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ECOLOGICAL STUDIES ON SOME MEALYBUG SPECIES ATTACKING MANDARIN TREES AND THEIR PREDATORY INSECTS AT MANSOURA DISTRICT

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ABSTRACT

The present investigation was carried out to study the population density of the common mealybug species attacking mandarin trees and their predatory insects, also to evaluate the effect of certain weather factors on these insects. The obtained resultus revealed that there were four mealybug species infesting mandarin trees namely *Planococcus citri* Risso, *Icerya seychellarum* (Westwood), *Icerya aegyptiaca* Douglas and *Icerya purchase* Mask.

The highest peak for *P. citri* in 15th of October 2010 and 15th of September 2012, for *I. seychellarum, I. aegyptiaca* and *I. purchase* recorded in the 15th of September 2011 and 2012 during the two successive years of study, respectively.

The maximum activity of *Rodolia cardinalis* (Mulsant) recorded in the beginning of October 2010 (31 indiv.) and in 15th of June 2012 (55 indiv.), *Chrysoperla carnea* (Steph.) recorded in 15th of June 2011 (21 indiv.) and in 15th of September 2012 (25 indiv.) and *Nephus includens* Kirsch in 15th of September 2011 (14 indiv.) and in 15th of June and 15th of September 2012 (16 indiv.) during the two successive years, respectively.

The highest average number for *I. purchasi, I. aegyptiaca, I. seychellarum* and *P. citri* were recorded in summer during the two years. Statistical analysis showed a highly significant differences for each insect pest between the four seasons during the two successive years of study.

The highest average number of *R. cardinalis* recorded in summer during the two years. Also, *N. includens* recorded in summer during the two seasons. Meanwhile, *C. carnea* recorded in spring during 2010/11 and in summer during 2011/12. Statistical analysis showed a highly significant differences for each insect predator between the four seasons during the two successive years.

The predator-prey ratios ranged between 40.0 in the third week of January 2011 and 9.1 in the first week of August 2011. The ratios was narrowed during the period from May to August 2011 during the second year. This ratio ranged between 29.3 in 15th of January and 8.4 in 15th of May 2012. The ratio was narrowed during the period from April to August 2012 during the second year.

Results of statistical analysis of simple correlation coefficient indicated that, the relationship between the mealybug species and their associated predator on mandarin trees showed a highly positive significant effect for *R. cardinalis, N. includens* and *C. carnea* during the two years of study.

The maximum and minimum as well as average temperature showed a highly positive significant effects on the population density of *I. purchasi, I. aegyptiaca*, *I. seychellarum*, *P. citri, R. cardinalis*, *N. includens* and *C. carnea*. On the other hand, the maximum, minimum and average relative humidity showed a highly negative significant effects or negatively significant effects of the population density for the previously insects during the first year. Meanwhile, *I. purchasi* and *I. seychellarum* showed insignificantly effects with minimum relative humidity during the second year.

INTRODUCTION

In Egypt, the main citrus species are oranges, mandarins and limes which represented more than 98.8% of the total area planted by citrus. 70.8% of citrus plantations exist in the Nile Delta and the valley where 29.2% are located in the new reclaimed areas. Mandarin orchard occupy about 94823 feddans in Egypt (According to the statistical report of the Ministry of Agriculture, 2010).

The different mealybug species are very injurious insect pests attacking these orchards, cause serious damage and fininnaly affecting quantity and quality of the fruits and causes economic loss in the crop (Laudonia and viggiani 1986, Abd-Allah 1988, Ozkan *et al.* 1991, Soares *et al.* 1999, Alvis *et al.* 2002 and Elkady 2013).

The role of predatory insects in controlling the mealybug species in different fruits orchards has been studies by several investigators (Khalaf 1987, Cardosa 1990, Soares *et al.* 1999, Manuel *et al.* 2003, Abdel-Mageed 2005 and Ramadan 2011).

For integrated pest management program needs the evaluation of the definite role of the natural enemies of these insect pests and knowledge of the population relationships of the insect host and their natural more ecological and biological informations.

Therefor, the objective of the present work was aimed to study the population density of some melybug species attacking mandarin orchards and their associated predatory insects, also investigate the effect of some weather factors on population density of these insects.

MATERIALS AND METHODS

The present studies were carried out in the experimental farm belonging to the Faculty of Agriculture, Mansoura University to evaluate the population density of the main mealybug species attacking mandarin trees *Citrus reticulate*, and their associated predators during the two successive years 2010/11 and 2011/12. No insecticides were applied during the two years of investigation.

Five trees of the same age and size from mandarin orchards were chosen and used as replications. Samples were collected biweekly during the two successive years from the beginning of October 2010 till 15th of September 2012. Each sample consisted of 100 leaves and 25 branches were randomly collected (20 leaves and 5 branches from each tree for the four directions and the middle of each tree). The collected leaves and branches were taken to the laboratory in polyethylene bags for further investigation of the mealybug species and their associated predators. The number of the mealybugs and their predators were counted. The predators which observed on each sample in spot close to the colonies of mealybugs were collected by an aspirator and counted. Also, the predator-prey ratio monthly were calculated.

To study the role of the main weather factors, i.e. temperature and relative humidity on the population density of the insect pests and their predators, the temperature and relative humidity were obtained from the Agrometeorological station at El-Mansoura region. Biweekly averages of temperature and relative humidity were calculated.

Costat software program (2004) was used to compute the effect of these weather factors on the population densities of these insects and their predators. The simple correlation coefficients and simple regression coefficients of the relationships between the biweekly average number of the insect pests and their predators and the biweekly average of temperature and relative humidity components were computed.

RESULTS AND DISCUSSION

Population density of the mealybug species and seasonal activity of their associated predatory insects:-

A: Mealybug species :-

Data represented in Fig. (1) showed that, *P. citri* recorded three peaks on mandarin trees during the first year 2010/11, the first peak in 15th of October (392 indiv.), the second one in 15th of June 2011 (313 indiv.), and the last peak in 15th of September 2011 (271 indiv.). On the other hand, *I. seychellarum* had three peaks in the beginning of October 2010, 1st of June and the end of the year 2011 and represented by 118, 42 and 197 indiv. / 100 leaves, respectively. While, *I. aegyptiaca* showed also three peaks in the beginning of October 2010 (175), beginning of June (133) and 15th of September 2011 (261 indiv. / 100 leafs). Meanwhile, *I. purchasi* had three peaks, the first one recorded in the beginning of the year, the second in 1st of June and the third in the end of the year and represented by 146,119 and 233, respectively (Fig. 1).

The obtained results in Fig. (2) showed that the population density of the mealybug species attacking mandarin trees during the second year 2011/12, *P. citri* had three peaks were recorded in 15th of October 2011, 15th of June and 15th of September 2012 and represented by 456, 395 and 569 indiv./ 100 leaves, respectively. On the other hand, *I. seychellarum* had also three peaks, in the beginning of October 2011, 15th of June and 15th of September 2012 with 139,126 and 214 indiv./ 100 leafs, respectively. While, *I. aegyptiaca* had also three peaks, 1st of October 2011, 15th of June and 15th of September 2012 and represented by 214, 213 and 317 indiv./ 100 leaves. Moreover, *I. purchasi* had also three peaks in the beginning of the season, 15th of June and the end of season and represented by 192, 177 and 294 indiv. , respectively (Fig. 2).

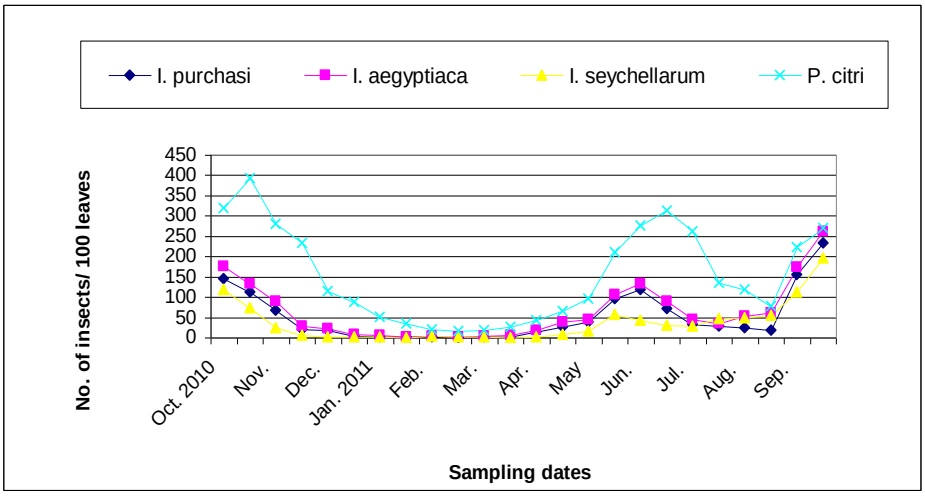

Fig. (1): Population density of the mealybug species attacking mandarin trees during the first year 2010/11 at Mansoura district.

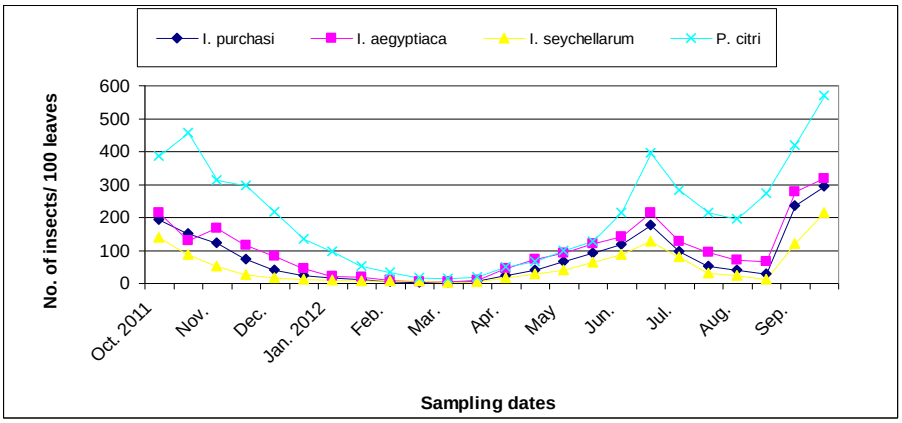

Fig. (2): Population density of the mealybug species attacking mandarin trees during the second year 2011/12 at Mansoura district.

As a conculusion, the highest peak for *P. citri* in 15th of October 2010 and 15th of September 2012, for *I. seychellarum, I. aegyptiaca* and *I. purchasi* recorded in the 15th of September 2011 and 2012 during the two successive years of study, respectively.

B: Predator species:-

Data arranged in Fig. (3) showed that the population density of the common insect predators associated with the mealybug species on mandarin trees during the first year 2010/11. Three peaks were recorded for *R. cardinalis* in the beginning of October 2010 (31 indiv.) in the beginning of June 2011 (24 indiv.), and in 15th of September 2011 (29 indiv.). *C. carnea*

had four peaks, the first peak in 1st of October 2010, the second one in 15th of June, the third in 1st of August and the fourth peak in 15th of September 2011 and represented by 10, 21, 10 and 18 indiv./ 100 leaves, respectively. While, *N. includens* had three peaks were recorded in 15th of October 2010, in 1st of June and in 15th of September 2011 and represented by 8, 13 and 14 indiv. / 100 leaves, respectively (Fig. 3).

Data illustrated in Fig. (4) showed that the Population density of the main predatory insects associated with maelybug species on mandarin trees during the second year of study. *R. cardinalis* had three peaks in the beginning of October 2011 (41 indiv.), in 15th of June (55 indiv.) and in 15th of September 2012 (43 indiv.). *C. carnea* had also three peaks, the first one in 1st of October 2011, the second peak in 15th of June and the third one in 15th of September 2012 and represented by 15, 22 and 25 indiv. / 100 leaves, respectively. Also, *N. includens* had three peaks, the first one in 1st of October 2011, the second in 15th of June and the last peak in 15th of September 2012 and represented by 9, 16 and 16 indiv./ 100 leaves, respectively (Fig. 4).

As a conclusion, data arranged in Fig. (3 and 4) showed that, the maximum activity of *R. cardinalis* recorded in the beginning of October 2010 (31 indiv.) and in 15th of June 2012 (55 indiv.), *C. carnea* recorded in 15th of June 2011 (21 indiv.) and in 15th of September 2012 (25 indiv.) and *N. includens* in 15th of September 2011 (14 indiv.) and in 15th of June and 15th of September 2012 (16 indiv.) during the two successive seasons 2010/11 and 2011/12, respectively.

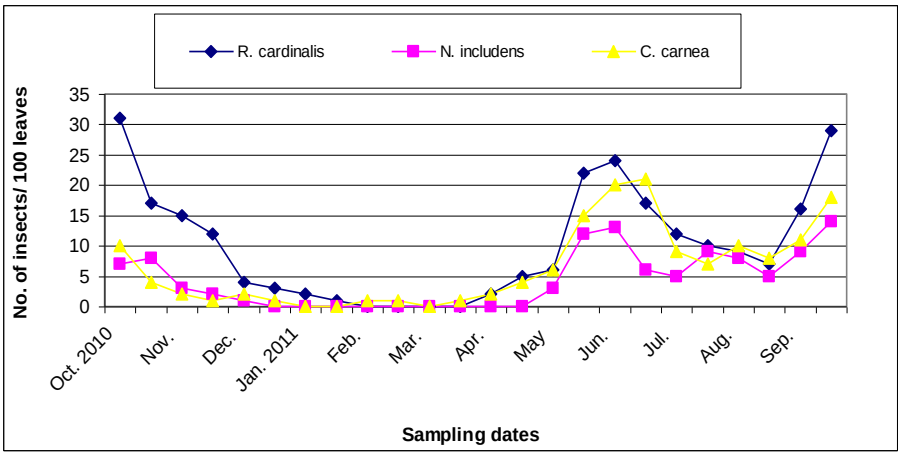

Fig. (3): Population density of the common predators on mandarin trees during the first year 2010/11 at Mansoura district.

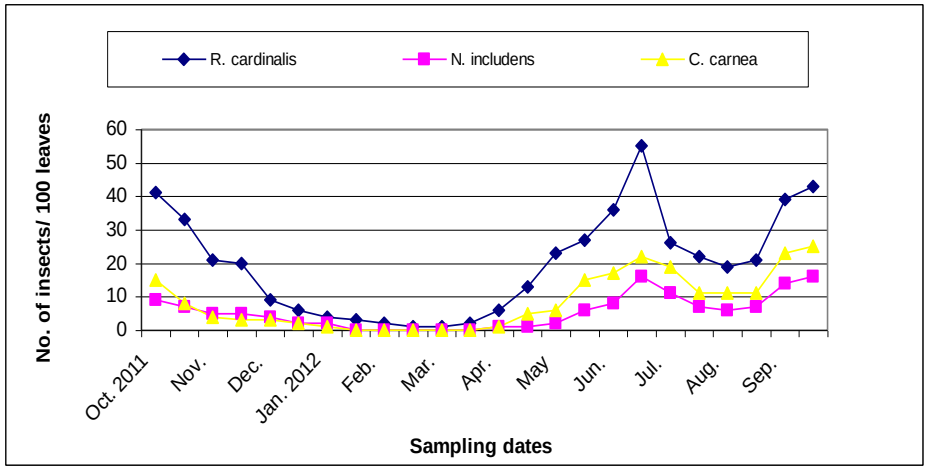

Fig. (4): Population density of the common predators on mandarin trees during the second year 2011/12 at Mansoura district.

Data represented in Table (1) showed that the seasonality average number of the mealybug species and their associated predatory insects on mandarin trees during the two years 2010/11 and 2011/12. It can be noticed that, the highest average number for *I. purchasi, I. aegyptiaca, I. seychellarum* and *P. citri* were recorded in summer and represented by 82.0±37.0, 104.8±37.4, 81.7±25.8 and 181.2±33.1 indiv. / 100 leaves during the first year 2010/11, respectively. Regarding to, the highest average number during the second season 2011/12 were recorded also in summer and represented by 124.3±46.1, 159.2±44.9, 79.7±31.5 and 325.2±58.2 indiv. / 100 leaves, respectively. Statistical analysis showed a highly significant differences for each insect pest between the four seasons during the two successive years of study.

In respect to, insect predators associated with the mealybug species on mandarin trees, data illustrated in Table (1) showed that, the highest average number of *R. cardinalis* recorded in summer during the two years and represented by 13.8±3.3 and 28.3±4.1 indiv./100 leaves, respectively. Also, *N. includens* recorded in summer during the two seasons and represented by 8.3±1.2 and 10.2±1.7 indiv. / 100 leaves, respectively. Meanwhile, *C. carnea* recorded in spring during 2010/11 and in summer during 2011/12 and represented by 11.3±3.4 and 16.7±2.7 indiv. / 100 leafs, respectively. Statistical analysis showed a highly significant differences for each insect predator between the four seasons during the two successive years 2010/11 and 2011/12.

Table (1): Seasonality average number of the mealybug species attacking mandarin trees and their associated predators during years 2010/11 and 2011/12 at Mansoura district.

seasons	Mealybug species				Insect predators		
	I. purchasi	*I. agyptiaca*	*I. seychellarum*	*P. citri*	*R. cardinalis*	*N. includens*	*C. carnea*
First year 2010/11							
Autumn	61.7± 23.3ab	76.3± 27.7ab	38.2± 19.4ab	238.0± 48.2a	13.7± 4.2a	3.5± 1.3bc	3.3± 1.4b
Winter	2.3± 0.3b	4.5± 0.7b	2.2± 0.5b	28.0± 5.5b	0.5± 0.3b	0.0± 0.0c	0.5 ±0.2b
Spring	61.0± 16.9ab	71.7± 18.1ab	26.2± 8.6b	167.3± 46.9a	12.7± 3.9a	5.7± 2.3ab	11.3± 3.4a
Summer	82.0± 37.0a	104.8± 37.4a	81.7± 25.8a	181.2± 33.1a	13.8± 3.3a	8.3± 1.2a	10.5± 1.6a
Total	1242	1544	889	3687	244	105	154
Mean±SE	51.8± 12.6	64.3± 13.9	37.0± 9.8	153.6± 23.8	10.2± 1.9	4.4± 0.9	6.4± 1.3
Second year 2011/12							
Autumn	100.2± 27.0a	125.2± 24.5a	55.5± 20.2ab	300.3± 47.2a	21.7± 5.5a	5.3± 0.0b	5.8± 0.01b
Winter	7.5± 2.4b	11.2± 3.0b	5.8± 0.9b	37.8± 13.0b	2.2± 0.5b	0.3± 0.3c	0.2± 0.2c
Spring	86.0± 22.9ab	113.8± 24.1a	60.8± 16.7ab	158.7± 52.9b	26.7± 7.1a	5.7± 2.4ab	11.0± 3.3ab
Summer	124.3± 46.1a	159.2± 44.9a	79.7± 31.5a	325.2± 58.2a	28.3± 4.1a	10.2± 1.7a	16.7± 2.7a
Total	1908	2456	1211	4932	473	129	202
Mean±SE	79.5± 16.3	102.3± 11.1	50.5± 11.1	205.5± 32.4	19.7± 3.2	5.4± 1.0	8.4± 1.6

Means followed by the same letter in a column are not significantly difference at 0.05 level of probability (Duncan's Multiple Range Test).

The relationship between the mealybug species and their associated predatory insects:-

From the obtained data in Fig. (5) the predator-prey ratios ranged between 1: 40.0 in the third week of January 2011 and 1: 9.1 in the first week of August 2011. It can be noticed, the ratios was narrowed during the period from May to August 2011 resulting to the peaks of the predatory insects were always followed by the presence of the mealybug species.

The presented results from the obtained data in Fig. (6) revealed that the predator-prey ratio ranged between 1: 29.3 in 15th of January and 1: 8.4 in 15th of May 2012. It can be noticed, the ratio was narrowed during the period from April to August 2012 resulting to the peaks of the predatory insects were always followed by the presence of the mealybug species.

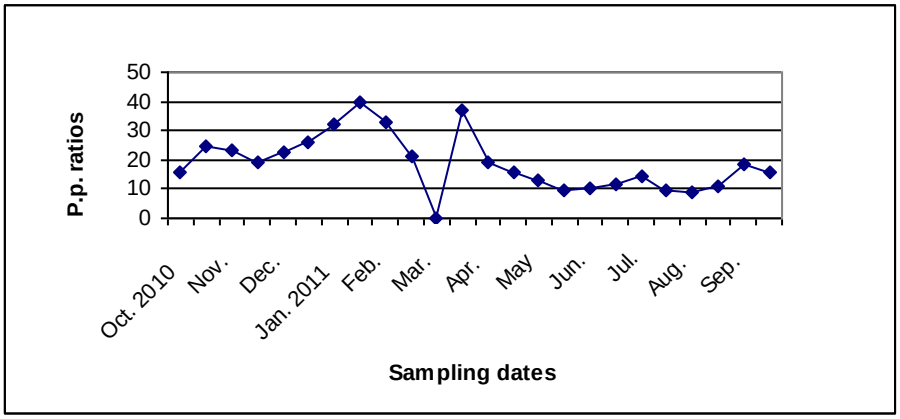

Fig. (5): Prey- predator ratios on mandarin trees during the first year 2010/11 at Mansoura district.

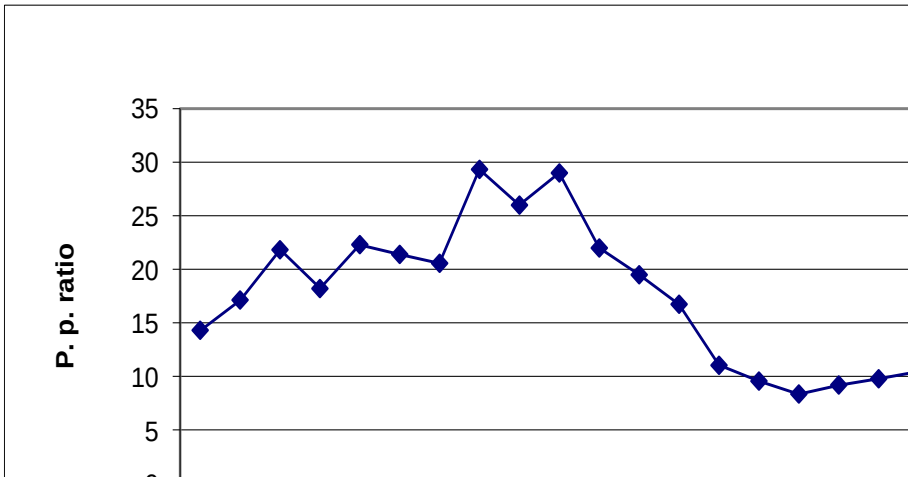

Fig. (6): Prey- predator ratios on mandarin trees during the second year 2011/12 at Mansoura district.

The obtained results of statistical analysis of simple correlation coefficient arranged in Table (2) indicated that, the relationship between the mealybug species and their associated predator on mandarin trees showed a highly positive significant effect for *R. cardinalis, N. includens* and *C. carnea* during the two years of study.

Table (2): Simple- correlation coefficient of variance between the total numbers of mealybug species and their associated predatory insects on mandarin trees during years 2010/11 and 2011/12 at Mansoura district.

Predators	Total mealybugs species					
	2010/11			2011/12		
	r	p	s	r	P	s
R. cardinalis	0.9484	0.0000	***	0.9022	0.0000	***
N. includens	0.8212	0.0000	***	0.9182	0.0000	***
C. carnea	0.7180	0.0001	***	0.8439	0.0000	***

*** Significant with varied degree where.**
r Correlation coefficients.
s Significant sign.
p probability.

Influence of cartain weather factors on the population density of mealybug species and their predatory insects:-

Data arranged in Table (3) showed that the simple correlation coefficient between biweekly population density of mealybug species and their associated predatory insects on mandarin trees and biweekly temperature and relative humidity components during the first year 2010/11 at Mansoura district. It can be noticed that, the maximum and minimum as well as average temperature showed a highly positive significant effects on the population density of *I. purchasi, I. aegyptiaca*, *I. seychellarum*, *P. citri, R. cardinalis*, *N. includens* and *C. carnea*. On the other hand, the maximum, minimum and average relative humidity showed a highly negative significant effects or negatively significant effects of the population density for the previously insects during the first year.

Table (3): Simple correlation coefficient between the population density of the mealybug species and their associated predatory insects and the temperature and relative humidity components on mandarin trees during years 2010/11 at Mansoura district.

Insects	Temperature			R. H.		
	Max.	Min.	Average	Max.	Min.	Average
I. purchasi	0.5406**	0.5764**	0.5637**	-0.5614**	-0.5039*	-0.4315*
I. aegyptiaca	0.6027**	0.6441**	0.6296**	-0.6158**	-0.5519**	-0.4717*
I. seychellarum	0.5875**	0.6262**	0.6077**	-0.6185**	-0.5092**	-0.4665*
P. citri	0.6723***	0.7121***	0.7044***	-0.6170**	-0.5879**	-0.5090
R. cardinalis	0.7021***	0.7303***	0.7238***	-0.6444**	-0.5916**	-0.5130
N. includens	0.7989***	0.8116***	0.8087***	-0.7637***	-0.6515**	-0.6082**
C. carnea	0.7411***	0.7068***	0.7349***	-0.7206***	-0.5966**	-0.5197**

***** correlation coefficient is significant at 0.001 level**
**** correlation coefficient is significant at 0.01 level**
*** correlation coefficient is significant at 0.05 level**

Data represented in Table (4) indicated that the proportional effects of the temperature and relative humidity parameters tested on the population abundance of the mealybug species and their associated predatory insects on mandarin trees during the first year of study. It can be revealed that, the

maximum temperature effects ranged between 32.75% - 61.00% and the minimum temperature effects ranged between 31.46% - 54.71% for all tested insects with an average effects ranged between 33.81 and 61.23%. Also, the maximum relative humidity effects ranged between 10.24- 43.06% and the minimum relative humidity effects 7.79 – 33.05% with an average between 14.49 % and 38.34% (Table4).

Table (4): Simple regression coefficient between the population density of the mealybug species and their associated predatory insects and the temperature and relative humidity components on madarin trees during years 2010/11 at Mansoura district.

Insects	Temperature			R. H.		
	Max.	Min.	Average	Max.	Min.	Average
I. purchasi	0.3275	0.3146	0.3380	0.1655	0.0779	0.1981
I. aegyptiaca	0.3964	0.4034	0.4298	0.1996	0.1287	0.2257
I. seychellarum	0.3687	0.4344	0.4256	0.1024	0.0848	0.1449
P. citri	0.4001	0.4820	0.4597	0.4306	0.3305	0.3834
R. cardinalis	0.4913	0.4664	0.5016	0.3060	0.2039	0.3657
N. includens	0.6976	0.5461	0.6123	0.1525	0.1165	0.1827
C. carnea	0.6100	0.3968	0.4981	0.1223	0.1396	0.1467

The obtained data in the Table (5) showed that the simple correlation coefficient between biweekly population density of mealybug species and their associated predatory insects on mandarin trees and biweekly temperature and relative humidity components during the second year 2011/12 at Mansoura district. It can be noticed that, the maximum, minimum and average temperature showed a highly positive significant of the population abundance for all insects under the study. On the other hand, relative humidity components showed also a highly negative significant or negatively significant effects of the population abundance for the previously insects during the second year. Meanwhile, *I. purchasi* and *I. seychellarum* showed insignificantly effects with minimum relative humidity (Table 5).

Table (5): Simple correlation coefficient between the population density of the mealybug species and their associated predatory insects and the temperature and relative humidity components on mandarin trees during year 2011/12 at Mansoura district.

Insects	Temperature			R. H.		
	Max.	Min.	Average	Max.	Min.	Average
I. purchasi	0.5934***	0.6454***	0.6337***	-0.4277*	-0.3836ns	-0.4726
I. aegyptiaca	0.6551***	0.7014***	0.6941***	-0.4185*	-0.4286	-0.5098*
I. seychellarum	0.5842**	0.6032**	0.6033**	-0.4408*	-0.3369ns	-0.4619*
P. citri	0.6261**	0.7683***	0.7243***	-0.5281*	-0.5822**	-0.5483*
R. cardinalis	0.7993***	0.7674***	0.8013***	-0.4639*	-0.5447**	-0.5902**
N. includens	0.7574***	0.8096***	0.7889***	-0.4402*	-0.5753**	-0.4611*
C. carnea	0.8373***	0.7933***	0.8156***	-0.3876ns	-0.4959	-0.4176

***** correlation coefficient is significant at 0.001 level**
**** correlation coefficient is significant at 0.01 level**
*** correlation coefficient is significant at 0.05 level**

Data arranged in Table (6) showed the proportional effects of the temperature and relative humidity parameters tested on the population abundance of the mealybug species and their associated predatory insects on mandarin trees during year 2011/12. It can be revealed that, the maximum temperature effects ranged between 34.13% - 70.10% and the minimum temperature effects ranged between 36.38% - 65.54% for all tested insects with an average effects ranged between 36.40 and 64.21%. Also, the maximum relative humidity effects ranged between 17.51- 27.89% and the minimum relative humidity effects 11.35 – 33.90% with an average between 17.44 % and 34.84% (Table 6).

Table (6): Simple regression coefficient between the population density of the mealybug species and their associated predatory insects and the temperature and relative humidity components on madarin trees during year 2011/12 at Mansoura district.

Insects	Temperature			R. H.		
	Max.	Min.	Average	Max.	Min.	Average
I. purchasi	0.3522	0.4165	0.4016	0.1830	0.1472	0.2234
I. aegyptiaca	0.4291	0.4920	0.4818	0.1751	0.1838	0.2599
I. seychellarum	0.3413	0.3638	0.3640	0.1943	0.1135	0.2134
P. citri	0.3921	0.5903	0.5246	0.2789	0.3390	0.3006
R. cardinalis	0.6389	0.5889	0.6421	0.2152	0.2967	0.3484
N. includens	0.5736	0.6554	0.6223	0.1938	0.3309	0.2126
C. carnea	0.7010	0.6293	0.6652	0.1502	0.2459	0.1744

According to Khalaf (1987) who mentioned that *I. Purchasi* produced four generations a year on citrus trees and *R. carinals* proved a very efficient predator of this insect pest. Also the present findings are in accordance with those obtained by Abd-Allah (1988) who found that, *R. cardinals* had three generation on citrus trees. According to Copland *et al.,* (1993) in India mentioned that *N. reunioni* was the most active predator on citrus and least active on passiflora. Alvis *et al.,* (2002) found that *R. cardinalis* was abundant in June and July in citrus orchards in Spain.

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دراسات أيكولوجية على بعض انواع البق الدقيقي الذى يهاجم أشجار اليوسفى والمفترسات الحشرية المرتبطة بها فى منطقة المنصورة

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* أجريت الدراسة الحالية لتقدير كثافة التعداد لأهم أنواع البق الدقيقي الذى يهاجم أشجار اليوسفى والمفترسات الحشرية وكذلك دراسة تأثير العوامل البيئية على هذه الحشرات.
* سجل أعلى ذروة تعداد لبق الموالح الدقيقي فى 15 أكتوبر 2010 و 15 سبتمبر 2012- بينما بق السيشلارم الدقيقي والبق الدقيقي المصرى والبق الدقيقي الأسترالى فقد سجل أعلى ذروة تعداد فى 15 سبتمبر خلال سنتى الدراسة على التوالى.
* سجل المفترس أبوالعيد فيداليا أعلى نشاط له فى بداية اكتوبر 2010 (31 فرد)، 15 يونيو 2012 (55 فرد) أما المفترس أسد المن الأخضر فقد سجل أعلى نشاط فى 15 يونيو 2011 (21 فرد)، 15 سبتمبر 2012 (25 فرد) بينما المفترس أبو العيد *N. includens* فى 15 سبتمبر 2011 (14 فرد) وفى 15 يونيو و 15 سبتمبر 2012 (16 فرد) خلال سنتى الدراسة على التوالى.
* سجل أعلى متوسط تعداد لأنواع البق الدقيقي الأربعة المصرى والأسترالى والسيشلارم وبق الموالح الدقيقي فى الصيف خلال سنتى الدراسة وقد أظهر التحليل الإحصائى وجود إختلافات عالية المعنوية فى فصول السنة الأربعة خلال سنتى الدراسة لكل نوع من أنواع البق الدقيقي.
* سجل أعلى متوسط تعداد للمفترس أبوالعيد فيداليا فى الصيف خلال سنتى الدراسة وأيضاً المفترس أبو العيد *N. includens* بينما المفترس أسد المن الأخضر سجل أعلى متوسط تعداد فى الربيع خلال السنة الاولى وفى الصيف خلال السنة الثانية. وقد اظهر التحليل الإحصائى وجود إختلافات عالية المعنوية بين الأربعة فصول خلال سنتى الدراسة لكل مفترس حشرى .
* نسبة المفترس للفريسة تراوحت مابين1: 40 فى الأسبوع فى الأسبوع الثالث من يناير 2011،1: 9.1 فى الأسبوع الأول من أغسطس 2011 وكانت فى أضيق نطاق فى الفترة من مايو وحتى أغسطس خلال السنة الأولى- وهذه النسبة تراوحت مابين1: 29.3 فى 15 يناير،1: 8.4 فى 15 مايو 2012 وكانت فى أضيق نطاق فى الفترة من ابريل وحتى أغسطس 2012 خلال السنة الثانية.
* وأكدت نتائج التحليل الإحصائى لمعامل الإرتباط بين أنواع البق الدقيقي والمفترسات الحشرية المرتبطة بها على أشجار اليوسفى وجود إرتباط موجب عالى المعنوية للمفترسات الثلاثة خلال سنتى الدراسة.
* وبالنسبة لتأثير بعض العوامل البيئية على الكثافة العددية لأنواع البق الدقيقي والمفترسات المرتبطة بها أن درجات الحرارة العظمى والصغرى وكذلك المتوسطة أظهرت وجود تأثير موجب عالى المعنوية على كثافة التعداد لأنواع البق الدقيقي والمفترسات الحشرية المرتبطة بها ومن ناحية أخرى الرطوبة النسبية العظمى والصغرى وكذلك المتوسطة اظهرت وجود تأثير سالب عالى المعنوية للحشرات السابقة خلال السنة الأولى بينما البق الدقيقي الأسترالى وبق السيشلارم أظهرت عدم وجود إختلافات معنوية مع الرطوبة النسبية الصغرى خلال السنة الثانية من الدراسة.

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