

Comparative annual analysis of the inspected armored, soft scales and mealybugs (Hemiptera: Coccoidea) populations on *Hedera canariensis* in Alexandria , Egypt

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ABSTRACT

A survey of armored, soft scales and mealybugs (Hemiptera: Coccoidea) infesting the ornamental plant species *Hedra canariensis* in Montazah garden was carried out in the years of 2005-2007. The results revealed the occurrence of two armored scales: *Mycetaspis personata* (Comstock) and *Aspidiotus nerii* Bouché (Hemiptera, Diaspididae), two coccid species named: *Pulvinaria psidii* Maskell (Hemiptera, Coccidae), and *Coccus hesperidum* (Linnaeus) (Hemiptera, Coccidae) and one pseudococcid species: *Planococcus citri* (Risso) (Hemiptera: Pseudococcidae). Considering the armored scale group, the highly abundance was recorded during January and February (75 and 83.4 % of grand total count) in the first year and in February (77.8 %) in the second year. The lowest abundance was recorded during July in two successive years. Regarding the population count of soft scale group, it's clear that the highest rate of these coccids was observed during July and August during the first year while in the second year this rate reached 94.0% during July only. The lowest rate of soft scale recorded during February in two years (16.4 and 22.2 % of total count in respect). The scarcely inspected citrus mealy bug individuals; *P. citri* was found in low numbers, while disappeared completely during the elapsing spring-summer months from April till August or / and September; and early winter month of January or / and January-February in the 1st or / and 2nd years, respectively.

Keywords: Soft scales , mealybugs, *Hedera canariensis* , Alexandria , Egypt

INTRODUCTION

Algerian ivy, *Hedra canariensis* (Family: Araliaceae) is an evergreen climbing plant, growing to 20-30 m high where suitable surfaces (trees, cliffs, walls) are available, and also growing as ground cover where there are no vertical surfaces. The flowers are very rich in nectar, an important late food source for bees and other insects; the fruit are small black berries ripening in late winter, and are an important food for many birds, although , poisonous to humans. The seeds are dispersed by birds eating the fruit. Leaves and berries are taken orally as an expectorant to treat cough and bronchitis. In 1597, the British herbalist John Gerard recommended water infused with ivy leaves as a wash for sore or watering eyes (Gerard and Woodward, 1985). Insect pests are regarded as one of the important injurious factors responsible for deterioration of ornamental plants in Egypt. Amongst, scale insects and mealybugs constitute one of the common insect pests of *H.canariensis* in Alexandria Governorate (Abdel Fattah, 2009).

The present work aimed to through the light on the important species of scale insects and mealy bugs which associated with algerian ivy with comparative annual studies on them.

MATERIALS AND METHODS

Survey and inspection of algerian ivy, *H. canariensis* plants were started from March 2005 till February 2007 in Montazah public gardens in Alexandria Governorate. The shrubs were not exposed to any pesticides treatments during the period of study. Five plants were randomly chosen to the survey of the armored, soft scales and mealybugs. Ten leaves were monthly picked out at random, from each direction of inspected tree. Leaves were put in cloth bags; transported immediately to the laboratory for classifying and counting the existing individuals of detected species using a stereoscopic binocular microscope. The upper and lower surfaces of the leaves were carefully examined. The rate of increase/decrease in population densities was calculated by dividing the mean number of insects found in the sample over that found in preceding one (Bodenheimer, 1951).

In an effort to estimate the distribution and population densities of the detected armored, soft scales and mealybugs, the obtained results were statistically analyzed according to (Snedecor, 1970).

RESULTS AND DISCUSSION

A survey of armored, soft scales and mealybugs infesting the algerian ivy plant species *H. canariensis* in Montazah garden was carried out in the years of 2005-2007. The results revealed the occurrence of two armored scales: *Mycetaspis personata* (Comstock) and *Aspidiotus nerii* Bouché (Hemiptera, Diaspididae), two coccid species named: *Pulvinaria psidii* Maskell (Hemiptera, Coccidae), and *Coccus hesperidum* (Linnaeus) (Hemiptera: Coccidae) and one pseudococcid species: *Planococcus citri* (Risso) (Hemiptera: Pseudococcidae). These three groups of scale insect species of superfamily Coccoidea are differed in occurrence from year to another and also during the following annual months.

1. The armored scales:

Data in Table (1) revealed that *M. personata* can be considered the main diaspidid species infesting *H. canariensis* in Montazah garden. Its population density represented 100% of total diaspidid count during April, May, June, July and August in the first year (2005 – 2006), and during April, May and June in the second year (2006 – 2007). It was observed in low population in September (73.7%) in the first year and in July (24.5%) in the second year.

Considering the rate of counted numbers of adult females of *M. personata* on *H. canariensis* it represented 100% of total counted individuals during April, May, June, July and September in the first year, while this rate was recorded also in the same previous months in addition to October in the second year of study (Table, 2). The lowest occurrence of adult females observed during January and February (59.2 and 60.0%, in respect) in the first year and in February only (52.0%) in the second one. No males had been observed during the months of high rate occurrence of adult females. Only, the higher value of adult male occurrence was observed during January and February (40.8 and 40.0% of total) in the first year and February (48.2%) in the second one (Table, 2).

Table (1): Monthly variations in total counts and calculated percentages of armored scale insects associated with *Hedra canariensis* during 2005 - 2007 in Alexandria Governorate.

Months	Total count of armored		Quotient of increase		% of total count		<i>Aspidiotus nerii</i>		
	2005-06	06-07	2005-06	06-07	<i>Mycetaspis personata</i>	2005-06	06-07	2005-06	06-07
March	534	565	-	-	91.2	94.2	8.8	5.8	
April	306	254	0.57	0.45	100.0	100.0	0.0	0.0	
May	280	172	0.91	0.67	100.0	100.0	0.0	0.0	
June	230	221	0.82	1.28	100.0	100.0	0.0	0.0	
July	27	12	0.11	0.05	100.0	24.5	0.0	75.5	
August	273	745	10.10	62.00	100.0	9405	0.0	5.5	
September	426	574	1.56	0.77	73.7	57.7	26.3	42.3	
October	383	542	0.89	0.94	83.0	51.7	17.0	48.3	
November	272	524	0.71	0.96	85.3	87.0	14.7	13.0	
December	464	676	1.70	1.29	78.0	77.4	22.0	22.6	
January	403	608	0.86	0.98	77.9	86.0	22.1	14.0	
February	438	449	1.08	0.73	86.5	82.6	13.5	17.4	
Grand total/year	4036	5342							
% of grand total count/year					89.6	79.6	10.4	20.4	

Table (2): Monthly variations in calculated percentages of inspected *Mycetaspis personata* adults (Males and Females) on *Hedra canariensis* during 2005-2007 in Alexandria Governorate.

Months	Total count/5trees		Quotient of Increase		% of total count			
	05-06	06-07	05-06	-6-07	Female		Male	
	05-06	06-07	05-06	-6-07	05-06	06-07	05-06	06-07
March	487	532	-	-	81.0	88.1	19.0	12.0
April	306	254	0.62	0.47	100.0	100.0	0.0	0.0
May	280	172	0.91	0.67	100.0	100.0	0.0	0.0
June	230	221	0.82	1.28	100.0	100.0	0.0	0.0
July	27	12	0.11	0.05	100.0	100.0	0.0	0.0
August	273	704	10.10	58.60	78.3	80.2	21.7	20.0
September	314	331	1.15	0.47	100.0	100.0	0.0	0.0
October	318	280	1.01	0.84	81.0	100.0	19.0	0.0
November	232	456	0.72	1.62	75.8	83.0	24.1	17.0
December	362	523	1.56	1.14	77.3	72.5	22.7	27.5
January,	314	523	0.86	1.00	59.2	73.4	40.8	26.5
February	379	371	1.20	0.70	60.0	52.0	40.0	48.2
Grant total/year	3522	4379			84.4		15.6	

The incidence of the second diaspidid species, *A. nerii* was completely coincided during late spring months (April and May) and summer months. While, it was recorded in moderate or lower numbers during September (represented by 26.3% of total monthly count) and all winter months (with a range of 13.5 to 22.1%) in the first year (Table 1). In the second year, 2006-2007, It was also recorded in high ratio reached 75.5% of total counted armored scales in July; greatly decreased to 5.5% in August; while in autumn and winter months (Table 1) showed amore or less lower ratio ranged between 13 and 42.3%.

2. The soft scales:

The exhibited data in first years of study (Table 3) indicated that *P. psidii* had been observed all over the year on *H. canariensis* representing higher ratio of total of both detected soft scale species. It was commonly abundant during autumn and early winter months, with a population density comprising 100% of total counted soft scale individuals/month. While, the lowest rate of its abundancy occurred in May (80.7%) (Table 3). In the second year a similar trend of results was detected, whereas, the population density of this insect represented also 100% of the total counted soft scale individuals/month during autumn and winter months (December & January), while the comparatively lower density was observed in June (81.3%) (Table, 3). This agree with the studies carried out by Abdel Razak (2000) on *P. psidii* infesting *Schinus*

trebenthifolius where the population of this soft scale insect was recorded in high rates during the autumn and winter months, at Alexandria.

Table 3: Monthly variations in total count/year of soft scale insects associated with *Hedra canariensis* during 2005 - 2007 in Alexandria Governorate.

Months	Total no/5trees		Quotient of increase		% of total count			
	05-06	06-07	05-06	06-07	<i>Pulvinaria psidii</i>		<i>Coccus hesperidum</i>	
					05-06	06-07	05-06	06-07
March	329	332	-	-	83.3	83.3	16.7	16.7
April	285	272	0.86	0.81	83.2	87.9	16.8	12.1
May	295	234	1.03	0.86	80.7	82.9	19.3	17.1
June	124	123	0.42	0.52	81.5	81.3	18.5	18.7
July	719	761	5.79	6.18	94.7	96.2	5.3	3.8
August	695	406	0.96	0.53	93.9	88.2	6.1	11.8
September	748	877	1.07	2.16	100.0	100.0	0.0	0.0
October	682	657	0.91	0.74	100.0	100.0	0.0	0.0
November	477	315	0.69	0.47	100.0	100.0	0.0	0.0
December	753	495	1.57	1.57	100.0	100.0	0.0	0.0
January,	134	622	0.17	1.25	82.1	100.0	17.9	0.0
February	86	137	0.64	0.22	82.6	93.4	17.4	6.6
Grant total/year	5327	5231			90.2	92.8	9.8	7.2

On the other hand, regarding its wide range of host plants Salama and Salem (1970) reported that *P. psidii* is mostly abundant in July and August on guava trees when temperature and humidity are relatively high. The same meaning was reported by Moursi (1974) who mentioned that the percentage of dead individuals of *P. psidii* are relatively high during February, March and April due to the weather conditions of temperature, relative humidity, rain fall and Khamasien wind. Also, Osman *et al.* (1982) found that the peak of infestation was high during August on *Aralia longifolia* shrubs. Vice versa, in both years of investigation the soft brown scale, *C. hesperidum* was completely disappearing during autumn and early winter months; recorded in low numerical densities in spring and summer months. Where, its population represented 16.7, 16.8, 19.3 and 18.5% of total counted soft scales/month, in respect during the first year. Also, its population density showed lower rates of 17.9 and 17.4% of monthly total during January and February in respect at the same year. Identically in the second year, the insect disappeared throughout the elapsing period from September till January and also recorded in low numerical densities during July (3.8%) and February (6.6%); in relatively moderate population densities during spring months, June and August, represented (16.7, 12.1, 17.1, 18.7 and 11.8 in respect).(Table, 3).

These above mentioned results agree with those obtained by many research workers (Tulhouk, 1969; Zalomi and Morse, 1991; Abdel Razak, 2000 and Moursi *et al.*, 2005). Whereas, Tulhouk, (1969) and Zalomi and Morse (1991) stated that the population of *C. hesperidum* is usually high in mid summer and early autumn. Abdel Razak (2000) and Moursi *et al.* (2005) confirmed that the occurrence of higher rates of the total inspected individuals of the soft brown scale during August. Also, according to Williams and Knoxfield (2000) *C. hesperidum* prefers warm dry climates and mainly affects trees up to 10 years old. While, Swailem and Awadallah (1973) found that *C. hesperidum* is active during Autumn and Winter where its highest abundance took place during December on sycamore fig trees.

3.Comparative analysis between the inspected armored, soft scales and mealybugs populations on *Hedra canariensis*:

In regard to the calculated grand total of all the total counted per year of each of the armored, soft scales and mealybugs species in each of both years of study 2005 – 2006 and 2006 – 2007. The calculated deduced percentage values of each of these insect

species in proportion to the total monthly counted insect/tree, it could be revealed that the calculated densities of total counted individuals of each of both groups of the common abundant armored scales and/or soft scales in proportionate to the grand total of all inspected coccoids species/year in the subsequent years of study (2005 – 2007), were merely equal. Whereas, the estimated densities of the armored scale group comprised 46.6% and 51.8 % of the grand total counted coccoids/year; compared to a semi equal measured densities of the soft scale group amounted to 52.6% and 47.7% of the grand total inspected coccoids/year in the following years of 2005 – 2006 and 2006 – 2007, respectively (Table, 4). In this concern, the lone inspected species of the 3rd coccoids group, i.e. the citrus mealy bug *P. citri* was represented by a negligible and rather lower population densities during both years of study not exceeding 0.8 and/or 0.5 % of the grand total counted coccoids/year, in respect.(Table,4).

Also, from (Table, 4 and Figs 1 and 2) it could be seen the more or less increased or/and decreased abundancy of each coccoid groups during the different months of the year. The observed data revealed that the high population’s numbers of three groups on *H. canariensis* occurred during the autumn months of (September and October) and early winter (December) in the first year (2005 – 2006) while in the second year, the highest counted numbers of three groups were noticed during August, September, October, December and January. In both successive years the lowest occurrence of counted populations number was observed during June and resembled (3.7 and 3.2 % of grand total counted individuals per year, in respect (Table 4).

Table 4: Monthly variations in total count/year of armored, soft scales and mealybug associated with *Hedra canariensis* (2005 – 2007).

Months	Total count/5trees		% of grand total year		% of total count					
	05-06	06-07	05-06	06-07	Armored scales		Soft scales		Mealybug	
					05-06	06-07	05-06	06-07	05-06	06-07
March	874	908	8.9	8.4	59.3	62.2	39.4	36.6	1.3	1.2
April	591	526	6.3	4.9	51.8	48.3	48.2	51.7	0.0	0.0
May	575	406	6.0	3.7	48.6	42.4	51.3	57.6	0.0	0.0
June	354	344	3.7	3.2	65.0	64.2	35.0	35.8	0.0	0.0
July	746	810	8.0	7.5	3.6	6.0	96.4	94.0	0.0	0.0
August	968	1151	10.3	10.6	28.2	65.0	71.8	35.3	0.0	0.0
September	1184	1451	12.6	13.4	36.0	39.5	63.2	60.4	0.8	0.0
October	1081	1216	11.5	11.3	35.4	44.6	63.0	54.0	1.5	1.4
November	776	847	8.2	7.8	35.0	62.0	61.5	37.2	3.5	0.9
December	1248	1200	13.2	11.1	37.2	56.3	60.3	41.2	2.5	2.4
January	537	1330	5.7	12.3	75.0	53.2	25.0	46.7	0.0	0.0
February	525	615	5.6	5.7	83.4	77.8	16.4	22.2	0.2	0.0
Grand total/year	9421	10804			46.6	51.8	52.6	47.7	0.8	0.5

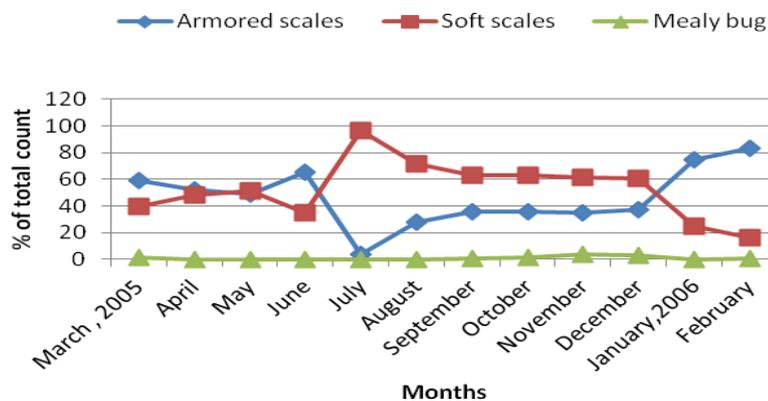


Fig. 1: Monthly variations in total count/year of armored, soft scales and mealybug associated with *Hedra canariensis* (2005 – 2006).



Fig. 2: Monthly variations in total count/year of armored, soft scales and mealybug associated with *Hedra canariensis* (2006 – 2007)

Considering the armored scale group, its high abundance was recorded during January & February (75 and 83.4 % of monthly total count) in the first year and in February (77.8 %) in the second one. Versus a lowest abundance recorded in July month of both successive years (3.6% and 6.0 %, in respect) (Table, 4). Regarding the population count of soft scale group, it's clear from (Table, 4 and Figs 1 and 2) that the highest rate of these coccids was observed during July, August during the first year (96.4 and 71.8 % of total counted insects/month), while in the second year this rate reached 94.0 % in July only. While, The lowest rate of these soft scales was recorded in February month of both years (16.4 and 22.2 % of total count/month in respect). Moreover, for the scarcely inspected citrus mealybug individuals; *P. citri* was found in low numbers, while disappeared completely during the elapsing spring-summer months from April till August or/and September; and early winter month of January or/and January-February in the 1st or/and 2nd years, respectively (Table, 4 and Figs 1 and 2). The detected negligible and/or ratherly lowered densities of *P. citri* all over the year on *H. canariensis* could be attributed to the fact that this host plant is not a preferable host for this citrus mealybug.

The seasonal variations in the calculated percentages of armored scales population densities on *H. canariensis* are also shown in Table (5). The data declared that the highest rate of occurrence of both diaspidid scales population's occurred during winter months and represented 65.2 % and 62.4 % of grand total individuals/year in both the successive years, in respect, and the lowest during summer months representing 32.3 and 45.0 % of grand total counted individuals/year (Table 5). Also, the seasonal variation in measured population's density of the two coccid species on *H. canariensis* are exhibited in Table (5). The data elucidated that the highest rate of abundance for the inspected individuals occurring on this host plant was noticed during summer-season in the two successive years and represented 67.7 and 55.0 % of grand total counted individuals per year followed by less higher rate of abundance in autumn & spring, 62.7 – 50.6 %; 50.6 – 48.6 %; while the lowest rate occurred during winter months (33.9 and 36.8 % of grand total count per year, in respect).

Table 5: Seasonal variations in population % of armored, soft scales and mealybugs associated with *Hedra canariensis* during 2005 –2006 and 2006-2007.

Season	Total count	% of total count		
		Armored scales	Soft scales	Mealy bugs
Spring 05-06	2040	53.2	46.3	0.5
06-07	1840	51.0	48.6	0.4
Summer05-06	2068	32.3	67.7	0.0
06-07	2305	45.0	55.0	0.0
Autumn05-06	3041	35.5	62.7	1.8
06-07	3514	48.7	50.6	0.7
Winter05-06	2310	64.7	33.9	1.40.8
06-07	3145	62.4	36.8	

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ARABIC SUMMARY

دراسة مقارنة لتعداد الحشرات القشرية المسلحة والرخوة والبق الدقيقي المرتبطة بنبات حبل المساكين الأبيض *Hedra canariensis* في منطقة الإسكندرية - مصر

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أوضحت الدراسة علي نبات حبل المساكين الأبيض خلال عامين متتاليين في حدائق المنتزه بالإسكندرية عن إصابته بنوعين من الحشرات القشرية المسلحة هما حشرة البرسوناتا القشرية *Mycetaspis personata* وحشرة الهيدرا القشرية *Aspidiotus nerii* وأيضا نوعين من الحشرات القشرية الرخوة هما الحشرة القشرية الرخوة البنية *Coccus hesperidum* وحشرة الجوافه القشرية الرخوة *Pulvinaria psidii* إلي جانب نوع واحد من البق الدقيقي وهو بق الموالح الدقيقي *Planococcus citri*. وقد أوضحت الدراسة أن مجموعة الحشرات القشرية المسلحة سجلت أعلى تعداد خلال يناير وفبراير في العام الأول وخلال فبراير فقط في العام الثاني وسجلت أقل تعداد خلال شهر يوليو في العامين المتتاليين أما بالنسبة لمجموعة الحشرات القشرية الرخوة فقد وصل اعلي تعداد لها خلال يوليو وأغسطس في العام الأول وخلال شهر يوليو فقط في العام الثاني وسجل أقل تعداد لهذه المجموعة في شهر فبراير علي مدي عامين متتاليين. وقد تبين من خلال الدراسة علي مدار عامين متتاليين أن نبات حبل المساكين الأبيض لايشكل عائل أساسي لحشرة بق الموالح الدقيقي حيث كان تعداد الحشرة قليل جدا علي النبات.