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Population dynamics and control of masked scale , *Mycetaspis personata* (Hemiptera: Diaspididae) infesting *Ficus nitida hawaii* in Alexandria, Egypt

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ABSTRACT

The performed inspection on the leaves of *Ficus nitida hawaii* (Moraceae) was carried out in Montazah garden during two successive years (June, 2005 till May, 2007). The observed scale insect infesting leaves is *Mycetaspis personata* (Comstock) (Hemiptera: Diaspididae). Results concerning the monthly variations in the total monthly counted individuals of the masked scale, *M. personata* per 5 trees throughout the period of study revealed the presence of five highly variation periods in the first year, one in summer, two during autumn months, one in winter months as well as one took place in late spring. While, in the second year the obtained data revealed that there were six highly variation periods, one in summer, two during autumn months, and two during winter as well as one in late spring. In the first year the number of adult female reached the maximum of total population during July (100% of the total counted insect), then decreased to 68% of the total count during October, increased to 72% in November, decreased again to 66% of total count in December, reincreased slightly to 69% in March then re-decreased to 62% in April and reached the maximum 94% of total count in May. Similar trend of results was also observed in the second year. A field experiment was conducted to control *M. personata* using tow mineral oils: [Masrona® (heavy oil) and Super Royal(R) (light oil)] and an insect growth regulator (IGR), Ropest®. The data obtained revealed that no significant difference between the tested materials on the reduction of population count of the insect. On the other hand, the light oil, S.Royal gave least reduction percentage of the parasitoid *Aphytis mytilaspidis* (Le Baron) (Hymenoptera: Aphelinidae) while Masrona oil gave a best result on reduction of predacious mite, *Tydeus californicus* (Banks) (Tydeidae : Acari).

Keywords: Population dynamics, *Mycetaspis personata* , *Ficus nitida hawaii*, Egypt

INTRODUCTION

Chinese banyan, *Ficus nitida hawaii* (Moraceae) is large evergreen tree. It can be used as outdoors or indoors trees. It's heavily infested with scale insects and mealybugs. Of them The masked scale, *Mycetaspis personata* (Comstock) (Hemiptera: Diaspididae). The masked scale distributes in many world regions, including Egypt (Ezzat, 1958). It is polyphagous species; it has been recorded as a citrus, mango and ornamental plant pest in Egypt (Ezzat, 1958 and Abdel- Razak, 2000). For the economic importance of the masked scale, it must be controlled using

an alternative effective and relatively environmental safe scalicides such as IGR,s and mineral oils (MARL, 1997 and Abo-Shanab,2005).

The present work aimed to add some ecological notes on this coccoid species on one of the important ornamental tree in public and private gardens. Also, the study aimed to evaluate the efficacy of two local mineral oils (heavy and light) and an IGR for controlling the masked scale.

MATERIALS AND METHODS

1. Ecological study:

Survey and inspection were started from March 2005 till February 2007 in Montazah public gardens in Alexandria Governorate. The trees were not exposed to any pesticides treatments during the period of study. Five trees were randomly chosen to the survey of the scale insect. 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).

2. Chemical study:

A field experiment was carried out in August, 2008 in Mountazah garden. Three treatments were used as well as control, replicated five times, were randomly districted over 20 trees. The tested scalicides were two local mineral oils namely Masrona oil® (heavy oil) [85% mayonnaise, produced by Misr Petroleum Co.] and Super Royal oil® (light oil) [95% E.C, produced by El-Gameia El-Taawnia for Petroleum Co.] and one IGR called Ropest® [produced by Shoura Chemicals, Co.] at concentrations of 2.5%, 1.5% and 0.125%, respectively. Pre-treatment count was made before spray and four post counts were made after 2, 4, 6, and 8 weeks after spray. The living scales were examined on 10 leaves from each tree. To evaluate the efficacy of the tested materials, the percentage of reduction was determined according to Stafford and Summers (1963) for scale insect and Henderson and Tilton (1955) for parasitoid and predacious mite. In an effort to estimate the distribution and population densities of the detected scale insect, the obtained results were statistically analyzed according to (Snedecor, 1970).

RESULTS AND DISCUSSION

1. Ecological study:

Data in Table (1) and Fig. (1) show the calculated monthly variations in population density of the masked scale, *M. personata* infesting *F. nitida hawaii* in Montazah gardens during the period of study. It is revealed that the relatively low total number of insects/5trees in July month (357) increased gradually to reach 1343 individuals/5trees in September; represented 14.4% of the total collected insect/year in September 2005, then decreased up to 511 individuals per 5trees representing 5.5% of total count/year in January, 2006, re-increased again to reach 1215 individuals/tree and represented 13% of total count per year in February, 2006, then started to decrease again to reach 542 individuals/tree resembling 5.8% of total count/year in April and so on re- increased during May to reach 868 individuals/tree (9.3% of total

count) to start another decrease in June and July of the next year (Table, 1 and Fig. 1).

Table 1: Monthly variations in population count of *Mycetaspis personata* infesting *Ficus nitida hawaii* during 2005-2006 and 2006-2007 in Alexandria Governorate.

Months	Total count/5trees		Quotient of increase		% of grand total count/year		% of inspected Females		% of inspected Males	
	05-06	06-07	05-06	06-07	05-06	06-07	05-06	06-07	05-06	06-07
June,	482	415	-	-	5.3	5.2	92.0	88.0	8.0	12.0
July	357	100	0.74	0.24	3.8	1.2	100.0	100.0	0.0	0.0
August	715	799	2.00	8.00	7.6	9.9	86.2	91.0	14.0	9.0
September	1343	559	1.88	0.70	14.4	6.9	72.0	72.0	28.0	28.0
October	854	610	0.64	1.09	9.2	7.6	68.0	75.0	32.0	25.0
November	856	763	1.00	1.25	9.2	9.5	72.0	74.0	28.0	26.0
December	711	973	0.83	1028	7.6	12.1	66.0	58.0	34.0	42.0
January	511	594	0.72	0.61	5.5	7.4	67.0	75.0	33.0	25.0
February	1215	1052	2.38	1.77	13.0	13.1	68.0	65.0	32.0	35.0
March	863	734	0.71	0.70	9.3	9.1	69.0	64.0	31.0	36.0
April	542	462	0.63	0.63	5.8	5.7	62.0	62.0	38.0	38.0
May	868	989	1.60	2.14	9.3	12.3	94.0	90.0	6.0	10.0
Grand total/year	9317	8050	% of grand total count/year				76.3	76.2	23.7	23.8

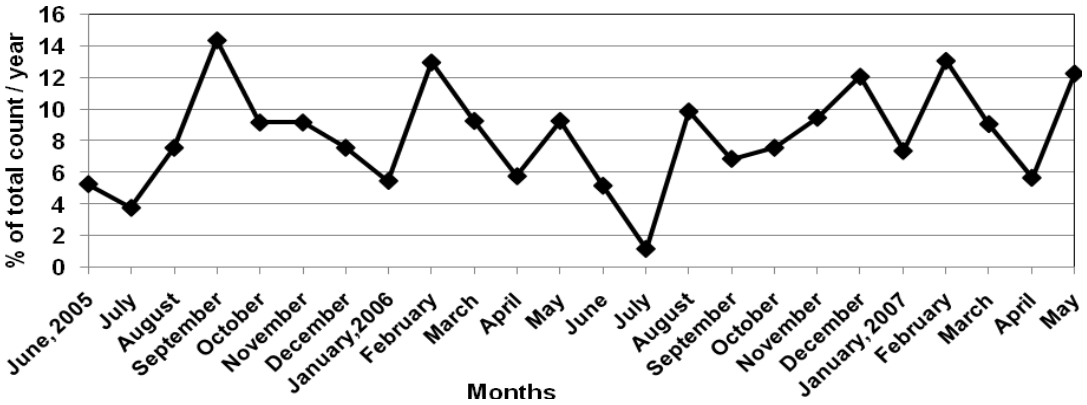

Fig. 1: Percentage monthly variations of total count of *Mycetaspis personata* infested *Ficus nitida hawaii* during (2005-2006 and 2006-2007) in Alexandria Governorate

Herein, in the second year (June 2006, May 2007) the data showed similar trend of results but with slight difference, where the first high number of insects was recorded in August (799 individuals/5trees representing 9.9% of grand total count/year). The second peak of increased insects was recorded in December (973 individuals/5trees representing 12.1% of total count/year), then that highest number decreased up to 594 individuals/5trees (7.4% of total count/year) in January, re-increased again to a maximum of 1052 individuals/5trees (13.1% of total count) in February; further re-decreased up to 462 insect/5trees in April, to give another increase comprised 989 individuals/5trees (12.3% of total count/year) in May, 2007 (Table 1 and Fig. 1); followed by a start of decrease in June & July of the next year. Moreover, the drastic effect of Khamasin hot winds was reflected also on the relatively lower number of total counted individuals/5trees in April month of both years.

Results concerning the monthly variations (Quotient of increase, Q.I.) in the total monthly counted individuals of the masked scale, *M. personata* per 5 trees throughout the period of study revealed the presence of five highly variation periods in the first year, one in summer (2.0), two during autumn months (1.88 & 1.0) one in winter months (2.38) as well as another one detected in late spring (1.60) (Table1). In

the second year, the obtained data revealed that also there were six highly variation periods, one in summer (8.0), two during autumn months (1.09 & 1.25), two during winter (1.28 and 1.77) as well as one in late spring (2.14), (Table, 1). The exhibited results in (Table, 1 and Fig.2) showed that the estimated density values of the adult females of *M. personata* on *F. nitida hawaii* leaves. Whereas in the first year the calculated percentage of adult female reached the maximum of total population during July.

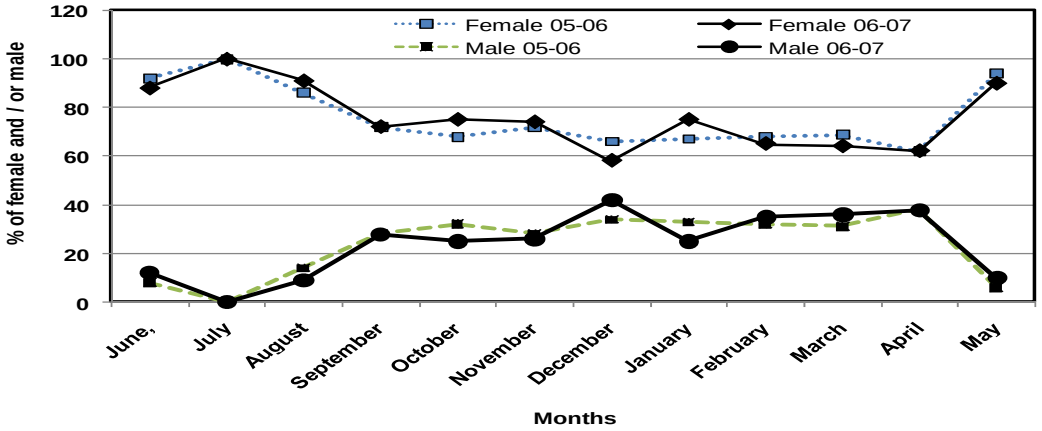

Fig. 2: Monthly calculated percentage of inspected females and males of *Mycetaspis personata* infesting *Ficus nitida hawaii* during 2005-2006 and 2006-2007 in Alexandria Governorate

(100% of the monthly total counted insects); then decreased to 68% of the total count during October, increased to 72% in November, decreased again to 66% of total count in December, re-increased slightly to 69% in March then re-decreased to 62% in April and reached the maximum 94% of total count in May (Table 1). Similar trend of results was also observed in the second year (June, 2006-May, 2007), during which the population of *M. personata* adult females reached 100% of total count during July, then decreased to reach 58% of the total counted insect during December, re-increased again to 75% in January, then re-decreased to 62% in April and reached highly percentage comprising 90% of the total count during May, 2007 (Table 1 and Fig.2). Concerning the measured population density of adult males, their detected numbers were less than those of adult females throughout the year. By beginning of summer months, the adult male of *M. personata* represented 8% of the total monthly counted insects; disappeared completely during July. Later, the calculated percentage of adult male during August represented 14% of total counted individuals/month; followed increase to reach 32% during October, then decreased to 28% during November; re increased to 34% in December, then followed by decreased densities during January, February and March and increased again to reach the maximum (38% of total count) in April in the first year of study (Table 1). The same trend of results has been obtained during the second year with a slight difference in the percentage of total count (Table1). These results are in agreement with the findings of Abdel Razak (2000) and Mesbah *et al.* (2003) who mentioned that the population of adult males of *M. personata* on *F. nitida* increased during October and reached high percentage during winter and spring months. The seasonal variation in population density of occurring *M. personata* individuals on *F. nitida hawaii* are shown in (Fig.3). The data revealed that the highest population density of collected individuals was observed during autumn months in the first year; comprised 3053 individuals that represent 32.7 % of grand total count per year; while in the second year the highest population

was recorded during winter months with a total count of 2619 individuals that represent 32.5% of grand total count of collected individuals /year. The lowest population density of collected individuals occurred during summer months; comprised 1554 and 1314 individuals that represent 16.7 and 16.3 % of grand total of collected ones/year in each of both successive years of study, in respect, (Fig. 3). Considering the efficacy of two local mineral oils and IGR treatment to control the masked scale, the applications were made during late summer (August) where the population of the insect started to increase to prevent this population to reach the peak during September and October, so its population decreased during the next season.

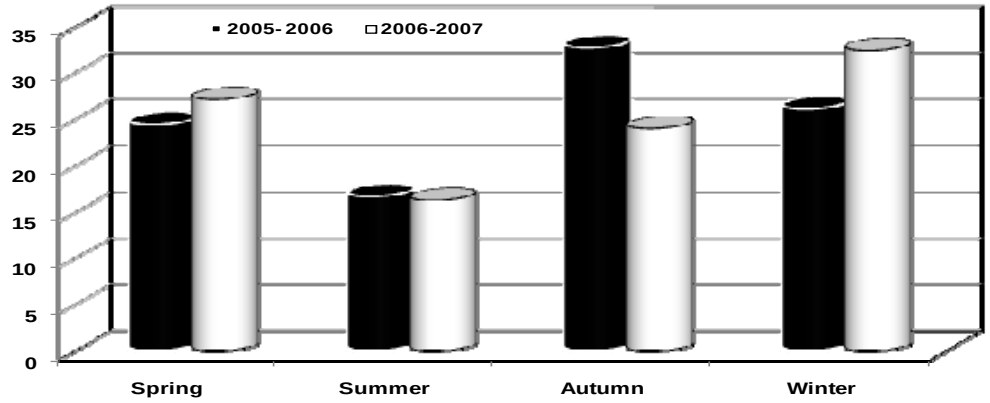

Fig. 3: Seasonal variations in estimated population density of *Mycetaspis personata* on *Ficus nitida hawaii* in Alexandria Governorate during the successive years (2005 – 2006 and 2006 – 2007)

1. Chemical study:

Data presented in (Fig. 4) clearly indicate that all tested scalicides gave good results against *M. personata*. Reduction percentage amounted to 91.4%, 94.2% and 94.9% for Masrona®, Super Royal® and Ropest®, respectively, with no significant differences in between, but they differ significantly with untreated control (17.2%).

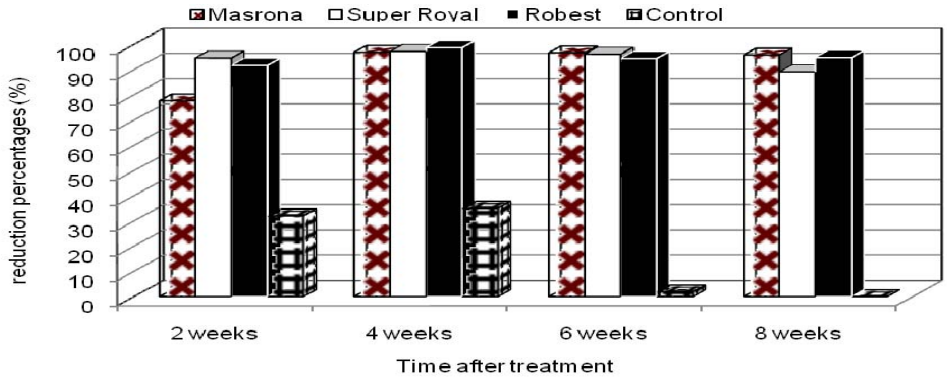

Fig. 4: Reduction percentages of tested insecticides against *Mycetaspis personata* infested *Ficus nitida hawaii* in Alexandria Governorate (2008)

Considering the probable occurring side effects of the tested mineral oils on the non-targeted *Aphytis mytilaspidis* (Le Baron) (Hymenoptera: Aphelinidae) (a main parasitoid of *M.personata*), the data illustrated that the light oil, Super Royal® at 1.5% caused least reduction effect (16.8%) than heavy oil, Masrona® (34.1%) with significant difference in between (Fig. 5). Also, the drastic side effect of tested

materials were determined on predacious mite, *Tydeus californicus* (Banks) (Tydeidae : Acari). The obtained data show that the tested materials affected the non-target mite, where they could be arranged descendingly according their reduction effect as follows: IGR, Ropest® (37.9%), followed by light oil, Super Royal® (23.5%) then heavy oil, Masrona® (6.7%) with significant differences between them (Fig.6).

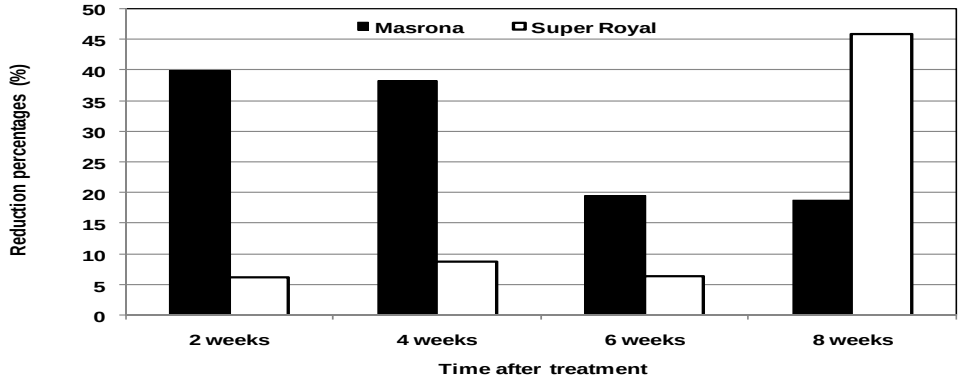

Fig. 5: Effect of tested insecticides against *Aphytis mytilaspidis* parasitoid on *Mycetaspis personata* which infested *Ficus nitida hawaii* in Alexandria Governorate (2008)

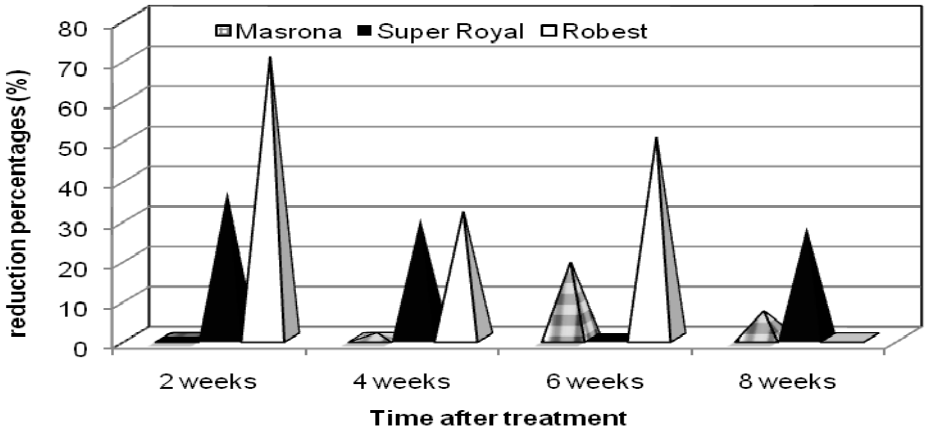

Fig. 6: Effect of tested insecticides against *Tydeus californicus* predatory *Mycetaspis personata* which infested *Ficus nitida hawaii* in Alexandria Governorate (2008)

Recently an interesting extension of the use of mineral oils against homopterous insects is encouraged. Mineral oils are valuable insecticide materials because they have little residual toxicity for beneficial insects as mentioned by (Moursi *et al.*, 1991; Abo-Shanab *et al.*, 2005 and Helmy *et al.*, 2006). The obtained results are agreement with those obtained by Zidan *et al.* (1996), Rup *et al.* (1998) and El-Deeb *et al.*(2002) and El-Deeb (2004) who mentioned that there were no significant differences between the tested mineral oils and IGR,s of their effect on scale insects and mealybugs.

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ARABIC SUMMARY

دراسة التعداد الفصلي والمكافحه الكيميائيه لحشرة البرسوناتا القشريه علي نبات الفيكس هاواي في الآسكندريه

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من خلال الدراسه التي اجريت علي نبات الفيكس هاواي خلال عامين متتاليين في حدائق المنتزه وجد ان حشرة البرسوناتا القشريه من اكثر الأنواع المرتبطه والمنتشره علي النبات بشده. وأوضحت الدراسه ان حشرة البرسوناتا تزداد في التعداد لتبلغ أقصي مايمكن خلال شهري سبتمبر وفبراير من العام حيث سجلت 5 فترات مختلفه لأعلي معدلات النمو إحداها خلال فصل الصيف وفترتان خلال الخريف وفتره خلال الشتاء والخامسه خلال فصل الربيع. وبلغ معدل تواجد الإناث 100% من التعداد الكلي للحشره خلال شهر يوليو بينما كان أعلي معدل لتعداد الحشره في فصل الخريف وأقل معدل سجل في فصل الربيع. أجريت تجربه لدراسه تأثير نوعين من الزيوت المعدنيه المحليه احداها شتوي (مايونيز) وهو مصرونا بتركيز5و2% وزيت صيفي سوبر رويال 1,5% وأحد المركبات مانعة الإنسلاخ وهو روبست بتركيز 0,125%. وقد أوضحت النتائج أن المركبات الثلاث اعطت نسبه مرتفعه في خفض تعداد الحشره حيث بلغ نسبة الخفض9. 94% لمركب روبست و94,2% للزيت المعدني سوبر رويال و91,4% للزيت المعدني مصرونا مع العلم بأنه لايوجد فرق معنوي بين المركبات الثلاث فيما بينها ولكن هناك فرق معنوي بينها وبين العينه الغير معامله(كونترول). وبخصوص التأثير علي الطفيل المرتبط بالحشره وجد أن زيت سوبر رويال أقل تأثيرا في خفض تعداد الطفيل بينما كان زيت مصرونا هو اقل المعاملات تأثيرا علي الأكاروس المفترس.