference between the efficacy of the tested treatments on *P. psidii* total population. On the other hand, the two tested organophosphorous insecticides and the two types of oils had insignificant differences between one of them with the other where L.S.D. was 2.68.

Concerning the susceptibility of *P. psidii* different stages to the tested treatments, analysis of data clearly showed the highly affect of the pre-adult (nymphs) followed by the ovisacs with percentage reduction (93.9 and 74.2), respectively, then adult females gave good percentage reduction (73.4).

It showed 41.4% reduction. There was significant difference between different stages each other except adult females and ovisac stages. L.S.D was 14.64.

1.2. The second post treatment count after 4 weeks from spraying: Statistically analysis of data presented in Table (6) and histogramatically illustrated in Fig. (25) clearly showed a highly significant difference between the bio-residual efficacies of the tested treatments on *P. psidii* against population response. Where " L.S.D. value was 0.97. The average percentages of reduction were superior in case of Apploud (88.5%) which had significant difference with the other treatments, followed by KZ oil (86.2%), Misrona oil (85.8%) and Sumithion (85.7%) which had insignificant difference between them. Then actellic (80.3), Admiral (78.4%) and Biofar (70.3%) which had significant differences between them. Statistical analysis of data presented in table, 6, Figs 24&25 clearly indicated that, there were significant differences between the efficacies of the tested treatments on *P. psidii* different stages L.S.D. value was 10.37. The average reduction in nymphs, adult females, gravid females and ovisac stages were 96.3, 83.9, 52.9 and 86.2, respectively. However, there was a significant difference between the response of the gravid female and the response of all other stages (nymphs, adult females and ovisacs stages).

1.3. The 3rd post treatment count after 6 weeks from spraying: Statistical analysis of data presented in Table (6) and histogramatically illustrated in Fig. (25) clearly indicated significant differences between the bio-residual efficacies of the tested treatments on *P. psidii* against population response, L.S.D. value was 0.96. The highest percentage of reduction was recorded by Misrona oil (87.2%) and Apploud (86.9%) with insignificant difference between them. On the other hand, there were significant differences between them and the following.

Table 6: Percentage of reduction in *Pulvinaria psidii* different stages induced by application insecticidal agent on guava trees at Qaliobiya governorate in summer.

Post Treat. Counts / Treat. Dosage	percentage reduction after																			
	2 weeks					4 weeks					6 weeks					8 weeks				
	Pre-adult	Adult	Gravid	Ovisacs	Mean	Pre-adult	Adult	Gravid	Ovisacs	Mean	Pre-adult	Adult	Gravid	Ovisacs	Mean	Pre-adult	Adult	Gravid	Ovisacs	Mean
Misrona Oil 1.5 %	97.10	89.9	35.1	89.3	77.8 c	97.6	88.5	66.5	90.5	85.8 b	98.1	88.6	71.6	90.6	87.2 a	96.3	88.8	82	86.2	88.3 a
KZ Oil 1.5 %	98.10	94.1	35.1	91.5	79.7 bc	98.2	90.1	66.6	90	86.2 b	98.4	75	66.6	90	82.5 b	95.6	83	66	89	83.4 b
Admiral 10% Ec 0.5 %	85.00	43	24.1	60.2	53.1 f	93.3	85.4	55	80	78.4 d	95.2	56.7	75	80	76.7 d	98.5	43	75	60	69.1 f
Apploud 0.5 %	89.5	56.9	21.2	80	61.9 d	94.4	85.9	79.7	94.1	88.5 a	95.1	78.3	80	94.1	86.9 a	95.3	59	80	88.8	80.8 c
Biofar 0.2 %	94.8	61.2	34	38.7	57.2 e	97.9	60	34.1	89.1	70.3 e	96.2	80	34.1	88.7	74.8 e	98.2	60	67	77	75.6 d
Sumithion 0.15 %	95.3	87.4	71.9	80	83.7 a	95.5	87.2	80	80	85.7 b	91.2	62.5	80.2	80.3	78.6 c	90.5	68	80	52	72.6 e
Actellic 0.15 %	97.4	81.4	68.5	80	81.8 ab	97.2	90	54.1	80	80.3 c	95.2	70	66.7	80	78 c	94.5	60	67.3	80	75.5 d
Mean	93.9 a	73.4 b	41.4 c	74.2 b		96.3 a	83.9 b	52.9 c	86.2 b		95.6 a	73 b	67.7 b	86.2 a		95.6 a	66 b	73.9 b	76.1 b	
F value for treat.					2.11					3.92					2.43					1.03
L.S.D. for treat.					2.68					0.97					0.96					1.96
F value for stages	19.42					16.82					10.76					9.61				
L.S.D. for stages	14.64					10.37					11.47					12.02				

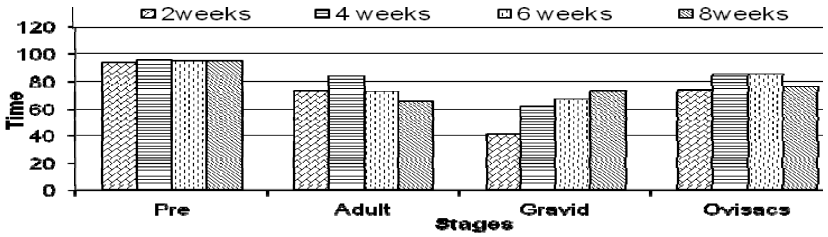


Fig.24: Average reduction percent of *Pulvinaria psidii* different stages in summer spraying

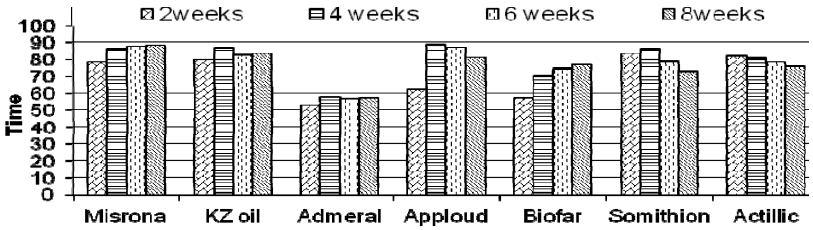


Fig.25: Average reduction percent of all treatments on *Pulvinaria psidii* total population in summer spraying

Treatments where KZ oil (82.5%), Sumithion (78.6%) and Actellic (78%) followed by Admiral (76.7%) and Biofar (74.8%) with significant difference between these treatments and the preceding them. Also data which presented in the above mentioned table and Figure showed significant differences between the efficacy of the tested treatments on *P. psidii* different stages, L.S.D. value was 11.47. Nymphal stage recorded the highest percentage of reduction (95.6), followed by ovisacs, adult and gravid females stages. The percentage of reduction (86.2, 73 and 67.7) respectively.

1.4. The 4th post treatment count after 8 weeks) from spraying: Statistically analysis of data presented in Table (6) and histogramatically illustrated in Fig. (25) showed significant differences between the bio-residual efficacies of the tested chemical treatments on *P. psidii* against population response, L.S.D. value was 1.96. The average reduction was the highest in case of Masrona oil (88.3%), followed by KZ oil (83.4%), Apploud (80.8%), Biofar (75.6%), Actellic (75.5%), Sumithion (72.6%) then Admiral (69.1%) with significant differences between them. In contrast, Actellic and Biofar with insignificant differences between them. Statistical analysis of the obtained data indicated that there was significant difference between the efficacies of the tested treatments on *P. psidii* different stages; L.S.D. was 12.02. Per-adult, recorded (95.6%), followed by ovisacs stage (76.1%), gravid female stage (73.9%) then adult stage with (66%)

2. Winter field evaluation of the tested treatments on *Pulvinaria psidii* : The toxic efficacy of the tested treatments (Albolium oil 2%, Diver oil 2%, Misrona oil 2% KZ oil 1.5% and Apploud 0.5%) against *Pulvinaria psidii* scale insect infesting guava trees at Shebeen El Kanater, Qaliobiya governorate were presented in Table (7) and illustrated in Figs (26 and 27) as follows:

Table 7: Percentage of reduction in *Pulvinaria psidii* different stages induced by application insecticidal agent on guava trees at Qaliobiya Governorate in winter.

Treatment and dosage/1L water	Percentage reduction / counts																			
	1st Post treatment (2 weeks)					2nd Post treatment (4 weeks) one month					3rd Post treatment (6 weeks)					4rth Post treatment (8 weeks) 2 month				
	Pre-adult	Adult	Gravid	Ovisacs	Mean	Pre-adult	Adult	Gravid	Ovisacs	Mean	Pre-adult	Adult	Gravid	Ovisacs	Mean	Pre-adult	Adult	Gravid	Ovisacs	Mean
Albolium 2 % (0.1)	75.30	73	73.3	44.7	66.6 B	74.8	81.5	80.3	71.3	77 b	84.5	81.2	84.3	84.1	84 b	79.4	85.9	85.3	84.8	84.4 b
Diver Oil 2%	70.40	79	53.7	37.4	60 C	83.8	84.4	66.1	60.3	74 c	84.9	83.9	74.1	80.4	81 c	77.8	85.1	84.4	77.2	81.6 c
Misrona Oil 2%	85.40	89	71	65.1	77.7 A	83.8	82.7	80.2	72.5	80 a	93.3	85.3	84.5	78.2	84 a	88.4	84.4	87.1	77.4	84.4 b
KZ Oil 1.5%	79.1	77	65.2	54.7	69.9 B	88.4	84.4	81.6	68.5	81 a	94.3	88.5	84.3	77.1	87 a	93.4	90.9	85.8	78	87 a
Apploud 0.5%	40.4	49	34.9	39.4	51.5 D	87.2	78.5	55.5	55.7	69 d	89.8	88	75	74.7	82 bc	92.3	84.1	75.7	74.7	82.7 bc
Mean	74.2	77	60	48.3		84	82.7	72.7	65.7		89.8	85.4	81.6	79.3		86.3	86.5	84.1	79.2	
	a	a	b	c		a	a	b	b		a	Ab	b	B		a	a	a	a	
F value for treat.					91.9					44.58					27.95					11.79
L.S.D for treat.					3.3					2.31					1.44					1.91
F value for stages	22.77					84					5.75					2.24				
L.S.D. for stag	8.79					8.9					5.85					4.95				

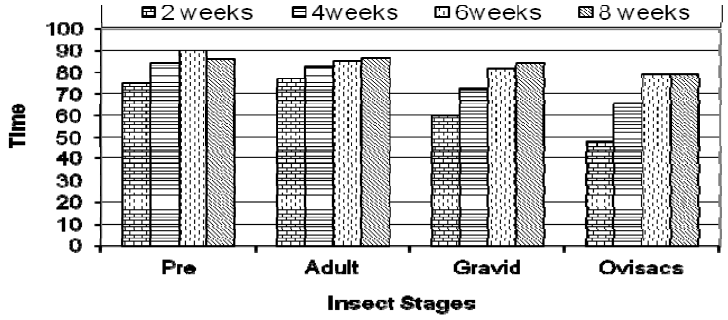


Fig.26: Average reduction percent of *Pulvinaria psidii* different stages in winter spraying

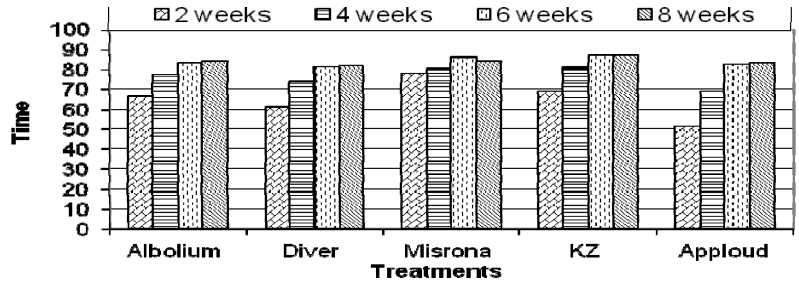


Fig.27: Average reduction percent of all treatments on *Pulvinaria psidii* total population in winter spraying

2.1. Reduction percent after2 weeks from winter spraying: Analysis of variance of data presented in Table (7) and illustrated in Fig. (27) revealed significant differences between the bio-residual efficacies of the tested treatments on *P. psidii* population response, L.S.D. was 3.3. Percentage of reduction in general mean of insect population as indication of efficiency of the tested treatments was high after using Misrona oil (77.68%), followed by KZ oil (68.9%) and Albolium oil (66.58%), then Diver oil (60%) and Apploud with (51.5%), with a significant differences between the treatments each other except the second and third treatments

Good response of *P. psidii* different stages to the tested treatments. Pre-adult, adult females, gravid females and ovisacs (74.16, 77.28, 60.02 and 48.3%) respectively, with insignificant difference between the first two stages (pre-adult and adult). On the other hand, there was significant difference between the first two stages and the other stages, where L.S.D.was 8.79.

2.2. Reduction percent after 4 weeks from winter spraying. Statistically analysis of data presented in Table (7) and illustrated in Fig. (27) clearly showed significant differences between the bio-residual efficacies the tested treatment on *P. psidii* population response. L.S.D. value was 2.31 (at 5% level). The average reduction was highly superior in case of KZ oil (80.73%) and Misrona oil (79.8%) then followed by Albolium oil (77.48%), Diver oil 74.2% and Apploud 69.23%. There was insignificant difference between the first two treatments. On the other hand, there were a significant difference between the first two treatments and the other three treatments with each other.

Highly response of *P. psidii* different stages to the tested treatments, the percentage of reduction in pre-adult, adult, gravid females and ovisacs were 84, 82.74, 72.74 and 65.66, respectively, with insignificant difference between the first two stage and the other stages. On the other hand, there was significant difference between the two groups. Where, L.S.D. value was 8.9.

2.3. Reduction percent 6 weeks after winter spraying. Analysis of data presented in Table (7) and illustrated in Fig. (27) clearly showed; the average percentage reduction recorded were very good results in case of KZ oil 87.05% and Misrona oil (85.83% then, followed by Albolium oil 83.53%, Apploud 82.38% and Diver oil 81.38% whose were with good results. With insignificant difference between the first two treatments and also insignificant difference between the third and fourth treatment but there significant difference between the two groups and the fourth treatment. . L.S.D value was 1.46. Concerning the susceptibility of *P. psidii* different stages to the tested treatments analysis of data clearly showed; pre-adult and adult females were the most affected stages. The percentages of reduction were (89.76 and 85.38) with insignificant difference between them. Then they were, followed by the other two stages (gravid females and ovisacs) the percentage of reduction were (81.64 and 79.34), respectively, with insignificant difference between them. In contrast, there was significant difference between the two groups. L.S.D 5.85.

2.4. Reduction percent after 8 weeks from winter spraying: Analysis of variance of data presented in Table (7) and illustrated in Fig. (27) mentioned that the average reduction was highly superior in case of KZ oil (87%) followed by Albolium oil & Misrona oil 84.4%, Apploud (82.7%) then Diver oil (81.6) with significant difference between all treatments with each other. In contrast to the later two treatments had insignificant difference between them. L.S.D. was 1.91. There were highly responses of Pre-adult, adult females, gravid females and ovisacs to the tested treatments where the percentages of its reduction were (86.3, 86.5, 84.1 and 79.2) respectively with insignificant difference between each stage and the other. L.S.D. equal 6.95.

DISCUSSION

I. Ecological Studies:

1. Survey of scale insects on guava trees at Qaliobiya Governorate:

Nine species were collected during this updated survey of the scale insects infesting guava trees at El-Khanka, Shebien El-Kanater and Benha, Qaliobiya Governorate from August (2005) till late July (2007). These species belonging to four families: Coccidae, Diaspididae, Monophlebidae and Pseudococcidae. The most serious guava soft scales: *P. psidii* and *C.s cirripediformis* ; the dangerous hard scales are**:** *A. nerii* and *L. ulmi*. The other scale insects infesting guava trees with low infestation. These results cleared differences from the earlier survey on guava trees by El-Minshawy *et al.* (1974) in Alexandria, where the appearance of some serious scales such as (*L. ulmi*, *C. cirripediformis* and *A. nerii*, the disappearance of other scales as *Hemiberiesia latania* (Signoret) and *Mycetaspis personata* (Comstock). But *P. psidii* still the most serious, with highest infestation (mainly meteorological and ecological differences) (Moustafa, 2012).

2. Seasonal fluctuation the most serious soft scale insect, *Pulvinaria psidii* different stages and total population during two year of studies :

As shown in result, this serious soft scale had three generations (two generation only by El-Minshawy*et al.* (1974) and three by Radwan (2003) each year, the highest

occurrence was during spring season, then autumn season, whereas the Min. Temp, Max. Temp, were suitable, R.H% was slightly high, no rain fall and slightly wind speed. But the lowest density was during winter season due to unsuitable climatic factors (Aly and Nada, 1993).There were great differences in the time from the previous seasonal fluctuation, in 1974 the greatest occurrence were during summer (July) and winter (November), this may be due to the changes in climatic factors or the high occurrence of their effective predators (*R. cardinalis, C. bipustulatus* and *A. swiriskii*). Hassan and Radwan (2008) recorded the highest population density of *R. cardinalis* during July and August).

II-Toxicological Studies:

Control of the most serious scale pest infesting guava trees: Evaluation of certain treatments on *P. psidii* during summer and winter season.

1- Summer evaluation: The present study showed that *P. psidii* different stages were affected by various types of treatments, (Masrona oil, KZ oil Apploud, Admiral, Biofar, Actellic, Sumithion) during the four post treatment counts; two, four, six and eight weeks after summer spray. The most affected stages were the pre-adult and ovisac stages, followed by the other stages during the experiment period, ensured the results of Helmy *et al*. (1992). Organophosphorus was more effective than the other groups after two weeks from summer spraying, then their effect was slightly decreased, in agree with Kwaiz (1999). Profenofos was the most effective compound, followed by Diazinon. Mayonnaise oil and miscible oil gave high reduction after two weeks gradually till the end of the experiment. IGRS reduction still to increase and gave high effect after one month (4 weeks) and also still increase till the end of the experiment.

2- The winter evaluation: The obtained results demonstrated that *P. psidii* different stages were affected by different types of the tested chemicals during post treatment counts; (two, four, six and eight weeks) after winter spray. The sprayed chemical divided to three groups' mayonnaise oils, miscible oils and I.G.R. During this experiment the most affect stages were pre-adult and adult stage but all stage nearly had the same affect. Miscible oils (Kz oil) had the most efficacy one, followed by mayonnaise oils; Misrona, Alboluim and Diver give good efficacy after two weeks, their effect increase gradually to give very good efficacy at the end of experiment I.G.R. and Applaud started to give good efficacy after 4 weeks (one month) and increase gradually after that to give very good efficacy till the end of experiment. The application time is very important, the summer spray was more effective than the winter spray (it is a lighter version, block insect spiracles, suffocating them). the organophosphorus compounds used only at high infestation where no fruits; mineral oils, I.G.Rs and the biological insecticides demonstrated successful performance against this soft scale insect populations, their effect begins at least two weeks later, extended up to 8 months after treatment in addition to their safety effect and also maintain the natural balance. (Helmy *et al.* 2001; El-Sobky, 2006; Hariss *et al.* 2006 and El-Sahn, 2007). Finally, for increasing crop production of this popular fruit, agriculture precautions (Baker, 2009) must be applied; The organophosphorus compounds must be replaced (due to its high systemic toxicity) by these other friendly alternatives during pest control management, the right time must be considered; the success occurred in the last century through releasing *R. cardinalis* for controlling mealy bugs (Tawfik, 1993) can be repeated during Jun (Hendawy, 1999 and El Serafi *et al*. 2004).

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ARABIC SUMMARY

الحشرات القشرية التى تصيب الجوافة مع مكافحة حشرة الجوافة الرخوة بأستخدام بدائل المبيدات

رضا فضيل على بكر[1،3] و صابر فهيم موسى[2]
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نظرا للتغير فى الظروف المناخية خلال السنوات الماضية وخاصة بالنسبة للحشرات القشرية التى تتزايد أعدادها باستمرارو ما تسببه من أضرارا جسيمة لبساتين الجوافه المحببة لكثير من الناس و مواكبة ايضا للوضع التصنيفى العالمى الحديث تم عمل الأتى.

1- حصر للحشرات القشرية التى تصيب أشجار الجوافة خلال عامين متتاليين فى ثلاث حدائق (بمركز الخانكة - شبين القناطر وبنها) بمحافظة القليوبية خلال عامين متتاليين إبتداءاً من أغسطس 2005 إلى يوليو 2007

و تم تجميع وتعريف تسعة أنواع من هذه الحشرات القشرية وعمل ايضا مفتاح تصنيفى مزود بالصور الملونة والرسومات لسهولة التعرف عليها (حيث تعد الحشرات القشرية من أصعب المجموعات التصنيفية) وكانت هذه الحشرات تتبع أربع عائلات حشرية وهى كالآتى :

- حشرات قشرية غير مسلحة (رخوة) Coccidae و يتبعها حشرة البلفيناريا الخضراء(*Pulvinaria psidii* (Maskell ؛ حشرة الجوافه الشمعية *Ceroplastis ceripediformis* الحشرة القشرية الرخوة (Limnacus) *Coccus hesperidum* ؛ حشرة الزيتون الرخوة *Kilifia acuminate* - حشرة المانجو الرخوة (signoret) *Saissetia oleae* (Olivier)
- حشرات قشرية مسلحة Diaspididae و يتبعها حشرة اللاتانيا القشرية المحدبه *Aspidutus nerii* و حشرة الحلويات المحارية *Lepidosaiphes ulmi*
- حشرات عائلة البق الدقيق Monophlepidae يتبعها حشرة السيشلارم (westwood) *Icerya seychellarum*
- حشرات من عائلة البق الدقيقى الكاذب Pseudococcidae بق الهيبسكس *Maconellicoccus hirsutus*

وقد وجدت اختلافات شديدة بين هذه الأنواع والتى جمعت أثناءالحصر للحشرات القشرية من على أشجار الجوافة بواسطة المنشاوى واخرون (1974) من حيث اختفاء بعض الأنواع وظهور اخرى لم تكن موجودة ولكن اتفقت النتائج فى كون *Pulvinaria psidii* هى أخطر هذه الأفات.

2- دراسة التواجد الموسمي ومدة وعدد الأجيال لحشرة الجوافه الرخوة *Pulvinaria psidii* التى تصيب أشجار الجوافه و أجريت هذه الدراسة فى محافظة القليوبية لمدة سنتين متتاليتين إبتداءا من أول إبريل 2005 إلى منتصف مارس 2007 على أشجار غير معاملة بالمبيدات كما تم دراسة تأثير بعض العوامل المناخية (درجة الحرارة القصوى أثناء النهارو درجة الحرارة الصغرى أثناء الليل – المتوسط اليومى للرطوبة-الأمطار- سرعة الرياح، على نشاط هذه الآفه، اضافة الى تجميع وتعريف مزودا بالصور لثلاثة مفترسات ودراسة تأثيرهم ايضا مع باقى العوامل على نشاط هذه الأفة وأظهرت النتائج:

- زيادة مدة تواجد الحشرة (ثلاثة أجيال) (جيلين فقط بواسطة المنشاوى واخرون-1974) وسجل لهذه الآفه ثلاث فترات نشاط أعلاهم فى الربيع (من منتصف ابريل لمنتصف مايو)، وأقلهم فى فصل الشتاء(فى شهرى يناير وفبراير) أما يوليو ونوفمبروديسمبر فشهدوا انخفاض عكس ما سجل من قبل ولذلك لحساسية الحشرات القشرية للظروف المحيطة بها
- أوضح التحليل الإحصائى لتأثير العوامل المناخية المختلفة والحيوية على تعداد الحشرة طوال العام أن التأثير المشترك للعوامل المناخية المختبرة كان أوضح من تأثير كل عامل على حده على حشرة الجوافه الرخوة لذلك يجب مراعاة عدد من العوامل لبرنامج المكافحة المتكاملة لهذة الافة.
- تم تجميع المفترسات الأتية: (*Rodalia cardinalis, Chilocorus bipustulatus* and *Amblyserius swiriskii*) وأظهرت نتائج باهرة فى مكافحة البق الدقيقى. حيث تتواجد هذه المفترسات بكثرة فى شهر يوليو مما كان له دور كبير فى تقليل كثافة هذه الافة في هذا الشهرعن الحصر السابق.

3- التقييم الحقلى لبعض المبيدات وبدائلهاعلى حشرة الجوافه الرخوة *Pulvinaria psidii* التى تصيب أشجار الجوافه فى محافظة القليوبية .

أ- التجربة الصيفية (التجربة الأولى) :

أجريت هذه التجربة فى شهر يوليو 2005 فى أحد بساتين الجوافه فى قريه أبو المعاطى مركز شبين القناطر بمحافظة القليوبية، لتقييم فاعلية بعض بدائل المبيدات (زيوت معدنية – مبيدات حيوية – منظمات نمو) وبعض المبيدات الفسفورية ثم تقدير معدل الأنخفاض في تعداد الحشرة علي الأشجار المعاملة بعد إسبوعان، شهر، 6 أسابيع ثم شهران من الرش الصيفي و قورنت بالأشجار قبل المعاملة حققت هذة المعاملات نتائج ممتازة خاصة عند إستخدام الزيوت. و قد أوضحت النتائج وجود فرق معنوى بين المعاملات وبعضها البعض وكان أفضل النتائج سجلت لزيت مصرونا ويليه زيت KZ ، منظم النمو أيلود وتبعهم بيوفار مبيد الاكتليك ، ومبيد ثومثيون واخيراً منظم النمو أدميرال. و كذلك سجلت طور الحوريات أعلى استجابة و طور الإناث البالغة أقل أستجابة.

التجربة الشتوية (التجربة الثانية)

أجريت هذه التجربة فى شهر فبراير 2006 فى أحد بساتين الجوافه فى قرية أبو المعاطى مركز شبين القناطر بمحافظة القليوبية على حشرة الجوافه الرخوة *Pulvinaria psidii* . لتقييم فاعلية بعض بدائل المبيدات و هي زيوت معدنية (kz - زيت ألبوليوم –زيت مصرونا – زيت دايفر) و منظم نمو أيلود. كانت أفضل النتائج سجلت في نهاية التجربة لزيت KZ 87% وتبعه زيت البوليوم وزيت مصرونا وبكفاءه 84.4% وتلاهم أيلود ثم زيت ديفر بكفاءة 82.7% و 81.6% على التوالى. كما سجل طور الحوريات في نهاية التجربة أعلى استجابة وكانت 86.3% و طور أكياس البيض أقلهم إستجابة حيث سجل 79.1% لحمايته بالخيوط الشمعيه ، مع وجود فرق معنوى بين كل طور والأخر .وأكدت النتائج أن:

1-المعاملة الصيفية أكثر تأثيرا من الشتوية، فالزيوت النباتية الصيفية أكثر تطايرا مما يسرع من انسداد فتحات التنفس للحشرة واختناقها.
2- المركبات الفسفورية يقل تأثيرها تدريجيا ، فتستخدم فى الأصابة العالية وفى عدم وجود الثمارفي أضيق الحدود، وتستبدل بالزيوت النباتية ومنظمات النمو والمبيدات الحيوية التى أبرزت نجاها باهرا فى مكافحة هذه الافة. بالاضافة لتأثيرها الأمن على النبات والبيئة الحيوية، بل ويستمر تأثيرها ويزداد لمدة شهرين أوأكثر بمراعاة توقيت الرش.