EFFECTS OF TEMPERATURE, RELATIVE HUMIDITY AND SOME BIOLOGICAL ASPECTS ON PARASITOIDS PERFORMANCE AGSINST OLEANDER APHID, *APHIS NERII* BOYER DE FONSCOLOMBE (HOMOPTERA, APHIDIDAE)

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Abstract

The study was performed to declare the effects of temperature and relative humidity on the population density of *Aphis nerii*, and the parasitoids, *Diaeretiella rapae* and *Aphidius* sp. at two districts, Zagazig and Mansoura (Sharkia and Dakahlia Governorates, respectively) throughout two seasons, 2005-2006 and 2006-2007 on Difla plants. The results indicated a highly significant positive correlation between temperature and population density of *A. nerii* in the second seasons at the two districts, while relative humidity showed negative significant at Mansoura district in the last season. On the other hand, the data cleared highly significant correlation between temperature and *D. rapae* during the two seasons at the two districts. Results indicated a highly negative significant between temperature and *Aphidius* sp at Mansoura district during two seasons. A significant negative correlation was obtained between the two parasitoids, *D. rapae* & *Aphidius* sp and *A. nerii* during two seasons at two districts.

The parasitoid, *D. rapae* accepted the stages of oleander aphid, *A. nerii*, with average number of mummies per female parasitoid 64.2. Results indicated insignificant effect on incubation period of eggs, larval and pupal durations between the two parasitoids, *D. rapae* and *Aphidius* sp., but the total developmental period of two parasitoids had a significant effect on *A. nerii*, the averages were 19.38±0.57 and 22.09±0.54 with *D. rapae* and *Aphidius* sp., respectively. The work showed that leaf - arrival time decreased with increasing host density. Meanwhile, the first sting-time, numbers of oviposition and mummies increased with increasing host density.

Keywords: *Diaeretiella rapae*, *Aphidius* sp, *Aphis nerii*, ecology, biology.

INTRODUCTION

Aphis nerii has infested plants of families Compositae, Convolvulaceae, and Euphorbiaceae as well as sunflower plants (Elliott *et al*., 1994), wax plant, *Hoya carnosa* and citrus (Stoetzel, 1994) and soybean plants (George *et al.*, 2004). Biological control is satisfactory program in an integrated pest management. Control of insect pests by parasitoids is defined as the action of parasitoids that maintains a pest population at a lower level. Parasitism of aphids has been shown to be density dependent (Walker *et al.,* 1984). Saleh and Gatwary, (2007) recorded five

hymenopterous parasitoids, *D. rapae*, *Aphidius* sp. (primary parasitoids), *Pachyneuron* sp., *Alloxysta* sp. and *Aphidencyrtus* sp. (Hyperparasitoids) on oleander aphid, *A. nerii*. *D. rapae* was the most dominant parasitoid. Biology of *D. rapae* was studied on different aphid species (El-Batran *et al.*, 1996, Ragab *et al.*, 2002, El-Heneidy *et al.*, 2006 and Saleh, 2008). The present work was conducted to study the effects of some climatic factors as temperatures and relative humidity on the abundance of the aphid and its associated parasitoids as well as biology of the two parasitoids, *D. rapae* and *Aphidius* sp.

MATERIALS AND METHODS

1- The survey

Aphis nerii populations were estimated on the oleander plants, *Nerium oleander* at two districts, Zagazig, (Sharkia) and Mansoura, (Dakahlia) during two successive seasons, 2005-2006 and 2006-2007. Random samples of twenty five leaves infested with aphids were taken weekly and transferred to the laboratory in tight closed plastic bags and calculated biweekly after that. The collected aphid specimens and the number of mummies per sample were recorded. Aphids were fed on their host plant and kept in Petri dishes (50 aphid/Petri dish) until formation of mummies. The mummies were isolated and kept in small glass tubes until emergence of adult parasitoids (Saleh and Gatwary, 2007).

Daily records of both minimum and maximum temperatures along with relative humidity were obtained from the Agrometerological Station at Zagazig and Mansoura regions during the above mentioned periods. The relationship between the average number of aphid individuals and the corresponding mean of temperatures were recorded, every 15 days.

2. The biology

2.1. Effect of aphid age on parasitism

Four ages of the aphids were tested, the first, second, third and fourth instars, each with five replicates. Each replicate had a oleander leaf in a separate jar. Two hundred of aphids in each jar were transferred to oleander leaf. About six hours later, five mated females of *D. rapae* were released in each jar, the leaf change daily, and after about 10-11 days the mummies were counted. The experiments were carried out at 18±1 ºC and 64±3 % R.H.

2.2. Production mummies per female

Five females of the parasitoid, *D. rapae* were tested for produce the mummies from adult female emergence to death. One hundred of aphids and one female put in Petri dishes for 24 h after that the same female was transferred with one hundred of

aphids and oleander leaf. The female transferred daily on another one hundred of aphid to death. The experiment replicated five time under laboratory condition.

2.3. Life cycle of *D. rapae* and *Aphidius* sp. on *A. nerii*

A laboratory culture of the aphid, *A. nerii* was maintained under laboratory condition. The aphid species were reared in caged young seedling of their hosts or reared on either cut flowering shoots in a caged pot or on detached young leaves set flat on the bottom of clear plastic jar. A laboratory culture of the adult parasitoids, *D. rapae* and *Aphidius* sp., that was started with mummies obtained from the field. Mummified aphids were placed singly in small glass tubes until the emergence of adult parasitoids which were fed on sugar solution.

The duration of different immature stages of the two parasitoid on the nymphs of A. nerii, was determined under temperature 18±1 ºC and 64±3 R.H. Nymphs of the aphid were exposed to enough numbers of newly mated females of the parasitoid under cages for 2-6 hours. Twenty five nymphs of each parasitized aphid were daily dissected to observe the development of immature stages of the two parasitoids.

2.3. Sex ratio:

Sex ratio of *D. rapae and Aphidius* sp., which reared on A. nerii was also determined depending on the ratio of females: males emerged from the total number of aphid mummies for each aphid.

2.4. Behaviour of the parasitoid, *D. rapae* at varying host densities.

D. rapae on varying host densities of 25, 50, 100 and 150 nymphs of the aphid, A. nerii (mostly 3rd instars) on a leaf of oleauder were placed separately in Petri dishes with moistened filter paper. Freshly emerged ones to 12 h. old, fully fed with 50 % honey solution and fertilized female parasitoids were gently introduced into each Petri dish. The behaviour of the parasitoid was observed for 30 min and recorded the following: 1- the period between introducing of the female and her first contact with the food plants, leaf (leaf – arrival time), 2- number of oviposition (no. sting), and 3- No. of mummies. The experiment was replicated five times. The obtained data were statistically analyzed by using Costat, (1990) computer program.

RESULTS AND DISCUSSION

1- The survey

Results in Table, (1) showed the values of simple correlation coefficient among temperature, relative humidity and the population density of *A. nerii* at two districts of Zagazig and Mansoura. During the first season, 2005-2006, temperature showed insignificant at Zagazig, while it cleared highly significant positive correlation at

Mansoura. The relative humidity showed a non significant in both districts of Zagazig and Mansoura. In 2006-2007 season, temperature showed a significant positive in Zagazig and it was highly significant positive correlation at Mansoura but the relative humidity showed a insignificant correlation at Zagazig, while it was significant negative in Mansoura district.

Data in Table, (2) showed numerical relation between temperature, relative humidity and the total numbers of *A. nerii* as dependent factor during two seasons. The probability simple regression analysis indicated highly significant relationships at Zagazig and Mansoura districts in the two seasons. Also, multiple regression analysis showed a highly significant in two season with the R^2 values of 0.9406 and 0.92023 at Zagazig respectively, while they were 0.98043 and 0.9749) at Mansoura in two seasons, respectively.

Results in Table, (3) show the values of correlation coefficient of the relation among temperature, relative humidity and the population density of *D. rapae* during the two seasons. Temperature parameters indicated highly significant during the two seasons at the two regions. Meanwhile, relative humidity showed insignificant effect on the population density of this species in the two seasons at the two previous districts, except during the other season in Mansura districts, it was high significant.

Data in Table, (4) showed the numerical relation among temperature, relative humidity and population density of *D. rapae* during the two seasons at the two districts. The temperature showed an insignificant effect on the population density *D. rapae* during the these seasons at the two districts.

Meanwhile, the relative humidity cleared a significant effect on the population density of *D. rapae* during the two seasons at the two districts. Also multiple regression analysis indicated a highly significant effect on the population density of *D. rapae* during two seasons at the two districts.

Results in Table, (5) showed the values of correlation coefficient of the relation among temperature, relative humidity and the population density of *Aphidius* sp during the two seasons. The temperature parameters showed highly significant during the periods of study. Meanwhile, the relative humidity showed insignificant effect on the population density of *Aphidius* sp in the period of investigation, except 2006-2007 season. The relative humidity showed a highly significant on the population density of *Aphidius* sp at Mansoura region.

Data in Table, (6) showed the numerical relation among temperature, relative humidity and the population density of *Aphidius* sp during two seasons at the two districts of Zagazig and Mansoura. The temperature parameter showed insignificant effect during the periods of study on the population density of *Aphidius* sp at the two regions. While, the relative humidity induced significant effect on the population density of *Aphidius* sp during the First season, at Mansora region, while it showed significant relation at Zagazig region in two seasons. Multiple regression analysis indicated significant effect on the population density during 2005-2006 and 2006-2007, and showed a highly significant during the two seasons at Mansoura region.

Results in Table, (7) showed the values of the correlation coefficient of relation between parasitoids number of *D. rapae*, *Aphidius* sp and the population density of *A. nerii* during the two seasons. The two parasitoids, *D. rapae* and *Aphidius* sp. showed highly significant negative correlation in 2006-2007 at Zagazig and Mansoura regions. Also, during 2005-2006 in Mansoura the two parasitoids showed highly significant negative correlation while its cleared a significant negative correlation at Zagazig region.

Data in Table, (8) showed numerical relation between *A. nerii* and each of the two aphid parasitoids during the two seasons. Simple regression analysis indicated a non significant correlation between *A. nerii* and the population of two aphid parasitoids.

Many studies dealt with the correlation between the parasitoid, *D. rapae* and different aphid species. El-Maghraby, (1993) showed that the metrological factors (temperature and relative humidity) play a great role in regulating the population density and seasonal abundances of insect pest, *B. brassicae*. Saleh, (2006) recorded the effects of temperature on population density of the parasitoid species, he revealed that the correlation coefficient of temperature was significant with *A. colemani* and insignificant with *D. rapae*, while a relative humidity showed insignificant on both parasitoids.

2. The biology

Figure, (1) showed effect of aphid age on parasitism, indicating the parasitoid, *D. rapae* accepted all stages of *A. nerii*. They produced an average of 7.4, 18, 25.1 and 21.6 mummies with 1^{st}, 2^{nd}, 3^{rd} and 4^{th} instars of nymphs, respectively. Meanwhile, the number of adults emergence were 14.3 and 17.0 with the third and fourth instars, respectively, but non adult emergence with first and second instars.

The data showed that *D. rapae* parasitized on old and young aphids but when we need released the parasitoid we must be release it on third instars. These results agree with these obtained by Zhang and Hassan, (2003), who mentioned that the parasitoid, *D. rape* accepted all stages of the cabbage aphid *B. brassicae* and parasitized on old and young aphid.

2.1. Behaviour of the parasitoid, *D. rapae* on *A. nerii* at varying host densities.

The results in Table, (9) showed that the leaf-arrival time (host-searching time) significantly decreased with increasing host density. It was 8.67±0.20 min., at host density of 25 aphid/leaf, while it was 0.96±0.17 min. with density of 150 aphid/leaf. Meanwhile, the first sting time, number of oviposition and number of mummies significantly increased with increasing host density. The number of mummies was 4.60±0.51 at 25 aphid/leaf but it was 19.60±0.93 at 150 aphid/leaf.

These results agree with these obtained by Tripathi and Singh, (1990), who reported that increase a number of antennal encounters, oviposition and number of mummies for *Lysiphlebia mirzai* with increasing of the host density. Also, Saleh, (2008) mentioned that decrease the leaf-arrival time for *D. rapae* was observed with increase of host densities, but increase first sting-time, number of sting and number of mummies with increase the host densities.

2.2. Production mummies by female

The results indicated that female of *D. rapae* was survival with an average 6.0±0.38 days. During this period the total mummies, whish was produced by female was 64.2±2.08 with an average 10.56±0.71 mummies in day. However, Zhang and Hassan, (2003) mentioned that the average number of mummies produced by female parasitoid, *D. rapae* was 42.8 mummies.

2.3. Life cycle of *D. rapae* and *Aphidius* sp reared on *A. nerii*

The results in Table (10) indicated that the incubation period It lasted 4.25±0.2 days for *D. rapae* and 5.42±0.45 days for *Aphidius* sp. reared on *A. nerii*. The larval stage showed average 8.12±0.69 days for *D. rapae*, while it was 9.04±0.57 days for *Aphidius* sp.

The average of pupal stage were 7.01±0.81 and 7.63±0.61 days with *D. rapae* and *Aphidius* sp., respectively. The total development period of *D. rapae* and *Aphidius* sp showed different significant effect on *A. nerii*. The average 19.38±0.57 days with

D. rapae, while it was 22.09±0.54 days with *Aphidius* sp. The longevity of *D. rapae* for females was 5.32 days and 2.77 days for males, while the corresponding figures were 4.11 days and 2.46 days for males with *Aphidius* sp.

The results are in agreement with those of Saleh, (2008) in Egypt who mentioned that the parasitoid *D. rapae* completed its life cycle on various aphid species *B. brassicae*, *A. nerii*, *A. gossypii*, *A. craccivora*, *M. persicae* and *H. pruni* it were an average 19.87, 24.39, 17.28, 16.34, 18.2 and 18.55 days, respectively at 16 °C.

CONCLUSION

The present study indicated that the temperature and R.H. % had exerted correlation degrees varied from slightly positive or negative to highly significant positive on the population density of *A. nerii*, *D. rapae* and *Aphidius* sp. The average number of mummies produced per female parasitoid was 64.2. The average life cycle was 19.38±0.57 days with *D. rapae* and 22.09±0.54 days with *Aphidius* sp.

Table 1. Simple correlation coefficient between weather factors (temperature, & R.H.%) and the total numbers of *Aphis nerii* during the two seasons at the two regions.

Weather factors	Zagazig				Mansoura			
	Corr (r)±S.E	Slope (b)	Y Int (a)	P	Corr (r)±S.E	Slope (b)	Y Int (a)	P
	2005-2006				2005-2006			
Temp.	0.3622±0.0077	0.0041	15.0807	ns	0.7931±0.0262	0.0042	1.4869	**
R.H.	0.3820±0.0175	0.0087	48.9488	ns	-0.266±0.0069	0.0052	72.0900	ns
	2006-2007				2006-2007			
Temp.	0.4519±0.0107	0.0042	13.6742	*	0.7786±0.0222	0.0037	3.4634	**
R.H.	0.2405±0.0039	0.0031	59.8424	ns	-0.560±0.0099	0.0029	74.6753	*

* = significant **= high significant n.s.= non-significant

Table 2. Numerical relation between weather factors (temperature, & R.H.%) and the total numbers of Aphis nerii during the two seasons at the two regions.

Weather factors	Zagazig			Mansoura		
	Regression equation	R^2	P	Regression equation	R^2	P
	2005-2006			2005-2006		
Tem.	y=31.274*1x	0.9232	**	y=34.307*1x	0.9756	**
R.H.	y=10.552*1x	0.9312	**	y=9.135*1x	0.9415	**
Multiple regression	y=13.463*tem+6.155*RH	0.9406	**	y=25.618*tem+2.444*RH	0.9804	**
	2006-2007			2006-2007		
Tem.	y=0.370*1x	0.9109	**	y=35.401*1x	0.9714	**
R.H.	y=0.097*1x	0.8999	**	y=8.989*1x	0.9235	**
Multiple regression	y=17.168*tem+3.803*RH	0.9202	**	y=28.292*tem+1.933*RH	0.9749	**

* = significant **= high significant n.s.= non-significant

Table 3. Simple correlation coefficient between weather factors (temperature, & R.H.%) and the total numbers of D. rapae during the two seasons at the two regions.

Weather factors	Zagazig				Mansoura			
	Corr (r)±S.E	Slope (b)	Y Int (a)	P	Corr (r)±S.E	Slope (b)	Y Int (a)	P
	2005-2006				2005-2006			
Temp.	-0.568±0.168	-0.0800	22.173	**	-0.719±0.145	-0.1353	21.169	**
R.H.	-0.289±0.195	-0.0874	62.478	ns	0.378±0.193	0.0562	66.345	ns
	2006-2007				2006-2007			
Temp.	-0.653±0.151	-0.0860	22.810	**	-0.851±0.107	-0.1716	21.535	**
R.H.	-0.001±0.199	-0.0005	62.077	ns	0.629±0.159	0.0788	66.548	**

* = significant **= high significant n.s.= non-significant

Table 4. Numerical relation between weather factors (temperature, & R.H.%) and the total numbers of D. rapae during the two seasons at the two regions.

Weather variables	Zagazig			Mansoura		
	Regression equation	R^2	P	Regression equation	R^2	P
	2005-2006			2005-2006		
Temp.	y=0.311*1x	0.3568	ns	y=0.2895*1x	0.3086	ns
R.H.	y=1.0132*1x	0.4286	*	y=1.3879*1x	0.5211	*
Multiple regression	y=-1.363*tem+0.868*RH	0.4563	*	y=-3.749*tem+1.354*RH	0.7945	**
	2006-2007			2006-2007		
Temp.	y=0.2383*1x	0.3417	ns	y=0.2975*1x	0.2976	ns
R.H.	y=0.8825*1x	0.5005	*	y=1.5284*1x	0.5693	**
Multiple regression	y=-4.050*tem+1.849*RH	0.6671	**	y=-3.627*tem+1.277*RH	0.8727	**

* = significant **= high significant n.s.= non-significant

Table 5. Simple correlation coefficient between weather factors (temperature, & R.H.%) and the total numbers of Aphidius sp. during the two seasons at the two regions.

Weather factors	Zagazig				Mansoura			
	Corr (r)±S.E	Slope (b)	Y Int (a)	P	Corr (r)±S.E	Slope (b)	Y Int (a)	P
	2005-2006				2005-2006			
Temp.	-0.617±0.161	-0.4713	22.3226	**	-0.716±0.146	-0.4598	22.8203	**
R.H.	-0.095±0.203	-0.1554	60.8723	ns	0.253±0.203	0.1284	66.9047	ns
	2006-2007				2006-2007			
Temp.	-0.489±0.174	-0.3572	21.6657	*	-0.763±0.132	-0.6376	20.5881	**
R.H.	-0.068±0.199	-0.0343	62.2583	ns	0.565±0.168	0.2928	66.9835	**

* = significant **= high significant n.s.= non-significant

Table 6. Numerical relation among between weather factors (temperature, & R.H.%) and the total numbers of Aphidius sp. during the two seasons at the two regions.

Weather variables	Zagazig			Mansoura		
	Regression equation	R^2	P	Regression equation	R^2	P
	2005-2006			2005-2006		
Temp.	y=1.658*1x	0.3409	ns	y=0.960*1x	0.2638	ns
R.H.	y=5.651*1x	0.4470	*	y=4.620*1x	0.4627	*
Multiple regression	y=-0.422*tem+0.217*RH	0.5261	*	y=-1.058*tem+0.375*RH	0.7432	**
	2006-2007			2006-2007		
Temp.	y=1.324*1x	0.2900	ns	y=1.224*1x	0.2717	ns
R.H.	y=4.796*1x	0.4064	*	y=0.298*1x	0.3181	ns
Multiple regression	y=-0.527*tem+0.252*RH	0.5089	*	y=-0.787*tem+0.274*RH	0.7791	**

* = significant **= high significant n.s.= non-significant

Table 7. Correlation coefficients between Aphis nerii and the two aphid parasitoids during the two seasons at the two regions.

Species	Parasitoids	Zagazig				Mansoura			
		Corr (r)±S.E	Slope (b)	Y Int (a)	P	Corr (r)±S.E	Slope (b)	Y Int (a)	P
Aphis nerri		2005-2006				2005-2006			
	D. rapae	-0.445±0.067	0.0276	69.9895	*	-0.585±0.103	0.0297	88.9048	**
	Aphidius sp	-0.479±0.013	0.0050	13.4583	*	-0.561±0.029	0.0089	24.5319	**
		2006-2007				2006-2007			
	D. rapae	-0.646±0.116	0.0273	101.553	**	-0.639±0.090	0.0222	81.0844	**
	Aphidius sp	-0.619±0.019	0.0051	16.7401	**	-0.597±0.020	0.0056	17.8922	**

* = significant **= high significant n.s.= non-significant

Table 8. Numerical relation between Aphis nerii and two aphid parasitoids during the two seasons at the two regions.

Species	Parasitoids	Zagazig			Mansoura		
		Regression equation	R^2	P	Regression equation	R^2	P
Aphis nerri		2005-2006			2005-2006		
	D. rapae	y=9.687*1x	0.3267	ns	y=10.840*1x	0.3586	ns
	Aphidius sp	y=51.647*1x	0.3123	ns	y=36.484*1x	0.3156	ns
		2006-2007			2006-2007		
	D. rapae	y=0.0429*1x	0.2725	ns	y=11.460*1x	0.3658	ns
	Aphidius sp	y=0.0061*1x	0.2045	ns	y=46.918*1x	0.3095	ns

* = significant **= high significant n.s.= non-significant

Table 9. Effect of behaviour of the parasitoid, D. rapae on oleander leaf at varying host densities.

No. host density	Leaf arrival time (min.)	First sting time (min.)	No. of sting (oviposition)	No. of mummies
25	8.67±0.20 a	9.18±0.54 d	7.6±0.50 d	4.60±0.5 d
50	6.38±0.21 b	15.11±0.37 c	30.8±1.77 c	9.60±0.93 c
10 0	1.84±0.42 c	16.83±0.94 b	52.8±1.56 b	15.60±0.68 b
150	0.96±0.17 d	22.86±0.13 a	77.8±1.91 a	19.60±0.93 a

Means followed by the same letter (vertically) are not significantly different.

Table 10. Duration of various developmental stages and survival period of the two parasitoids, D. rapae and Aphidius sp. reared on A. nerii at 18±1 C and 64±3 RH.

Stages		*D. rapae* mean±S.E	*Aphidius* sp Mean±S.E
Eggs		4.25±0.20 a	5.42±0.45 a
Larvae		8.12±0.69 a	9.04±0.57 a
Pupae		7.01±0.81 a	7.63±0.61 a
Total develop. Period (egg-adult)		19.38±0.57 b	22.09±0.54 a
Survival	Female	5.32±0.43 a	4.11±0.60 a
	Male	2.77±0.29 a	2.46±0.39 a

Means followed by the same letter (vertically) are not significantly different.

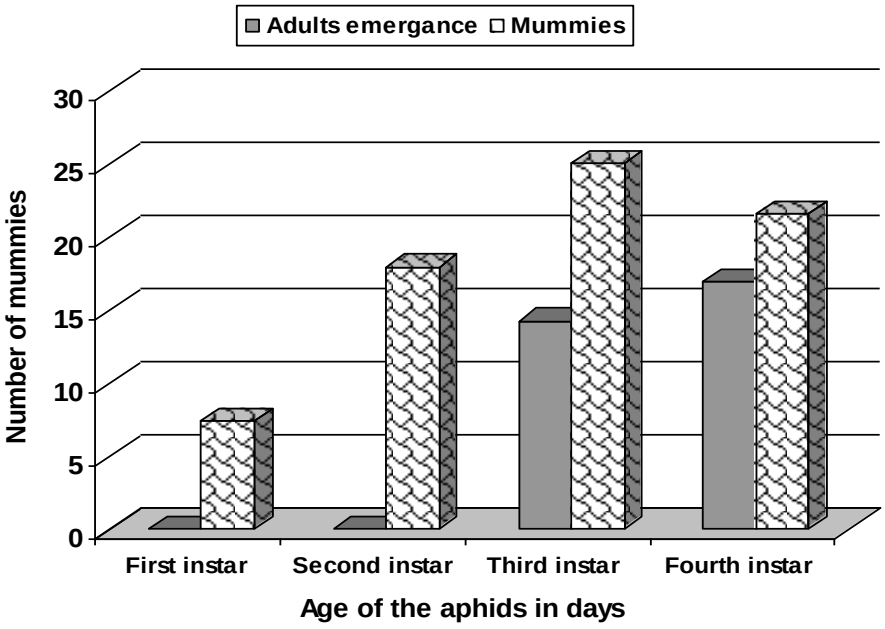

Fig. 1. Number of mummies and adults emergence form *Aphis nerii* aphids by the parasitoid, *D. rapae*.

REFERENCES

1. Costat Software. 1990. Micro Computre Programe Analysis version 4.20, CoHort Software, Berkeley, CA.
2. El-Batran, L. A., S. S. Awadallah and H. M. Fathy. 1996. On some predators and parasitoids of the cabbage aphid *Brevicoryne brassicae* (L.) in Mansoura district. Egyptian Journal of Biological Pest control, 6(1): 35-38.
3. El-Heneidy, A. H., D. Gonzalez, M. A. Ahmed, M. M. Ibraheem, H. E. Megahed, W. M. Abdel-Awal and D. Adly. 2006. Performance of certain exotic aphid parasitoid species towards cereal aphids under laboratory, field cage and open wheat field conditions in Egypt. Egyptian Journal of Biological Pest Control, 16(2): 67-72.
4. Elliott, N. C., B. W. French, D. K. Reed, J. D. Burd and S. D. Kindler. 1994. Host species effects on parasitization by a syrian population of *Diaeretiella rapa*e M`Intosh (Hymenoptera: Aphidiidae). Can. Entomol., 126: 1515-1517.
5. El-Maghraby, M. M. A. 1993. Seasonal abundance of the cruciferous aphid *Brevicoryne brassicae* L. (Homoptera, Aphididae) in relation to the primary and hyperparasitoids on cauliflower in Zagazig region, Egypt. Zagazig. J. Agric., Res., 20, (5): 1627 – 1639.
6. George, E. H., W. R. L. David, V. Robert, R. H. Keithr, J. O. C. Robert and W. U. Zhishan. 2004. Prospects for importation biological control of the soybean aphid: Anticipating potential costs and benefits. Ann. Entomol. Soc. Am. 97(2): 249 – 258.
7. Ragab, M. E., A. A. Abou El-Naga, A. A. Ghanim and A. A. Saleh. 2002. Effect of host aphid species temperature and food supply on some biological, characteristics of the two aphid parasitoids, *Diaeretialla rapae* (M'Intosh) and *Aphidius* sp. (Nees) (Hymenoptera: Aphidiidae). J. Agric. Sci. Mansoura Univ., 27(7): 4997-5002.
8. Saleh, A. A. A. 2006. *Aphidius colemani* Viereck and *Diaeretiella rapae* (M`Intosh) as parasitoids on the common red aphid, *Hyalopterus pruni* (Geoffroy) in Egypt. Egyptian Journal of Biological Control, 16(2): 93-97.
9. Saleh, A. A. A. 2008. Ecological and biological studies of *Diaeretiella rapae* (M`Intosh) (Hymenoptera: Aphidiidae) the parasitoid of some aphid species in Egypt. 2nd Arab Conference of Applied Biological Pest Control, Cairo, Egypt, 7-10 April.
10. Saleh, A. A. A. and W. G. T. Gatwary. 2007. Seasonal abundance of the oleander aphid *Aphis nerii* Boyer de Fonscolombe (Homoptera, Aphididae) in relation to the primary and hyperparasitoids on Difla in Egypt. J. Product & Dev., 12(2): 709-730.

11. Stoetzel, M. B. 1994. Aphid (Homoptera: Aphididae) of potential importance on citrus in the United States with illustrated keys to species. Proceeding of the Entomol., Society of Washington, 96: 74-90.
12. Tripathi, R. N. and R. Singh. 1990. Behaviour of the parasitoid *Lysiphebia mizai* Shuja-Uddin (Hym., Aphidiidae) at varying host densities. J. Appl. Ent., 110: 26-34.
13. Walker, G. P., L. R. Nault and D. E. Simonet. 1984. Natural mortality factors acting on potato aphid (*Macrosiphum euphorbiae*) populations in processing tomato fields in Ohio. Environmantal Entomol., 13: 724 – 732.
14. Zhang , W . Q. and S.A. Hassan. 2003. Use of the parasitoid *Diaeretialla rapa*e (McIntosh) to control the cabbage aphid *Brevicoryne brassicae*(L) China. J. Appl. Ent ., 127: 522 -526.

دراسة تأثير درجات الحرارة والرطوبة وبعض الخصائص البيولوجية على أداء طفيليات من التفلة

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تهدف الدراسة الى تحديد تاثير الحرارة والرطوبة النسبية على الكثافة العددية لمن التفلة *A. nerii* وكذلك الطفيلين *D. rapae* ، *Aphidius* sp فى منطقتى الزقازيق والمنصورة أثناء موسمين متتاليين ٢٠٠٥-٢٠٠٦، ٢٠٠٦-٢٠٠٧.

أشارت النتائج وجود معنوية موجبة فى منطقة الزقازيق وارتباط معنوي عالي موجب فى منطقة المنصورة أثناء عام ٢٠٠٦-٢٠٠٧ بين درجة الحرارة والكثافة العددية لمن التفلة بينما أوضحت الرطوبة النسبية وجود معنوية سالبة فى منطقة المنصورة فى الموسم الثاني.

وأظهرت البيانات وجود ارتباط معنوي عالى إثناء الموسمين في منطقتي الزقازيق والمنصورة بين درجات الحرارة والطفيل *D. rapae*.

وأظهرت النتائج وجود ارتباط معنوي عالي سالب فى منطقة المنصورة خلال الموسمين بين درجة الحرارة والطفيل .*Aphidius* sp.

وكذلك أوضحت النتائج ارتباط معنوي سالب بين كلا الطفيلين *D. rapae* و *Aphidius* sp وبين من التفلة *A. nerii*.

,وتناولت الدراسة تطفل *D. rapae* على كل أطوار من التفلة *A. nerii* وكان متوسط إنتاج عدد المومياء للأنثى الواحدة ٦٤.٢ مومياء وأظهرت النتائج عدم وجود معنوية بين الأطوار المختلفة (البيضة واليرقة والعذراء) بين الطفيلين *D. rapae*، .*Aphidius* sp التي تم تربيتهم على من التفلة *A. nerii* حيث كان متوسط فترة التطور الكلية ١٩.٣٨± ٠.٥٧ يوم للطفيل *D. rapae*، ٢٢.٠٩±٠.٥٤يوم للطفيل *Aphidius* sp على نفس نوع المن.

أوضحت الدراسة انخفاض زمن الوصول للورقة مع زيادة كثافة العائل بينما يتزايد وقت اول وخزة وعدد البيض وكذلك عدد المومياء المتكونة مع زيادة كثافة العائل.