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Population and Mortality Studies on the Black Scale Insect, *Parlatoria ziziphi* (Lucas) (Hemiptera: Diaspididae) in an Egyptian Citrus Orchard

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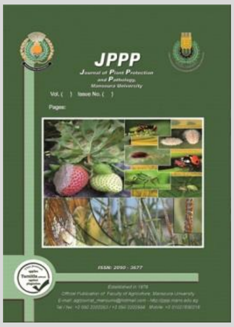

ABSTRACT

The diaspidid black scale, *Parlatoria ziziphi* (Lucas) is amongst the most destructive pests to citrus in several countries. This study was conducted in navel orange orchard at the experimental farm belonging to Mansoura University during 2017/2018 and 2018/2019. *Parlatoria ziziphi* had three peaks of abundance annually. The highest peaks occurred in autumn. The ectoparasitoid, *Aphytis* sp. had four peaks of abundance annually and its populations were synchronized with those of the insect. The endoparasitoid, *H. aspidioti* exhibited three-four peaks of abundance annually and the parasitoid populations were coincided partially with those of the insect. However, as the population of insect increased, the parasitism rates by *Aphytis* was significantly decreased, whereas those of *H. aspidioti* were unstable. Thus, *Aphytis* seems to be inverse-density mortality agent and its releases must be early in the season on low pest populations. Parasitism% by *Aphytis* sp. had two peaks annually, almost occurred in the period from May to August. *Aphytis* parasitism percentages ranged from 14.6 to 35.4%, whereas those of *H. aspidioti* ranged from 5.7 to 16.5% in both years. *Harbolepis aspidioti* recorded three peaks of parasitism in January, May, and August annually with the highest one was in January. Predation% in *P. ziziphi* populations ranged from 5.8 to 18.9%. The highest percentages of unknow mortality (12.3-17.8%) were in the period from December to January annually. The total population mortality ranged from 37.9 to 73.9%. Both parasitoid species contributed with the highest fate in the total population mortality of *P. ziziphi* in all seasons.

***Keywords**:* Aphytis, Harbolepis, Parasitism, Predation, Release, Synchronization

INTRODUCTION

Egypt, navel orange, *Citrus sinensis* (L.) represents one of the most economically crops. A great attention has been given to improve the quality and quantity of this crop (Nabil *et al*., 2018). The cultivated area with citrus in Egypt has enormously increased through the last decades reaching about 530415 fed. The fruiting area reached 440706 fed., producing about 4402180 tons with a mean of 10.42 tons/fed. (Statistics of the Ministry of Agriculture, 2014).

Scale insects and mealybugs are one of the important injurious factors responsible for deterioration of citrus trees (Franko *et al*., 2009; Pellizzari and Germain, 2010; Mazzeo *et al*., 2014). Scale insects damage citrus trees by extracting vital fluids from the tree, resulting in poor fruit quality and tree health (Wawrzynski and Ascerno, 2009). Many scale insects are notorious pests especially on perennial, fruit and nut trees, ornamental shrubs, and forest trees (Rosen, 1986; Kaydan *et al*., 2006).

The black scale *Parlatoria* (ziziphus) *ziziphi* (Lucas) (Hemiptera: Diaspididae) is amongst the most destructive pests to citrus, as well. It is a cosmopolitan species and very abundant on citrus in several countries. It is originated from Europe and later from particularly every tropical and subtropical part of the world on numerous hosts, especially on citrus (Ferris, 1937; Tawfeek and Abu-shall, 2010). It was not a key (secondary) insect pest of citrus in Egypt until 1972 (Salama *et al*., 1985). Then, its population often exceeds the tolerable threshold, and thus citrus sector must be protected from all risks which can cause direct or indirect damages.

The first published works in Egypt regarding the life history and population fluctuations of *P. ziziphi* is conducted by Darwish (1976) and Amin and Salem (1978). Since 1987, this scale insect has become the most important pest of citrus in Egypt (Ismail, 1989). Population fluctuations *P. ziziphi* were studied by Darwish (1976) and Amin and Salem (1978). However, continuous updating of population estimates under different geographical habitats would help in control decision-making in the suitable time for an insect species.

Biological control of *P. ziziphi* has been focused on its parasitoid, *Aphytis* sp. which is widely regarded as the most important parasitoid of this scale in citrus orchards (Kamel *et al*., 2003; Abd-Rabou *et al*., 2014). However, three parasitoid species have been recorded associated with *P. ziziphi* populations in Upper Egypt namely, *E. citrina*, *Habrolepis aspidioti* Compere & Annecke) and the hyperparasitoid *Marietta leopardine* Motschulsky (S. Abd-Rabou, unpublished data). But in Algeria, there were two more species recorded namely *Aphytis hispanicus* and *A. chilensis* (Rachida and Mohamed, 2015).

Therefore, the present study aims to examine the 1) population abundance of the black scale insect and its parasitoids, 2) seasonal activity of parasitoids associated with the black scale insect, 3) synchronization between population of living and parasitized scales of the black scale insect, 4) seasonal activity of mortality factors acting the population of black scale insect, and 5) contribution of different mortality factors in the total population mortality of the black scale insect.

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MATERIALS AND METHODS

The present studies were conducted in navel orange trees, *Citrus sinensis* (L.), at the experimental farm belonging to the Faculty of Agriculture, Mansoura University during the two successive years (2017/18 and 2018/19). Five adjacent navel orange trees (> 10 years old) homogenous in size and age were chosen and marked for the present studies. Samples were collected biweekly for the two successive years and started from 24th of June until 22nd of June 2019. Each sample consisted of 100 navel orange leaves from the five marked trees (20 leaves/ tree) were collected randomly from the different directions (North, East, South, and West) of the tree. The collected leaves were transferred in a polyethylene bags to the laboratory for examination. The scale insect species on each leaf were determined and counted on both surfaces of the navel orange leaves by using a binocular microscope. The scale insects were recorded as living, parasitized by either the immature ectoparasitoid or the immature endoparasitoid species, eaten by predators, and died scales by unknown mortality factors. The presence of the predator species on the sampled leaves was also recorded. To identify the parasitoids species, leaves of each sample with parasitized individuals were maintained in 10 cm petri-dishes containing a filter paper in their bottom and a small piece of moistened cotton wool until parasitoid emergence. The emerged parasitoid individuals were preserved in Eppendorf tubes containing 90% alcohol until they sent for identification. Parasitoids' samples were sent to the Plant Protection Institute, Cairo, to identify.

To estimate the rates of parasitism, predation, and unknown mortality and their contribution in the total population mortality; parasitism, predation, and unknown mortality% were estimated according to equation of Orphanides (1982) as follows:

Number of parasitized scale insects

$$\textbf{Parasitism \%} = \frac{\text{Number of parasitized scale insects}}{\text{Living scales + predacious scales + dead scales}} \times 100$$

$$\textbf{Predation \%} = \frac{\text{Number of consumed scale insects}}{\text{Living scales + parasitized scales + dead scales}} \times 100$$

$$\textbf{Unkown mortality \%} = \frac{\text{Number of dead scales by unknown factors}}{\text{Living scales + parasitized scales + predacious scales}} \times 100$$

One-way ANOVA was used to test whether the data of the experiment was significant or not. In case of significant, means were separated using Fisher LSD test (α = 0.05). The Person Product Moment correlation was also considered. All analyses were conducted using SigmaPlot software.

RESULTS AND DISCUSSION

Results

1. Population abundance of the black scale insect *P. ziziphi*

The data in Figures (1 and 2) show the population fluctuations of living individuals of *P. ziziphi* as well as the fluctuations in the total population (i.e., living + dead scales) during the first (2017/18) and second (2018/19) years in Mansoura region. The population of living individuals had three peaks of abundance in the first year. The first peak occurred in October 2017, the second in March 2018, and the third one appeared in May 2018. In respect to the total number of *P. ziziphus* scales, it also showed three peaks of abundance in the same months as the living scales (Fig. 1). In the second year, the living individuals of *P. ziziphi* exhibited three peaks of abundance in September 2018, February 2019, and April 2019, respectively. Regarding the total number of *P. ziziphi* scales, it exhibited three peaks of abundance in the same times of living scales except the third peak was in April 2019 (Fig. 2).

2. Population abundance of the black scale insect, *P. ziziphi* parasitoids

The data in Figures (3 and 4) show the population abundance of the immature stages of the ectoparasitoid *Aphytis* sp. (egg, larvae, and pupae) and the endoparasitoid *Harpolepis aspidioti* (larvae and pupae) that parasitize the black scale, *P. ziziphi* during the first (2017/18) and second (2018/19) years in Mansoura region. In the first year, the ectoparasitoids, *Aphytis* sp. exhibited four peaks of abundance. These peaks appeared in August 2017, October 2017, and February 2018, and May 2018, respectively. Meanwhile, the endoparasitoid *H. aspidioti* had three peaks of abundance. They were in August 2017, November 2017 and May 2018, respectively (Fig. 3). In the second year, *Aphytis* sp. recorded four peaks of abundance in July 2018, October 2018, February 2019 and May 2019, respectively. On the other hand, *H. aspidioti* exhibited four peaks of abundance in July 2018, September 2018, March 2019 and April 2019, respectively (Fig. 4).

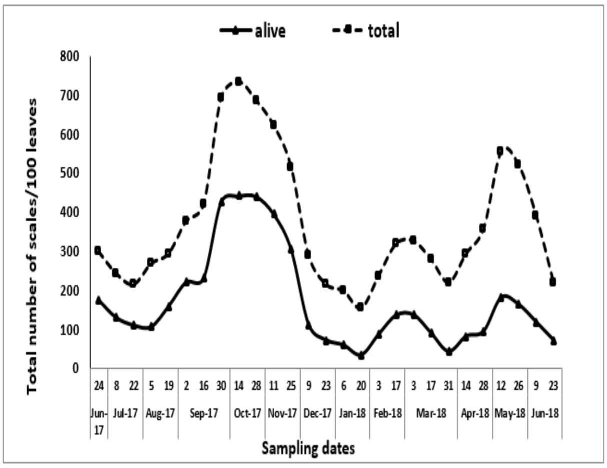

Fig. 1. The population fluctuations of living and total (living + dead) individuals of the black scale insect *Parlatoria ziziphi* on navel orange during the first year (2017/18) in Mansoura region.

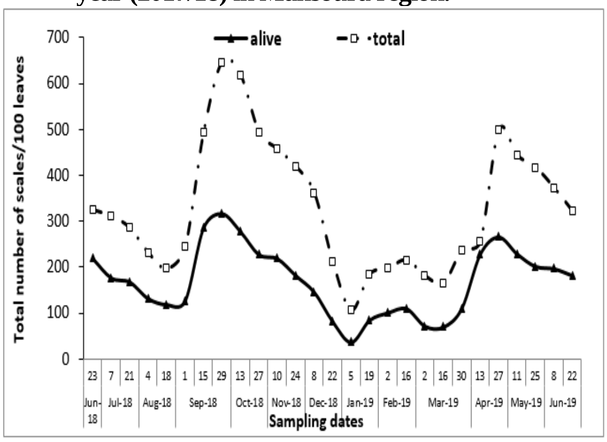

Fig. 2. The population fluctuations of living and total (living + dead) scales of the black scale insect *Parlatoria ziziphi* on navel orange during the second year (2018/19) in Mansoura region.

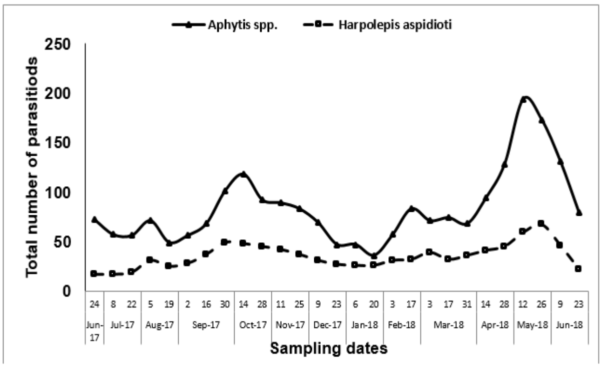

Fig. 3. The seasonal abundance of the black scale insect *Parlatoria ziziphi* parasitoids on navel orange during the first year 2017/18 in Mansoura region.

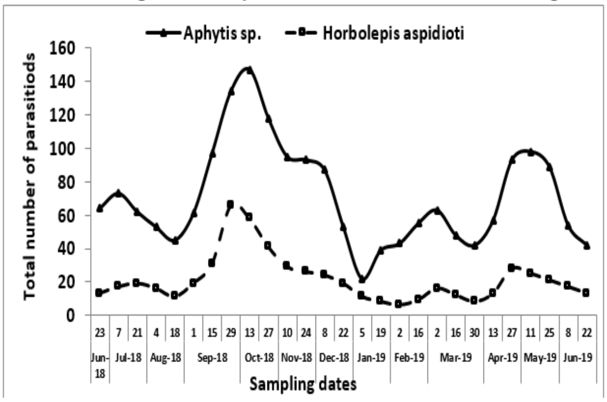

Fig. 4. The seasonal abundance of the black scale insect *Parlatoria ziziphi* parasitoids on navel orange during the second year 2018/19 in Mansoura region.

3. Synchronization between population of living and parasitized scales of the black scale insect, *P. ziziphi*

Figure (5) show the synchronization between number of living and parasitized scales of *P. ziziphi* by each parasitoid species on navel orange during the first (2017/18) and second (2018/19) years in Mansoura region. The populations of both parasitoid species were synchronized with the total number of living scales, but the numbers of *Aphytis* sp. was more coincided with those of its insect host scale than those of *H. aspidioti* during both years of study. Correlation values and their probability levels confirmed these results (Table 1).

To test the dependency relationship between density of the black scale insect and parasitism rates by their parasitoids, correlation analysis was also performed (Table 1). The relation between the number of living scales and parasitism rates by *Aphytis* species during both years of the study was significantly negative, whereas that for *H. aspidioti* were significantly positive or non-significant during the first and second year, respectively.

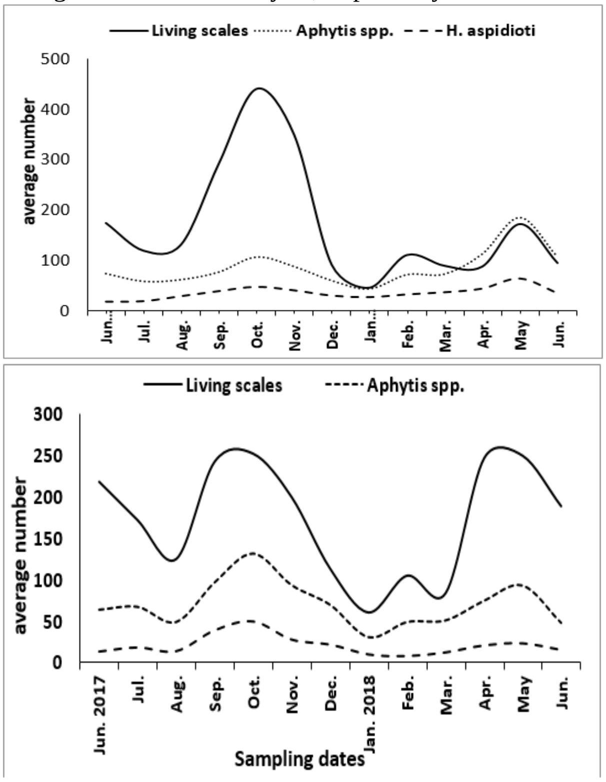

Fig. 5. Synchronization between monthly average numbers of living and parasitized scales of the black scale insect, *P. ziziphi* on navel orange during 2017/18 (upper) and 2018/19 (lower) years in Mansoura region.

Table 1. Correlation estimates between number of living and parasitized scales of *P. ziziphi,* as well as between number of living scales and rate of parasitism by each parasitoid species on navel orange during the first (2017/18) and second (2018/19) years in Mansoura region.

Correlation	*Aphytis* sp.				*Habrolepis aspidioti*			
	First year		Second year		First year		Second year	
	No.	Rate	No.	Rate	No.	Rate	No.	Rate
Coefficient (*r*)	0.55	-0.77	0.91	-0.58	0.63	-0.73	0.83	-0.04
Probability level (*p*)	0.04	0.002	0.0001	0.03	0.02	0.005	0.0004	0.87

4. Seasonal activity of mortality factors acting the population of the black scale, *P. ziziphi*

The results represented in Table (2) show the monthly average number of different mortality factors acting the black scale insect, *P. ziziphi* on navel orange during the first (2017/18) and second (2018/19) years in Mansoura region. During the course of this study, two parasitoid species (*Aphytis* sp. and *H. aspidioti*) and seven predator species were observed attacking this scale insect. They were *Coccinella undecimpunctata* L., *Coccinella septempunctata* L., *Chilocorus bipustulatus* L., *Paederus alferii* Koch., *Cheilomenes propinqua isis* (mulsant), *Cheilomenes propinqua nilotica* mulsant and *Chrysoperla carnea* Steph.

Parasitism percentages on living scales of *P. ziziphi* by the ectoparasitoid *Aphytis* sp. during the first year had two peaks: the first one occurred in July 2017 and the second one was in June 2018. In the second year, the parasitism by *Aphytis* sp. had also two peaks: the first one was in August 2018 and the second one was in May 2019. In both years, the highest seasonal activity (parasitism%) was in May-June in the second and first year, respectively. The parasitism percentages by *Aphytis* sp. ranged from 14.8 to 34.6% and from 14.6 to 35.4% in the first and second year, respectively.

On the other hand, parasitism percentages by the endoparasitoid, *H. aspidioti* recorded three peaks in each of both years. In the first year, they were August 2017, January 2017, and May 2018, while they were in August 2018, January 2018, and March 2019. In both years, the highest seasonal activity (parasitism%) was in January of both years. The parasitism percentages by *H. aspidioti* ranged from 5.7 to 14.9% and from 5.8 to 16.5% in the first and second year, respectively. The total parasitism by both parasitoid species was the highest during the period from March to June in both years of the study (Table 2).

Table 2. Seasonal activity% of mortality factors (parasitoids, predators, unknown mortality factors, and total population mortality) acting on the population of the black scale insect *Parlatoria ziziphi* on navel orange trees during 2017/18 (A) and 2018/19 (B) seasons in Mansoura region.

Month	Parasitism						Predation		Unknow mortality		Total population mortality	
	Aphytis sp.		*Habrolepis aspidioti*		Total							
	A	B	A	B	A	B	A	B	A	B	A	B
June	24.2	24.7	5.7	5.8	29.9	30.5	7.1	5.8	4.4	4.1	41.4	40.4
July	24.8	24.2	7.9	7.7	32.7	31.9	9.7	11.3	5.1	5.9	47.6	49.1
August	21.4	24.4	10.0	11.4	31.4	35.8	13.2	6.9	8.4	3.9	53.0	46.5
September	15.1	15.4	7.7	7.8	22.8	23.2	11.3	9.4	6.8	7.4	40.9	40.0
October	14.8	14.7	6.6	6.5	21.4	21.2	10.6	8.9	5.9	7.9	37.9	38.2
November	15.2	14.6	6.9	6.7	22.1	21.3	8.6	11.7	7.7	7.9	38.4	40.9
December	23.2	22.3	11.6	11.2	34.8	33.5	13.8	17.9	15.0	13.7	63.6	65.0
January	23.8	26.3	14.9	16.5	38.7	42.8	17.2	16.1	17.8	12.3	73.9	71.2
February	25.4	27.2	11.4	12.3	36.8	39.5	11.2	9.7	11.9	7.8	59.9	57.0
March	26.3	29.2	13.2	14.7	39.5	43.9	15.1	12.2	12.4	7.4	67.0	63.4
April	34.3	34.1	13.3	13.2	47.6	47.3	15.4	15.1	10.0	10.8	72.9	73.1
May	34.2	35.4	11.8	12.2	46.0	47.6	12.6	11.7	9.3	7.6	67.9	66.8
June	34.6	31.9	11.2	10.4	45.8	42.3	12.7	18.9	10.4	10.0	68.9	71.2
Annual mean (±)	24.4±1.9	24.9±1.9	10.2±0.8	10.5±0.9	34.6±2.5	35.4±2.6	12.1±0.8	11.9±1.1	9.4±1.1	7.9±0.8	56.4±3.8	55.6±3.7
t-test	0.20		0.26		0.24		0.16		1.05		0.15	
p	0.84		0.79		0.81		0.87		0.30		0.88	

In respect to mortality caused by predator, predation% on *P. ziziphi* populations ranged from 7.1 to 17.2 in the first year, and from 5.8 to 18.9 in the second year. The highest predation percentages were in January and June of the first and second year, respectively. Regarding, the mortality caused by unknown factors, the highest percentages of unknow mortality were in the period from December to January in both years of investigations. The total population mortality, of the black scale insect, *P. ziziphi*, by all mortality factors ranged from 37.9 to 73.9 and from 38.2 to 73.1% in the first and second year, respectively with the highest values estimated in January and April of both years (Table 2). The annual averages of mortality caused by all factors during both years are presented in Table (2). These averages were almost closed in both years. The annual average of total population mortality caused by all mortality factors was 56.4 and 55.6% in the first and second years. Statistical analysis revealed that there was no significant difference between the two years in any of the varying mortality factors as well as the total population mortality of *P. ziziphi* (Table 2).

5. Contribution of different mortality factors in the total population mortality of *P. ziziphi*

Data in Table (3) show the contribution of the different mortality factors of the black scale insect *P. ziziphi* within each season of the first (2017/18) and second (2018/19) years on navel orange in Mansoura region. In the both years, the ectoparasitoid *Aphytis* sp. contributed with the highest rates in the total population mortality of *P. ziziphi* in all seasons of the year compared with the other mortality. Further, the highest efficiency of *Aphytis* sp. was counted during spring, of endoparasitoid (*H. aspidioti*) was in winter, of predators was in spring, and of unknown mortality factors was in winter seasons in the first year. In the second year, the highest efficiency of *Aphytis* sp. was counted during summer, of endoparasitoid (*H. aspidioti*) was in autumn, of predators was in autumn, and of unknown mortality factors was in spring seasons. Both parasitoid species contributed with the highest fate in the total population mortality of *P. ziziphi*.

Table 3. The contribution of different mortality factors acting the black scale insect, *Parlatoria ziziphi* during the 2017/18 (A) and 2018/19 (B) years in a navel orange orchard at Mansoura region.

Seasons	Contribution %							
	Summer		Autumn		Winter		Spring	
Mortality factor %	A	B	A	B	A	B	A	B
Aphytis sp.	43.8	52.9	39.2	41.5	37.8	45.5	48.3	38.5
Habrolepis aspidioti	17.8	14.7	17.9	14.9	19.4	11.4	17.6	10.1
Total parasitism	61.6	67.6	57.1	56.4	57.2	56.9	65.9	48.6
Predation	23.9	19.9	25.5	24.4	21.3	24.4	19.7	31.8
Unknown mortality	14.5	12.5	17.7	19.1	21.4	18.8	14.4	19.6
Total mortality contribution	100	100	100	100	100	100	100	100

Discussion

The population abundance of *P. ziziphi* had three peaks annually and this finding consistent with that reported by Tawfeek and Abu-Shall (2010). Because all developmental stages of this insect present throughout the year, it can complete several overlapping generations annually. In Egypt, it had two generations per year on sour oranges, two-three on navel orange (Nabil *et al*., 2018 and

2019) and three on grapefruit and other citrus varieties (Salama *et al*., 1985; Helmy, 2000), in the Caucasus, it produced two and half generations (Borchsenius, 1950), in China, it had three to four overlapping generations (Huang *et al*., 1988) , in Algeria, it had four generations per year (Sellami and Biche, 2006), in Taiwan, it had seven generations (Miller and Davidson, 2005), and in Greece, it had several overlapping generations (Stathas *et al*., 2008). This difference in the number of insect generations between studies is due to the difference in many ecological factors, i.e., region, host plant, weather conditions. In this study, *P. ziziphi* had the highest abundance in autumn (i.e, September-October) and these results are consistent with those of Tawfeek and Abu-Shall (2010), are partially consistent with those of Salama *et al.* (1985), Moustafa (2012) and Darwish (2016), and are inconsistent with those of Abd-Rabou (1997) who mentioned that the insect reached a maximum population during summer (August) in Giza, Egypt.

In this study, the endoparasitoid *H. aspidioti* exhibited three-four peaks annually with the highest abundance was during summer months. This parasitoid had two peaks of abundance for the parasitoid during July and November on *A. aurantia* (Moustafa, 2012), two peaks on *H. lataniae* (Bayoumy, 2010), one peak on *H. lataniae* in mid-June and four on *Aonidiella orientalis* (Mohammad *et al*., 2002) and *C. dictyospermi* in Morocco (Benassy and Euverte, 1973). The numbers of scales parasitized by *H. aspidioti* ranged between 7.5 and 63 individuals of *P. ziziphi*. The percent of parasitized *C. dictyospermi* by this parasitoid reached up to 50% (Benassy and Euverte, 1973), *H. lataniae* reached up to 58%.

The ectoparasitoid *Aphytis* sp. was the most abundant parasitoid, had four peaks of abundance annually, and the highest peaks were recorded in May and October. *Aphytis* sp. was the important parasitoid attacking *P. ziziphi* and had 3 generations in autumn, spring and summer seasons and its rate was 19.81% per year (Nabil *et al*., 2019).

Parasitism percentages of *P. ziziphi* by *Aphytis* sp. were high in spring-Summer months, probably because *Aphytis* species respond positively to humidity zone. The parasitism percentages by *Aphytis* sp. almost ranged between 14.6 and 35.4% in both years. On the other hand, the highest parasitism percentages by *H. aspidioti* were in January of both years. The parasitism percentages by *H. aspidioti* ranged between 5.7 and 16.5% in both years. The total parasitism by both parasitoid species was the highest during the period from March to June in both years of the study (Table 2). Parasitism rate by *Aphytis* sp. was 19.81% (Nabil *et al*., 2019), *Aphytis* sp. ranged between 0.8 and 14.6 % (Kamel *et al*., 2003), and *Aphytis lingnanensis* ranged between 12.69 and 14.8% (Darwish, 2016). The unknown mortality percentages were higher in winter than other seasons. This high mortality may be because the mortality arising from the worst weather temperature during winter season.

The relation between the number of living scales and parasitism rates by *Aphytis* species during both years of the study was significantly negative, whereas that for *H. aspidioti* were significantly positive or non-significant during the first and second year, respectively. This implies that *Aphytis* species is inverse-density mortality factors (i.e. its response to host populations seems to be type II) which multiply its efficiency at low host populations. The same results are obtained by Bayoumy (2011) for *Aphytis diaspidis* Howard on both *H. lataniae* and *Quadraspidiotus perniciosus* (Comstock). A type II functional response has been measured for *Aphytis holoxanthus* DeBach in response to densities of Florida red scale, *Chrysomphalus aonidum* (L.) (Podoler *et al*., 1978).

Aphytis sp. and *H. aspidioti* parasitoids contributed with the highest fate in the total population mortality of *P. ziziphi*. Further, *Aphytis* sp. contributed more than *H. aspidioti* in the total population mortality of *P. ziziphi*. Bayoumy (2010) has been reached the same finding regarding the total population mortality of *H. lataniae*

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دراسات المجموع والموت علي الحشرة القشرية البالاتوريا السوداء في مزرعة موالح مصرية

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تعتبر حشرة البالاتوريا السوداء ضمن أهم الآفات المدمرة للموالح في مناطق عديدة. أجريت هذه الدراسة في مزرعة برتقال أبو سرة في المزرعة التجريبية التابعة لجامعة المنصورة خلال موسمي 2018/2017/ و2019/2018. أظهرت حشرة البالاتوريا السوداء ثلاث ذروات من الوفرة العددية سنوياً. أعلي ذروات ظهرت في فصل الخريف. أما الطفيل الخارجي .*Aphytis* sp أظهر أربع ذروات من الوفرة العددية سنوياً وكانت تعدادته متزامنة مع تعدادات الحشرة، أما الطفيل الداخلي أظهر من ثلاث إلي أربع ذروات من الوفرة العددية سنوياً وإن تعدادته كانت متزامنة جزئياً مع تعدادت الحشرة. ومع ذلك كلما ازداد تعداد الحشرة فإن معدلات التطفل بواسطة طفيل *Aphytis* انخفضت بصورة معنوية في حين أن معدلات التطفل بواسطة طفيل *H. aspidioti* كانت غير ثابتة. ولهذا فإن طفيل *Aphytis* يميل إلي أن يكون عامل موت معتمد عكسياً علي الكثافة وإن أطلاقاته يجب أن تكون مبكرا في الموسم علي تعدادات الحشرة المنخفضة. أظهرت نسب التطفل بواسطة طفيل *Aphytis* ذروتين سنوياً والتي تقريباً تظهر في الفترة من شهر مايو إلي أغسطس. تراوحت نسب التطفل بطفيل *Aphytis* من 14.6 إلي 35.04%، في حين أن تلك النسب تراوحت بواسطة طفيل *H. aspidioti* من 5.7 إلي 16.5% في كلتا سنتي الدراسة. طفيل الـ *H. aspidioti* سجل 3 ذروات من التطفل في شهر يناير ومايو وأغسطس سنوياً مع أعلي تعداد كان في شهر يناير. أما نسب الافتراس علي تعدادات حشرة البالاتوريا السوداء تراوحت من 5.8 إلي 18.9%. أما أعلي نسب من الموت غير المعروف في تعداد الحشرة تراوحت من 12.3 إلي 17.8% في الفترة من شهر ديسمبر إلي يناير سنوياً. أما نسبة الموت الكلي في تعداد الحشرة تراوحت من 37.9 إلي 73.9% . أسهمت أنواع الطفيليات بالنصيب الأعلى في الموت الكلي لتعداد حشرة البالاتوريا السوداء في كل المواسم.