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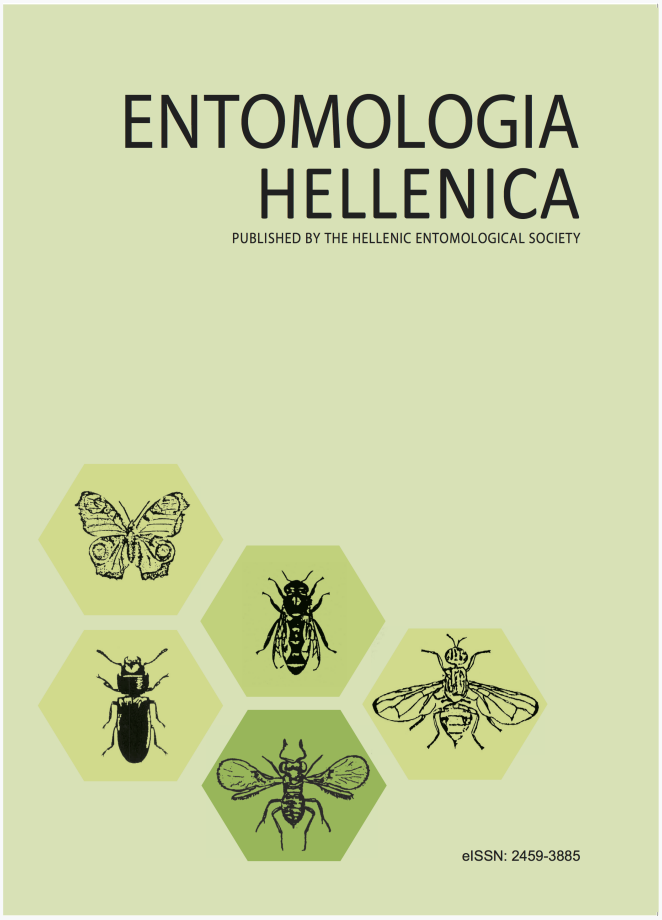

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Natural Enemies Associated with Black Parlatoria Scale, *Parlatoria ziziphi* (Lucas) in Citrus Orchards at El-Qualubia Governorate, Egypt

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ABSTRACT

A survey on black parlatoria scale, *Parlatoria ziziphi* (Lucas), natural enemies present at El-Qualubia Governorate, Egypt, during the season 2010-2011, was carried out in an orchard of navel orange. Identification of the collected samples indicated that the most abundant enemies were the ectoparasitoid *Aphytis hispanicus* (Mercet), the endoparasitoid *Prospaltella inquirenda* (Silvestri) and two predatory mites *Cheletogenes ornatus* (Canestrini&Fanzago) and *Amblyseius swirskii* (Athias-Henriot). *Aphytis hispanicus* preferred to parasitize on males more than females and nymphs, whereas *P. inquirenda* preferred to attack females more than males and nymphs. The activity of parasitoids was not observed during the two main periods, the first from July to August, and the second from January to March. On the other hand, the predatory mites, *C. ornatus* and *A. swirskii*, prefer nutrition to females more than males and nymphs. The percentage of their population was high during the winter-spring and autumn host generations.

KEY WORDS: *Parlatoria ziziphi*, parasitoids, predatory mites, Egypt.

Introduction

The black parlatoria scale, *Parlatoria ziziphi* (Lucas) (Hemiptera: Diaspididae), has long been considered one of the major pests of citrus in certain areas of the world (Ismail, 1989; Miller and Davidson, 1990; Coll & Abd-Rabou, 1998), and the Mediterranean region (Franco *et al.* 2006; and Jendoubi, 2012). Heavy infestations of this scale cause chlorosis and premature drop of leaves, twig and branch dieback, stunting and distortion of fruit, and fruit drop before maturation. Perhaps the most important damage is the virtually irremovable scale cover on the fruit (Quayle, 1938). *Parlatoria ziziphi* has seven generations per year in Taiwan, (Chang and Tao, 1963) and in Egypt three annual generations: summer (15 weeks, from the beginning of May until the first week of August), autumn (17 weeks, from mid-August to first week of December) and winter-spring (26 weeks, from mid-December to first week of June) (Faskha, 2012). Generally, four parasitoid species have been recorded on *P. ziziphi*, namely *Aphytis chrysomphali* (Mercet) (Hymenoptera: Aphelinidae), *Aph. proclia* (Walker), *Aspidiotiphagus citrinus* (Craw) (Hymenoptera: Aphelinidae) and *Asp. buryi* (Berlege & Paoli) (Chang and Tao, 1963). Coll and Abd-Rabou (1998) reported that three parasitoid species are associated with *P. ziziphi* in Upper Egypt: *Encarsia*

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citrina (Craw) (Hymenoptera: Aphelinidae), *Habrolepis aspidioti* (Compere & Annecke) (Hymenoptera: Encyrtidae) and the hyperparasitoid *Marietta leopardina* (Motschulsky) (Hymenoptera: Aphelinidae). There are also two coccinellid predators associated with this scale species; *Chilocorus bipustulatus* (L.) and *Rhyzobius lophanthae* (Blaisdell) in Greece (Stathas *et al*., 2008).

Considering the important role of these natural enemies in suppressing pest populations in the agro-ecosystem preserving and enhancing their activity is highly important within the framework of Integrated Pest Management (IPM) strategies. The objective of the present work was to identify the most abundant enemies of the black parlatoria scale as well as their seasonal activity at El-Qualubia Governorate, Egypt.

Materials and Methods

A survey of black parlatoria scale natural enemies was carried out in 15-year-old navel orange tree orchard (*Citrus sinensis* L.) var. Washington, at the Faculty of Agriculture, Ain Shams University, El-Qualubia Governorate, where no control measures have been undertaken for several years.

To determine the seasonal variation of the population density of *P. ziziphi* present enemies (parasitoids and predators) in those generations, regular weekly excursions were made to this orchard from 2 May 2010 to 5 June 2011. Random samples of 50 infested leaves were taken from the middle shoots of the trees at ca. 1.5m height from the ground and transported to the laboratory in plastic bags. One cm^2 of the upper surface of 10 leaves was examined under a stereoscopic microscope. The black parlatoria scale, *P. ziziphi*, is a sessile insect; the only mobile instar is the crawler. Therefore, dead individuals accumulate from one generation to the next. In each examination the following were recorded: the number of alive scales of all developmental stages, the number of dead scales due to several reasons, the number of parasitized and predated scales, as well as the number of parasitoid species and predatory mites. The means (and ±SE) and percentages (%) of the above numbers were counted weekly. Additionally, separate infested leaves were placed in a wooden box equipped with holes, with adapted glass tubes, to collect emerged adult parasitoids. Meanwhile all other pests on the leaves were discarded. For classifying the inspected species of scale insects, as well as their natural enemies, slides were prepared using Hoyer's medium and examined microscopically at a 10-15x magnification. Specimens were identified by the Scale Insects and Mealybugs Division, Plant Protection Institute, Agricultural Research Center, Egypt and by the keys of parasitoids by Muma and Selhime, (1966), Rosen and DeBach (1979) and Heraty *et al.* (2008). The results are shown separately for each generation of the host.

Results

1. Identification of the natural enemies and their activity against *P. ziziphi*

Identification of the natural enemies indicated the presence of one ectoparasitoid, *Aphytis hispanicus* (Mercet), one endoparasitoid, *Prospaltella inquirenda* (Silvestri) and two mite predators: *Cheletogenes ornatus* (Canestrini & Fanzago) and *Amblyseius swirskii* (Athias-Henriot). Results are listed in Table 1.

Data of the summer generation (May to August 2010) revealed that the mean percentages of mortality caused by other causes and natural enemies were moderate. The mean percentages of mortality by other causes were 5.25, 7.98 and 4.51% for nymphs, females and males, respectively. The mean percentages of mortality caused by natural enemies were 1.59, 4.62 and 4.08% for the three stages, respectively. The mean percentage of mortality caused by other causes and natural enemies across all *P. ziziphi* stages, were 6.59 and 3.45% respectively. Regarding the autumn generation (August to

December 2010), the mean percentages of mortality caused by other causes in the three stages was the lowest among the three generations, being 2.96, 3.56 and 9.5% for nymphs, females and males, respectively. Mortality caused by natural enemies was relatively low for either nymphs or males being 0.99 and 3.20% respectively but higher in females, being 9.82%. The mean percentage of mortality in the total population recorded by other causes and by natural enemies was 5.4 and 3.98%, respectively. Considering the winter-spring generation (December 2010 to June 2011) the mortality caused by other factors was relatively high for the three stages nymphs, females and males as well as the total population, being 8.52, 14.09, 11.42 and 10.48%, respectively. Mortality due to natural enemies in nymphs, females, males and total population being 2.12, 9.24, 2.49 and 3.89%, respectively.

From the above-mentioned data, it could be concluded that the natural enemies seemed to be more effective on the different developmental stages during autumn and winter-spring generations, whereas they were relatively less effective during the summer generation.

2. Seasonal activity of the parasitoids on the black parlatoria scale, *P. ziziphi*

2.1. The ectoparasitoid *Aphytis hispanicus*

The seasonal activity for this parasitoid is presented by the actual numbers and percentages of parasitism on different stages of the host as well as the total population, throughout the three annual generations of the host (Table 2 and Figure 1). It is obvious that *A. hispanicus* seemed to prefer males than females and nymphs. During the summer generation (May to August 2010), the mean percentage of parasitism was 0.74, 0.94, 2.3 and 1.07% on nymphs, females, males, and total population, respectively.

During the autumn generation (August to December 2010), the activity of the parasitoid *A. hispanicus* was also low at the beginning of this generation and then increased in successive samples. The mean percentage of parasitism was 0.46, 0.92, 1.62 and 0.93% on nymphs, females, males and the total population, respectively. On the contrary, the parasitoid *A. hispanicus* reached its highest activity level during winter-spring generation (December 2010 to June 2011), where the mean percentage of parasitism on nymphs, females, males and total population was 0.92, 1.15, 0.52 and 0.71%, respectively.

Thus, it can be concluded that the ectoparasitoid *A. hispanicus* attacked all three stages, nymphs, females and males but male scales were the most preferred host stage. Activity of the parasitoid was low from mid-July to mid-August 2010 and between late January to late March 2011, but it was higher during May and October.

2.2. The endoparasitoid *Prospaltella inquirenda*

The results obtained are given in Table 3 and graphically illustrated in Figure 2. This endoparasitoid parasitized females, nymphs and males of its host, but seemed to prefer females than nymphs and males. The mean percentage of parasitism of females was 1.36, 1.46 and 1.25% in summer, autumn and winter-spring generation, respectively. The mean percentage of parasitism on nymphs was 0.63, 0.31 and 0.81% in summer, autumn and winter-spring generation, respectively.

Percentage parasitism of males was 0.72, and 0.39% in summer and winter-spring generation respectively, but in autumn generation, there was no recorded parasitism of males.

The endoparasitoid *P. inquirenda* was the only endoparasitoid on the black parlatoria scale *P. ziziphi* and it was more active during April, May and September.

TABLE 1. The total counts and the mean (±SE) of different alive and dead developmental stages of *Parlatoria ziziphi*, and the percentage of the mortality causes, natural enemies and other causes, throughout annual generations at El- Qualubia Governorate, during the 2010- 2011 season.

Gene-ration		Nymph total no / 1cm²		Dead nymphs				Female total no / 1cm²		Dead females				Male total no / 1cm²		Dead males				Popul. total no / 1cm²		Dead popul.			
		Living	Dead	*O.F.		**N.E.		Living	Dead	O.F.		N.E.		Living	Dead	O.F.		N.E.		Living	Dead	O.F.		N.E.	
				No.	%	No.	%			No.	%	No.	%			No.	%	No.	%			No.	%	No.	%
Summer (15 weeks)	Total	252.8	16.4	14.1	78.73	2.3	23.78	288	44.9	28.1	119.75	16.8	69.34	165.8	12.1	7	67.64	5.1	61.26	706.6	73.4	49.2	98.91	24.2	51.69
	Mean	16.85	1.09	0.94	5.25	0.15	1.59	19.20	2.99	1.87	7.98	1.12	4.62	11.05	0.81	0.47	4.51	0.34	4.08	47.11	4.89	3.28	6.59	1.61	3.45
	±SE	2.14	0.13	0.14	0.4	0.05	0.6	1.33	0.52	0.29	0.82	0.25	0.85	1.06	0.1	0.03	0.61	0.09	1.26	2.49	0.57	0.21	0.63	0.39	0.85
Autumn (17 weeks)	Total	362.7	13.9	10.9	50.39	3	16.76	289.7	37.7	11.1	62.06	26.6	166.99	301.5	44.5	33	161. 5	11.5	54.39	963.8	96.1	55	91.8	41.1	67.6
	Mean	21.34	0.82	0.64	2.96	0.18	0.99	17.04	2.22	0.65	3.65	1.56	9.82	17.74	2.62	1.94	9.50	0.68	3.20	56.69	5.65	3.24	5.40	2.42	3.98
	±SE	2.02	0.08	0.08	0.34	0.04	0.3	1.78	0.15	0.05	0.33	0.16	1.58	0.57	0.3	0.18	0.85	0.14	0.63	2.74	0.49	0.22	0.44	0.3	0.48
Winter-spring (26 weeks)	Total	285.6	30.8	26.3	221.58	4.5	55.21	211.6	55.2	31	366.41	24.2	240.31	284.6	42.6	34.9	296.87	7.7	64.62	781.8	128.6	92.2	272.58	36.4	101.22
	Mean	10.98	1.18	1.01	8.52	0.17	2.12	8.14	2.12	1.19	14.09	0.93	9.24	10.95	1.64	1.34	11.42	0.30	2.49	30.07	4.95	3.55	10.48	1.40	3.89
	±SE	0.84	0.07	0.09	0.62	0.03	0.47	1.51	0.26	0.15	1.46	0.14	1.01	0.97	0.1	0.1	0.69	0.06	0.53	1.84	0.29	0.14	0.38	0.22	0.56

* = other factors
** =natural enemies

TABLE 2. The total counts, means (±SE) and mean percentage parasitism of different stages of *Parlatoria ziziphi* by the ectoparasitoid *Aphytis hispanicus* on navel orange trees at El- Qualubia Governorate, during the 2010-2011 season.

Generation		Nymph			Females			Males			Total		
		Mean of total nymph no	*A. hispanicus*		Mean of total female no	*A. hispanicus*		Mean of total male no	*A. hispanicus*		Mean of total popul. no	*A. hispanicus*	
			No.	%		No.	%		No.	%		No.	%
Summer (15 weeks)	Total	269.2	1.3	11.11	332.9	3.4	14.05	177.9	2.7	34.51	780	7.4	16.03
	Mean	17.95	0.09	0.74	22.19	0.23	0.94	11.86	0.18	2.30	52.00	0.49	1.07
	±SE	2.22	0.03	0.24	1.69	0.06	0.2	0.98	0.06	0.82	2.05	0.13	0.29
Autumn (17 weeks)	Total	376.6	1.1	7.78	327.4	2.3	15.69	346	5.9	27.56	1050	9.3	15.86
	Mean	22.15	0.06	0.46	19.26	0.14	0.92	20.35	0.35	1.62	61.76	0.55	0.93
	±SE	2.06	0.03	0.2	1.72	0.02	0.2	0.63	0.09	0.4	2.75	0.1	0.18
Winter-spring (26 weeks)	Total	316.40	1.80	23.98	266.80	3.70	30.02	327.20	2.50	13.48	910.40	8.00	18.49
	Mean	12.17	0.07	0.92	10.26	0.14	1.15	12.58	0.10	0.52	35.02	0.31	0.71
	±SE	0.87	0.02	0.28	1.72	0.03	0.23	1.05	0.04	0.19	2.04	0.08	0.17

TABLE 3. The total counts, means (±SE) and mean percentage parasitism of different stages of, *Parlatoria ziziphi* by the endoparasitoid *Prospaltella inquirenda*on navel orange trees at El- Qualubia Governorate, during the 2010-2011 season.

Generation		Nymph			Females			Males			Total		
		Mean of total nymph no	*P. inquirenda*		Mean of total female no	*P. inquirenda*		Mean of total male no	*P. inquirenda*		Mean of total popul. no	*P. inquirenda*	
			No.	%		No.	%		No.	%		No.	%
Summer (15 weeks)	**Total**	269.2	0.7	9.45	332.9	5.1	20.45	177.9	0.9	10.77	780	6.7	14.46
	Mean	17.95	0.05	0.63	22.19	0.34	1.36	11.86	0.06	0.72	52.00	0.45	0.96
	±SE	2.2	0.02	0.31	1.69	0.1	0.34	0.98	0.02	0.21	2.05	0.13	0.28
Autumn (17 weeks)	**Total**	376.60	0.60	5.23	327.4	4.8	24.82	346	0	0	1050	5.4	8.22
	Mean	22.15	0.04	0.31	19.26	0.28	1.46	20.35	0.00	0.00	61.76	0.32	0.48
	±SE	2.06	0.01	0.17	1.72	0.07	0.32	0.63	0.00	0.00	2.75	0.06	0.08
Winter- spring (26 weeks)	**Total**	316.40	1.60	21.00	266.8	5.1	32.54	327.2	1	10.08	910.40	7.70	18.91
	Mean	12.17	0.06	0.81	10.26	0.20	1.25	12.58	0.04	0.39	35.02	0.30	0.73
	±SE	0.87	0.02	0.22	1.72	0.06	0.27	1.05	0.01	0.12	2.04	0.07	0.14

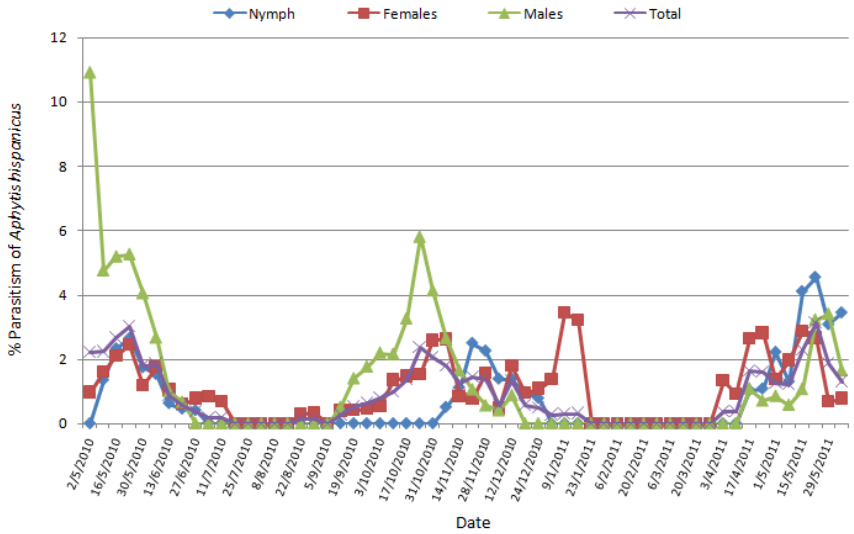

FIG.1: Percentage of parasitism of different stages of *Parlatoria ziziphi* by the ectoparasitoid *Aphytis hispanicus* at El-Qualubia Governorate, during the 2010-2011 season.

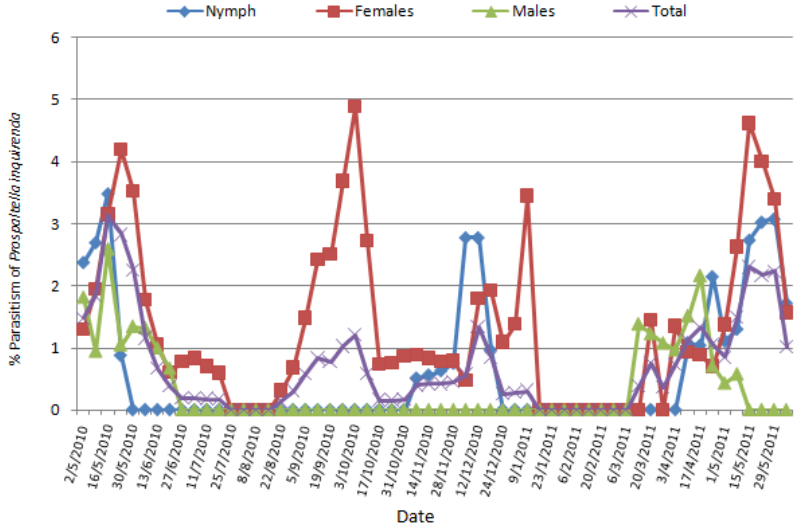

FIG. 2: Percentage of parasitism of different stages of *Parlatoria ziziphi* by the endoparasitoid *Prospaltella inquirenda* at El-Qualubia Governorate, during the 2010-2011 season.

3. Seasonal activity of the two predatory mite species, *Cheletogenes ornatus* and *Amblyseius swirskii*, on the black parlatoria scale, *P. ziziphi*

The two predatory mites, *C. ornatus* and *A. swirskii* fed on all stages of their host but they mostly preferred females (Tables 4 and 5, and Figure 3). They were found to be less active during the summer generation than the previous generation. For *C. ornatus*, the mean percentage scale predation was 1.1, 0.46, 0.08 and 0.62% for females, males, nymphs and total population, respectively. For *A. swirskii*, the mean scale predation percentage was 1.23, 0.61, 0.17 and 0.87% for females, males, nymphs and total population, respectively. The activity of *C. ornatus* and *A. swirskii* was moderate on *P. ziziphi* during the autumn generation. The mean scale predation percentage of *C. ornatus* was 4.68, 1.09, 0.14 and 1.57% for females, males, nymphs and total population, respectively. Whereas, the mean scale predation percentage of *A. swirskii* was 2.76, 0.49, 0.23 and 0.97% for those stages, respectively.

During the winter-spring generation, *C. ornatus* was not observed during January. The scale predation percentage was 3.95, 1.06, 0.39 and 1.43% for females, males, nymphs and total population, respectively. As for *A. swirskii*, it was not observed from early February to early March; the mean scale predation percentage was 2.89, 0.52, 0.09 and 1.01% for females, males, nymphs and total population, respectively. These results suggest that the predatory mites, *C. ornatus* and *A. swirskii* attacked all stages of *P. ziziphi*, but mostly preferred females. *C. ornatus* was present throughout the whole year except late July 2010 and January 2011, whereas the predatory mite, *A. swirskii*, was not recorded from late June to mid-July 2010, and February 2011.

Generally, abundance of predators was high in both winter-spring and autumn generations. The activity of *C. ornatus* reached its peak on females scales between the 27th of June and 24th of October 2010 and between the 20th March and 19th of June 2011. In contrast, the peak of *A. swirskii* activity was recorded in late May, late October and late December 2010 and between early April and the 21st of August 2011.

Discussion

Our study showed that mortality of different stages of *P. ziziphi* caused by abiotic factors was moderate, low and high during the summer, autumn and winter–spring generation, respectively. In contrast, mortality caused by natural enemies was low during the summer and autumn generations and relatively higher during the winter-spring generation. Miller and Davidson (2005) suggested that climatic conditions, temperature and humidity, limit the range and abundance of scale insects. Many species are adversely affected by high humidity which favors the development of parasitic fungi, whereas extensive summer heat and drought could be the main cause of mortality of crawlers of some armored scale insects.

The natural enemies associated with *P. ziziphi* in this survey were the ectoparasitoid *Aphytis hispanicus*, and the endoparasitoid *Prospaltella inquirenda*. The highest percentage of scale parasitism by *A. hispanicus* was 3.45, 4.55 and 10.91% on adult females, nymphs and adult males, respectively, whereas parasitism by *P. inquirenda* was 4.89, 3.49 and 2.6% respectively. In a comparable study, Gerson (1977) recorded these two parasitoids attacking also the chaff scale *P. pergandeii* Comstock (Hemiptera: Diaspididae). Both parasitoids were more abundant during spring and autumn; however *P. inquirenda* was found attacking all chaff scale stages except ovipositing females, whereas *A. hispanicus* attacked only second-stage nymphs, females and males. The highest rate of scale parasitism by *A. hispanicus* was 16.4, 4.6 and 6.2 for adult females, nymphs and adult males respectively.

TABLE 4. The total counts, means (±SE) and mean percentage predation of different stages of *Parlatoria ziziphi* by the predatory mite *Cheletogenes ornatus* on navel orange trees at El-Qualubia Governorate, during the 2010-2011 season.

Generation		Nymph			Females			Males			Total		
		Mean of total nymph no	*C. ornatus*		Mean of total female no	*C. ornatus*		Mean of total male no	*C. ornatus*		Mean of total popul. no	*C. ornatus*	
			No.	%		No.	%		No.	%		No.	%
Summer (15 WEEKS)	Total	269.2	0.1	1.16	332.9	3.6	16.5	177.9	0.8	6.84	780	4.5	9.37
	Mean	17.95	0.01	0.08	22.19	0.24	1.10	11.86	0.05	0.46	52.00	0.30	0.62
	±SE	2.22	0.01	0.08	1.69	0.04	0.18	0.98	0.02	0.15	2.05	0.05	0.11
Autumn (17 WEEKS)	Total	376.6	0.7	2.34	327.4	11.4	79.62	346	4	18.57	1050	16.1	26.66
	Mean	22.15	0.04	0.14	19.26	0.67	4.68	20.35	0.24	1.09	61.76	0.95	1.57
	±SE	2.06	0.02	0.07	1.72	0.12	1.0	0.63	0.06	0.25	2.75	0.18	0.29
Winter- spring (26 WEEKS)	Total	316.4	0.9	10.24	266.8	7.6	102.57	327.2	2.5	27.47	910.40	11.00	37.17
	Mean	12.17	0.03	0.39	10.26	0.29	3.95	12.58	0.10	1.06	35.02	0.42	1.43
	±SE	0.87	0.02	0.18	1.72	0.05	0.86	1.05	0.03	0.33	2.04	0.09	0.36

TABLE 5. The total counts, means (±SE) and mean percentage predation of different stages of *Parlatoria ziziphi* by the predatory mite *Amblyseius swirskii*on navel orange trees at El-Qualubia Governorate, during the 2010-2011 season.

Generation		Nymph			Females			Males			Total		
		Mean of total nymph no	*A. swirskii*		Mean of total female no	*A. swirskii*		Mean of total male no	*A. swirskii*		Mean of total popul. no	*A. swirskii*	
			No.	%		No.	%		No.	%		No.	%
Summer (15 weeks)	**Total**	269.2	0.2	2.51	332.9	4.7	18.39	177.9	0.7	9.12	780	6.3	13.09
	Mean	17.95	0.01	0.17	22.19	0.31	1.23	11.86	0.05	0.61	52.00	0.42	0.87
	±SE	2.20	0.01	0.11	1.69	0.08	0.3	0.98	0.02	0.26	2.05	0.1	0.21
Autumn (17 weeks)	**Total**	376.60	0.60	3.83	327.4	8.1	46.84	346	1.6	8.3	1050.0	10.20	16.52
	Mean	22.15	0.04	0.23	19.26	0.48	2.76	20.35	0.09	0.49	61.76	0.60	0.97
	±SE	2.06	0.01	0.1	1.72	0.08	0.54	0.63	0.03	0.17	2.75	0.11	0.19
Winter- spring (26 weeks)	**Total**	316.40	0.20	2.33	266.8	7.8	75.16	327.2	1.7	13.61	910.40	9.60	26.35
	Mean	12.17	0.01	0.09	10.26	0.30	2.89	12.58	0.07	0.52	35.02	0.37	1.01
	±SE	0.87	0.01	0.07	1.72	0.06	0.54	1.05	0.02	0.2	2.04	0.08	0.21

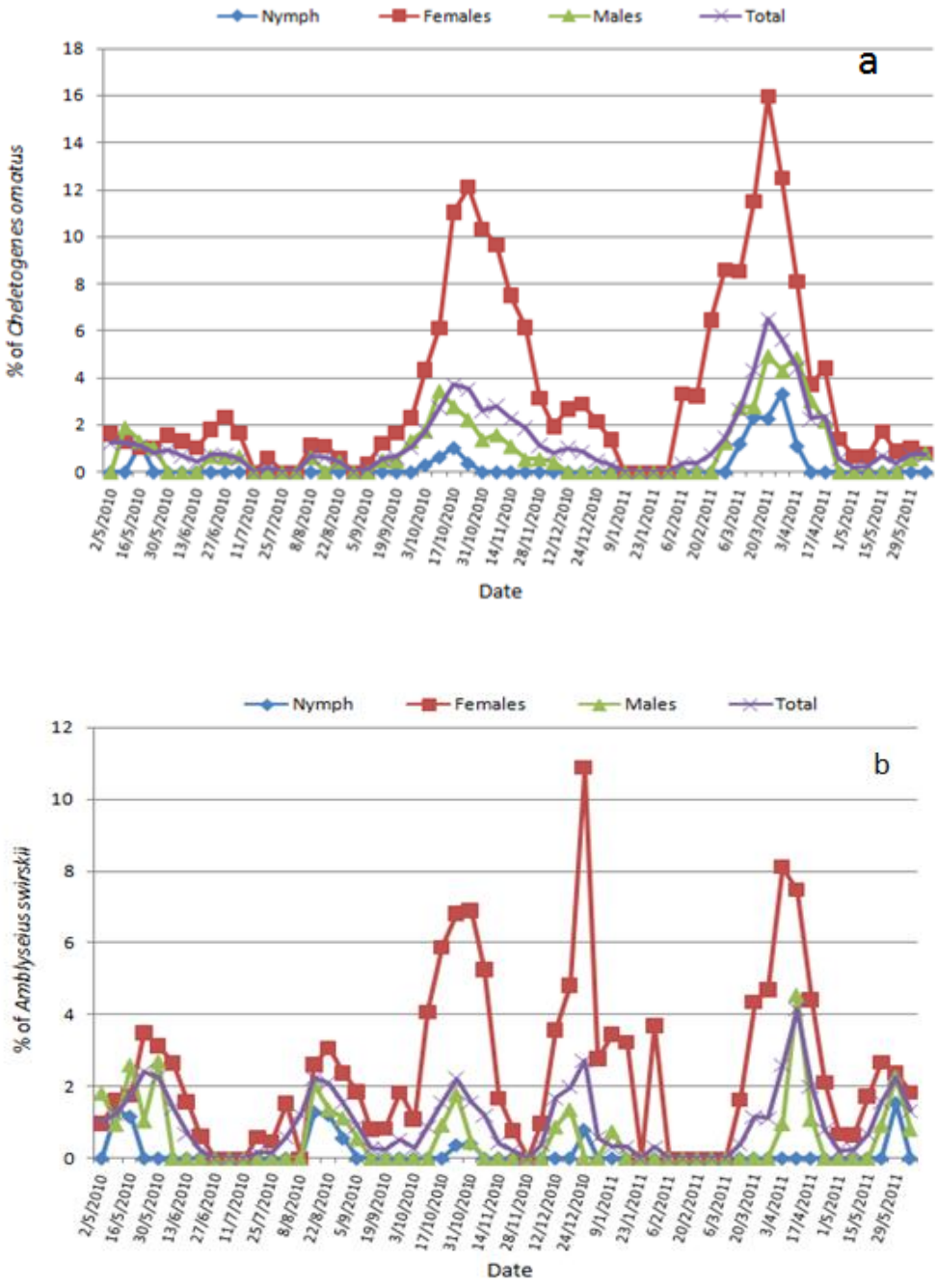

FIG. 3: Predation percentage of different stages of *Parlatoria ziziphi* by the predatory mite *Cheletogenes ornatus* (a) and *Amblyseius swirskii* (b) at El-Qualubia Governorate, during the 2010-2011 season.

Moreover, the highest rate of scale parasitism of *P. inquirenda* was 12.5, 1.2 and 3.7 on adult females, nymphs and adult males respectively. Coll and Abd-Rabou (1998) indicated that three parasitoid species associated with *P. ziziphi* in Upper Egypt are *Encarsia citrina* (Craw), *Habrolepis aspidioti* (Compere & Annecke) (Hymenoptera: Encyrtidae) and the hyperparasitoid *Marietta leopardina* (Motschulsky) (Hymenoptera: Aphelinidae). Other parasitoids associated with *P. ziziphi* are *Aphytis proclia, E. citrina, E. lounsburyi and H. aspidioti* (Jendoubi, 2012).

Fasulo and Brooks (2004) reported that a number of parasitoids and predators attack *P. ziziphi* but it is unlikely that they are effective biological control agents. Some of the parasitoids have exerted up to 40% parasitism. In general, our survey showed that the activity of natural enemies was higher during spring and autumn, which is consistent with studies by Gerson, (1977) and Saker, (1994), who similarly found that low density of the black scale *Chrysomphalus ficus* (Ashmead) in Qualubia Governorate was attributed to the activity of the ectoparasitoid *A. holoxanthus* (DeBach), three endoparasitoids, *Aspidiophagus citrinus* (Craw), *A. lounsburyi* (Dozier) and *H. pascuorum* (Mercet) and the entomopathogenic fungus *Cladosporium cladosporioides* (Fresenius) which was more prominent during the winter and the spring generation of *C. ficus*. These natural enemies were less active during summer and therefore, summer sprays are not harmful for them, whereas winter sprays are detrimental to the natural enemy populations.

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Φυσικοί εχθροί σχετιζόμενοι με τη μαύρη ψώρα *Parlatoria ziziphi* (Lucas) σε οπωρώνες εσπεριδοειδών στο κυβερνείο El-Qualubia της Αιγύπτου

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ΠΕΡΙΛΗΨΗ

Το χρονικό διάστημα 2010-2011 διεξήχθη έρευνα για τους φυσικούς εχθρούς της μαύρης ψώρας, *Parlatoria ziziphi* (Lucas), που είναι παρόντες σε οπωρώνες πορτοκαλιάς Navel στο κυβερνείο El-Qualubia της Αιγύπτου. Η αναγνώριση των συλλεχθέντων δειγμάτων έδειξε ότι τα είδη σε μεγαλύτερη αφθονία ήταν το εκτοπαράσιτο *Aphytis hispanicus* (Mercet), το ενδοπαράσιτο *Prospaltella inquirenda* (Silvestri), καθώς και δύο αρπακτικά ακάρεα, τα *Cheletogenes ornatus* (Canestrini& Fanzago) και *Amblyseius swirskii* (Athias-Henriot). Το *A. hispanicus* έδειξε προτίμηση ως προς τον παρασιτισμό αρσενικών ατόμων σε σχέση με τα θηλυκά και τις νύμφες, ενώ το *P. inquirenda* έδειξε προτίμηση προς τα θηλυκά άτομα σε σχέση με τα αρσενικά και τις νύμφες. Δεν παρατηρήθηκε δραστηριότητα των παρασιτοειδών κατά τη διάρκεια των δύο βασικών περιόδων (από τον Ιούλιο ως τον Αύγουστο και από τον Ιανουάριο ως το Μάρτιο). Από την άλλη, τα αρπακτικά ακάρεα *C. ornatus* και *A. swirskii* έδειξαν προτίμηση προς τα θηλυκά άτομα και λιγότερο στα αρσενικά και τις νύμφες. Το ποσοστό του πληθυσμού τους ήταν υψηλό κατά τις γενεές χειμώνα-άνοιξης και φθινοπώρου του ξενιστή τους.

