J. Agric. Sci. Mansoura Univ., 34 (7): 8251 - 8262, 2009

BIOLOGICAL AND LIFE TABLE PARAMETERS OF *Myzus persicae* (Salz.)(Hemiptera: Aphididae) IN RELATION TO HOST PLANTS AND THERMAL REQUIREMENTS.

Abdel - Salam, A. H.[1]; A. A. Ghanim[1]; Hala A. K. El – Serafi [1]; A. H. El-Heneidy [2] and Mervat K. El-Sherbeni [2]

[1]**Economic Entomology Department, Faculty of Agriculture, Mansoura University, Mansoura 35516, EGYPT**

[2]**Plant Protection Research Institute, Agricultural Research Center, Ministry of Agriculture,***Giza, Egypt*

E-mail: adhabdelus@yahoo.com

ABSTRACT

The developmental times, growth index, developmental rate, survivorship, thermal requirements, longevity, fecundity, and life table parameters of *Myzus persicae* (Sulzer) were investigated on apricot and peach at three constant temperatures 20, 24 and 28°C.

The data revealed that there were significant differences among the three temperatures in developmental time of nymphal instars. Meanwhile, there were no significant variations of the developmental time between different host plants at the same temperature. The survival percentage differed significantly among the three tested temperatures. The higher survival percentage was observed at 28°C.

Minimum developmental thresholds for nymphal instars and nymphal stage of *M. persicae* were not similar on apricot and peach. *M. persicae* required 57.47 DD to complete its development from first nymphal instar to adult female on apricot and 56.82 on peach. There were no significant variations in the pre-reproductive, reproductive, and post-reproductive of *M. persicae* when reared on apricot and peach at the three tested temperatures (20, 24, and 28°C). Meanwhile, there were significant differences in the total longevity of adult females at three tested temperatures. The mean total fecundity (mean number of offspring/female) was 25.6, 30.3, and 60.0 nymphs on apricot, and 25.0, 28.0, and 59.0 nymphs on peach at 20, 24, and 28°C, respectively with significant different.

The duration of mean generation time (T) of *M. persicae* was 19.55, 13.56, and 8.38 days at the three tested temperatures on apricot and on peach, 20.01, 13.32, and 8.30 days on peach. The population could be doubled (DT) every 4.65, 2.84, and1.41 days at 20, 24 and 28°C on apricot and 4.51, 2.86, and 1.43 days on peach. The values of gross reproductive rate (GRR), net reproductive rate (Ro), intrinsic rate of increase (r_m), and finite rate of increase (λ) were higher at 28°C than at 20 and 24°C on both host plants. The survivorship (Lx) for female age was higher at 28°C than at 20 and 24°C on apricot and peach.

Keywords: *Myzus persicae*, biological characteristics, thermal requirements, life table parameters.

INTRODUCTION

The green peach aphid (GPA), *M. persicae* has an European native and it is now distributed worldwide. It is a common pest of peach and nectarine throughout North America (Blackman and Eastop, 2000 and Davis *et al.,* 2006; Davis and Radcliffe, 2008). The recent resurgence of this aphid on stone fruits is attributed to the destruction of natural predators with pesticides and resistance to chlorinated hydrocarbon and organophosphate insecticides. GPA has a diverse host range of over 875 species of plants, including all stone fruits and many ornamental shrubs and vegetables (Blackman and Eastop, 2000, Davis *et al.,* 2006 and Davis and Radcliffe, 2008). GPA feeds primarily on the underside of leaves which causes them to curl, becomes distorted and yellow, and drops prematurely. Feeding may also occur on flowers and fruit resulting in distortion and drop. When abundant, aphid feeding results in excretion of large amounts of honeydew which supports the growth of a black sooty fungus that causes spotting of leaves and fruits. This aphid may also serve as a vector of virus diseases to stone fruits. GPA is an efficient vector of 100 plant viruses (Blackman and Eastop, 2000; Sood and Singh, 1997; Ricci *et al.,* 1999; Cividanes and Souza, 2003; Davis *et al.,* 2006 and Davis and Radcliffe, 2008) and resistant to almost all major insecticide classes (Devonshire *et al.*, 1998; Davis *et al.,* 2006 and Davis and Radcliffe, 2008). GPA is one of several aphids that can transmit plum pox virus. This is a major disease of peaches and nectarines (Blackman and Eastop, 2000).

Construction of life tables is an appropriate method for description of the insect population dynamics (Southwood, 1978). Developmental times, survival, longevity and fecundity are basic data for life table analysis. Life table definitions include: 1) age-specific fecundity rate (*Mx*) which is the mean number of female offspring produced per surviving female during the age interval (x), 2) survivorship rate (*Lx*) which is the fraction of females living from birth to age (x), 3) the mean generation time (*T*), which is the average age of females producing nymphs in a population that is in a stable age distribution, 4) the doubling time (*DT*) which is the time (in days) needed for the population to double, 5) the net reproductive increase (R_o), which is the average number of female offspring from a birth cohort of females during their lifetime if they experience a fixed pattern of age-specific birth and death rate, 6) gross reproductive rate (GRR)=ΣMx, which is the mean total number of offspring produced by a female over its life time, 7) intrinsic rate of increase (r_m), which is a measure of per capita instantaneous rate of change in population density expressed as female progeny per female per day, and 8) the finite rate of increase (λ), which is the proportional change in population density from one day to the next, expressed in the same unit as the (r_m) (Hulting *et al.*, 1990 and Tang *et al.*, 1999).

Information on the development, survival and reproduction of a pest at different environmental conditions is vital to its forecast, management and pest risk analysis. Temperature is probably the most important physical environmental factor influencing the development, reproduction of insects, and regulates insect population dynamics, and seasonal occurrence. Numerous studies have illustrated the effect of temperature on the biological and population growth of aphids (Kersting *et al.,* 1999; Tang *et al.*, 1999; Xia *et al.*, 1999; Liu and Yue, 2000 and Mc Cornack *et al.*, 2004).

In Egypt, little information is available on the effect of temperatures on biological characteristics and life table parameters of *M. persicae*. Therefore, the current investigation was conducted to study the influence of temperatures on biological attributes of the aphid species, as well as testing the effect of temperatures on life table parameters of the species and establish the developmental threshold and degree day for development of *M. persicae*., and provide information for survivorship, longevity, fecundity, and fecundity rate.

MATERIALS AND METHODS

Females of *M. persicae* were obtained from the laboratory maintained culture collected previously from peach at the Experimental Research Station, Faculty of Agriculture, Mansoura University. Five apterous, parthenogenesis females of *M. persicae* were confined in glass Petri dishes (9 cm in diameter) on peach and apricot leaves to produce nymphs. Each Petri dish was provided with a layer of moistened filter paper to provide humidity. All nymphs produced within 24 hours were assumed uniform age. There were 20 replicates for each aphid species for each temperature. First instar nymphs were reared individually in the incubators at 20±0.5, 24±0.5 and 28±0.5°C. The relative humidity was 60.0±5.0% and the photoperiod was 14:10 (L: D) with each temperature. The leaves were replaced every two days. Each first instar nymph was placed on new leaves of each host plant in a separate Petri dish and observed to determine the developmental time of nymphal instars, survival percentage of each instars and total days taken to reach the adult stage. The presence of exuviae was used to determine molting. The pre-reproductive, reproductive, and post-reproductive periods were determined. In addition, the number of offspring born at each day of adult life and survival were recorded every 24 hours. All nymphs produced were removed after each count.

The ability of the nymphs to molt and to metamorphose on the test plants was determined as (a) percentage of individuals transforming into adults, and (b) average period required. The ratio of (a) to (b) then represented the insect's "growth index" (Saxena, 1969).

Developmental times for each life stage, as well as the total nymphal stage, were used to calculate developmental rates (1/development time), which was regressed against temperature. The regression parameters and slopes were used to estimate the lower temperature threshold for development (to) and the thermal constant K, as described by Campbell *et al.* (1974).

Survivorship rate (Lx), age-specific fecundity (Mx), the mean generation time (T), the net reproductive increase (Ro), the intrinsic rate of increase (rm), the gross reproductive rate (GRR) (=ΣMx), and the finite rate of increase (λ) were calculated for each temperature using a BASIC computer program (Abou-Setta et al., 1986). This computer program is based on Birch's method for the calculation of an animal's life table (Birch, 1948). The doubling time (DT) was calculated according to Mackauer's method (Mackauer, 1983). The life tables were prepared from the data recorded daily on developmental time, the number of produced nymphs, the fraction of nymphs reaching maturity, and the survival of females. An interval of one day was chosen as the age classes for constructing the life table.

All experimental data concerning the above characters (developmental times, survivorship, longevity, fecundity, and fecundity rate) were analyzed with one-way analysis of variance (ANOVA). Comparisons of means of biological characters were made with the Duncan's Multiple Range Test (CoHort Software, 2004).

RESULTS

I. Developmental times of nymphal instars:

Developmental times of the four nymphal instars of *M. persicae* feeding on peach and apricot at the three tested temperatures are presented in Table (1). There were significant differences among the three temperatures in nymphal instars. Meanwhile, there were no significant variations between the two host plants at the same temperature.

On apricot, there were significant differences among *M. persicae* at the three tested temperatures in the fourth nymphal instar and total days to reach the adult stage. In particular, the total days of nymphal development were 12.8, 8.5 and 4.6 days at 20, 24 and 28°C. On peach, the developmental of the fourth nymphal instars and total days to reach the adult stage were 3.3, 3.3, 3.2, 3.2, and 13.0 days at 20°C, 2.1, 2.2, 2.1, 2.2, and 8.6 days at 24°C and 1.1, 1.1, 1.2, 1.2, and 4.6 days at 28°C.

Growth index of *M. persicae* was 6.64, 10.59, and 21.74 at the three tested temperatures (20, 24, and 28°C, respectively) on apricot (Table 2). Meanwhile on peach, there was 6.54, 10.47, and 20.65 at the three tested temperatures.

Developmental rate (1/duration) of *M. persicae* was 0.0781, 0.1177 and 0.2174 at the three tested temperatures (20, 24, and 28°C, respectively) on apricot and 0.0769, 0.1163, and 0.2174 on peach (Table 2).

Table (1): Developmental times (mean±SE)[a] in days of nymphal instars of *M. persicae* reared on two host plants at three constant temperatures.

Host plant	Temp. (°C)	Nymphal instar				Total days to reach the adult stage
		1st	2nd	3rd	4th	
Apricot	20	3.2±0.81 a[A]	3.2±0.81 a[A]	3.2±0.81 a[A]	3.2±0.79 a[A]	12.8±0.96 a[A]
	24	2.1±0.76 ab[A]	2.2±0.81 ab[A]	2.1±0.76 ab[A]	2.1±0.76 ab[A]	8.5±0.87 b[A]
	28	1.1±0.71 b[A]	1.1±0.76 b[A]	1.2±0.79 b[A]	1.2±0.81 b[A]	4.6±0.91 c[A]
Peach	20	3.3±0.82 a[A]	3.3±0.82 a[A]	3.2±0.76 a[A]	3.2±0.78 a[A]	13.0±0.93 a[A]
	24	2.1±0.76 ab[A]	2.2±0.79 ab[A]	2.1±0.76 ab[A]	2.2±0.81 ab[A]	8.6±0.85 b[A]
	28	1.1±0.71 b[A]	1.1±0.76 b[A]	1.2±0.79 b[A]	1.2±0.81 b[A]	4.6±0.89 c[A]

[a]Means followed by the same small letter in a column between the three temperatures on each host plant or same capital letter in a column between the two host plant at the same temperature are not significantly different at the 1% level of probability (Duncan's Multiple Range Test).

Table (2): Growth index and developmental rate of *M. persicae* reared on different hosts at three constant temperatures.

Host plant	Temperature(°C)	Growth index	Developmental rate
Apricot	20	6.64	0.0781
	24	10.59	0.1177
	28	21.74	0.2174
Peach	20	6.54	0.0769
	24	10.47	0.1163
	28	20.65	0.2174

II. Survival of nymphal instars:

Concerning *M. persicae*, the survival rate of nymphal instars and total of nymphal stage was 95.0, 94.74, 100.0, 94.44, and 85.0% at 20°C, 100.0, 100.0, 95.0, 94.74, and 90.0 at 24°C, and 100.0, 100.0, 100.0, 100.0, and 100.0% at 28°C on apricot (Table 3). The data in Table (3) indicated that the survival rate of nymphal stage on peach was higher at 28°C (95.0.0%) than at 20°C (85.0%) on peach.

Table (3): Survival percentage of nymphal instars of *M. persicae* reared on two host plants at three constant temperatures.

Host plant	Temp.(°C)	Nymphal Instars				Survival %
		1st	2nd	3rd	4th	
Apricot	20	95.0	94.74	100.0	94.44	85.0
	24	100.0	100.0	95.0	94.74	90.0
	28	100.0	100.0	100.0	100.0	100.0
Peach	20	95.0	94.74	100.0	94.44	85.0
	24	100.0	95.0	94.74	100.0	90.0
	28	100.0	95.0	100.0	100.0	95.0

III. Degree-Day Requirements:

Minimum developmental thresholds for nymphal instars and nymphal stage of *M. persicae* were not similar on apricot and peach (Table 6). *Myzus persicae* required 57.47 DD to complete its development from first nymphal instar to adult female on apricot and 56.82 on peach (Table 4). On apricot, results showed that T_o of 1st, 2nd, 3rd, 4th, and total nymphal stage were 16.40, 16.49, 15.69, 15.69, and 16.09°C, respectively. Meanwhile, on peach, T_o of 1st, 2nd, 3rd, 4th, and total nymphal stage were 16.56, 16.66, 15.69, 15.81, and 16.16°C, respectively.

Table (4): Linear regression analysis of temperatures versus developmental rates, degree-days requirements, and minimum developmental thresholds of *M. persicae* when reared on two host plants.

Nymphal Instar	Regression equation	R^2	DD's	T_o
Apricot				
1st	Y = - 1.2236+0.0746x	0.9365	13.40	16.40
2nd	Y = - 1.2308+0.0746x	0.9162	13.40	16.49
3rd	Y = - 1.0218+ 0.0651x	0.9560	15.36	15.69
4th	Y = - 1.0218+0.0651x	0.9560	15.36	15.69
Total	Y = - 0.2801+ 0.0174x	0.9413	57.47	16.09
Peach				
1st	Y = - 1.2553+0.0758x	0.9423	13.19	16.56
2nd	Y = - 1.2625+0.0758x	0.9231	13.19	16.66
3rd	Y = - 1.0217+ 0.0651x	0.9560	15.36	15.69
4th	Y = - 1.029+ 0.0651x	0.9355	15.36	15.81
Total	Y = - 0.2845+ 0.0176x	0.9395	56.81	16.16

IV. Longevity and fecundity of females:

Based on the statistical analysis, results in Table (5) indicated that there were no significant variations in the pre-reproductive, reproductive, and post-reproductive of *M. persicae* when reared on apricot and peach at the three tested temperatures (20, 24, and 28°C). Meanwhile, there were significant differences in the total longevity of adult females at three tested temperatures. In addition, there were no significant variations between the two host plants in the total longevity of adult females (Table 5). The mean total fecundity (mean number of offspring/female) was 25.6, 30.3, and 60.0 nymphs on apricot, and 25.0, 28.0, and 59.0 nymphs on peach at 20, 24, and 28°C, respectively with significant difference. The fecundity rate (mean number of nymphs/female/day) on apricot and peach was significantly higher at 28°C (8.96 and 8.68 nymphs) than at 20 and 24°C.

Table (5): Longevity (mean±SE) in days of *M. persicae* when reared on different hosts at different temperatures.

Host Plant	Temp. (°C)	Longevity				Total mean fecundity	Mean of fecundity rate
		Pre-reproductive period	Reproductive period	Post-reproductive period	Total		
Apricot	20	2.6± 0.84 a^A	7.8± 0.84 a^A	2.2± 0.92 a^A	12.6± 0.92 a^A	25.6± 1.1 c^A	3.28± 0.67 b^A
	24	2.2± 0.81 a^A	7.0± 0.81 a^A	1.4± 0.85 a^A	10.6± 0.85 b^A	30.3± 1.4 b^A	4.33± 0.82 b^A
	28	1.3± 0.84 a^A	6.7± 0.85 a^A	1.4± 0.85 a^A	9.4± 0.91 b^A	60.0± 1.4 a^A	8.96± 0.91 a^A
Peach	20	2.7± 0.83 a^A	8.3± 0.83 a^A	2.3± 0.91 a^A	13.3± 0.91 a^A	25.0± 1.3 c^A	3.01± 0.71 b^A
	24	2.2± 0.81 a^A	6.8± 0.79 a^A	1.5± 0.89 a^A	10.6± 0.89 b^A	28.0± 1.4 b^B	4.12± 0.85 b^A
	28	1.2± 0.79 a^A	6.8± 0.81 a^A	1.4± 0.85 a^A	9.4± 0.93 b^A	59.0± 1.4 a^A	8.68± 0.91 a^A

'Means followed by the same small letter in a column between the three temperatures on each host plant or same capital letter in a column between the two host plant at the same temperature are not significantly different at the 1% level of probability (Duncan's Multiple Range Test).

V. Life table parameters:

According to life table analysis for *M. persicae*, the durations of mean generation time (T) were19.55, 13.56, and 8.38 days at the three tested temperatures on apricot and on peach, there were 20.01, 13.32, and 8.30 days on peach. The population could be doubled (DT) every 4.65, 2.84, and1.41 days at 20, 24 and 28°C on apricot and 4.51, 2.86, and 1.43 days on peach. The values of gross reproductive rate (GRR), net reproductive rate (R_o), intrinsic rate of increase (r_m), and finite rate of increase (λ) were higher at 28°C than at 20 and 24°C on both host plants. From the data illustrated in Fig. (1), it could be noted that the survivorship (Lx) for female age was higher at 28°C than at 20 and 24°C on apricot. On apricot, the maximum reproduction rate per female per day (Mx) was 3.82 on the third day at 20°C, while at 24 and 28°C, Mx was 5.17 and 10.85 on the third day. In addition, on peach, the maximum reproduction rate per female per day (Mx) was 4.00 on the third day at 20°C, while at 24 and 28°C, Mx was 5.17 and 10.58 on the third day (Fig. 2).

Table (6): Life table parameters of *M. persicae* when reared on two host plants at three constant temperatures.

Host Plant	Temp. (°C)	Life table parameters					
		Mean generation time (T) (in days)	Doubling time (DT) (in days)	Gross reproductive rate (GRR)	Net reproductive rate (R_o)	Intrinsic rate of increase (r_m)	Finite rate of increase (λ)
Apricot	20	19.55	4.65	21.64	18.4	0.1489	1.1606
	24	13.56	2.84	30.67	27.25	0.2436	1.2758
	28	8.38	1.41	60.75	60.75	0.4900	1.6324
Peach	20	20.01	4.51	25.51	21.60	0.1535	1.1659
	24	13.32	2.86	28.01	25.20	0.2422	1.2741
	28	8.30	1.43	58.99	56.05	0.4853	1.6247

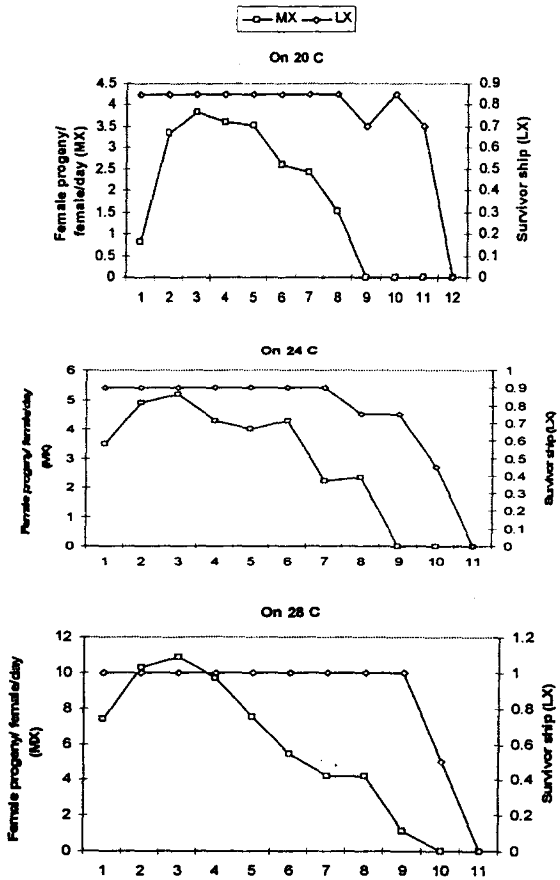

Fig. (1): Age-specific fecundity (*Mx*) and survivorship (*Lx*) of *M. persicae* at 20, 24, and 30°C on apricot.

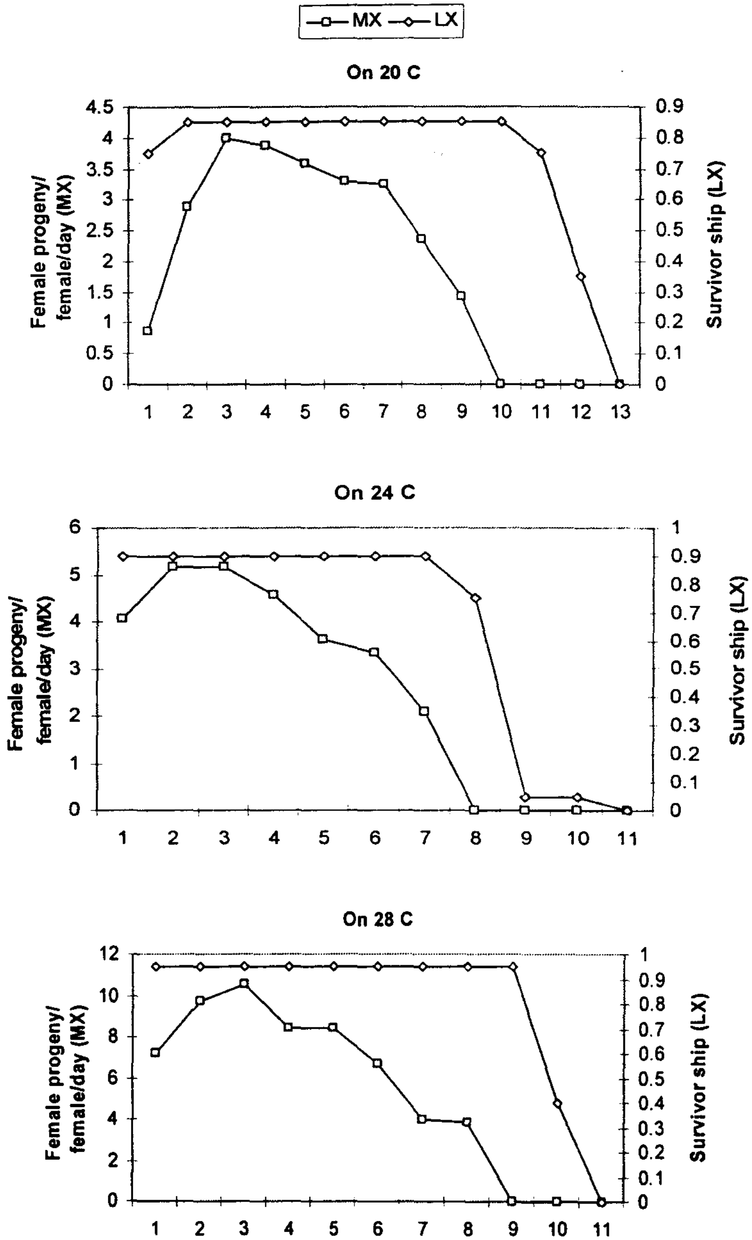

Fig. (2): Age-specific fecundity (*Mx*) and survivorship (*Lx*) of *M. persicae* at 20, 24, and 30°C on peach.

DISCUSSION

Biological information of aphid species is essential for assessing the potential rate of increase of a population and for the prediction of the number of generations that could occur in one crop season. In addition, any pest management program requires an understanding of the biology and ecology of this pest. Development in insects is strongly influenced by external temperatures. Metabolic rates increase and population doubling times decrease as temperatures rise (Gullan and Cranston, 2005). Thus, an increase in temperature will affect insect pest abundance by shortening generation time (Lawton, 1995), and shifting pest distributions (Porter, 1995).

Sood and Singh (1997) mentioned that life table studies of *M. persicae* on cauliflower revealed a generation time (T) of 28.31 days and the population multiplied 88.62 times. The true intrinsic rate of increase determined graphically was 0.153. The doubling time was 4.53 days. The species could multiply 1.165 times on cauliflower. Ricci *et al.* (1999) noted that six cohorts (45 individuals each) of *M. persicae* reared under laboratory conditions at 20±1.0°C, 16:8 (light: dark) photoperiod and 50-70% relative humidity, were placed on seedlings of lettuce (*Lactuca sativa*) cv. Crimor, Dolly and Regina to obtain their main life table parameters. On Regina, the net reproductive rate (R_o) was less than 1 with a negative intrinsic rate of increase (r_m). On Crimor, R_o reached a value, 1.76 times higher than on Dolly; r_m was also significantly higher. It is concluded that population development of *M. persicae* can be affected by lettuce variety.

Cividanes and Souza (2003) reported that the thermal constant (K) of *M. persicae* was 165.6 day-degree. They noted that the age-specific life table parameters, on a degree-day time scale, indicated that temperatures of 23°C and 25°C provided the best thermal conditions for the population growth of *M. persicae.* At these temperatures, the highest intrinsic rate of natural increase (r_m=0.012) was observed, as well as the lowest mean generation time (T=303.8 degree-day and T=272 degree-day, respectively) and population doubling time (TD=57.8 degree-day). Davis *et al.* (2006) noted that green peach aphid developed faster and had greater fecundity under fluctuating conditions. Optimal temperature for green peach aphid population growth was 26.7°C. The lower and upper developmental thresholds were 6.5 and 37.3°C, respectively. Under optimal conditions, intrinsic rate of increase was 0.356, and population doubling time was 1.95 days. At optimal fluctuating temperature conditions, one female aphid produced 12.2 progeny each week while under the most favorable constant temperature conditions; each female aphid produced only 5.9 progeny. Davis and Radcliffe (2008) mentioned that life tables statistics indicated green peach aphid had its highest reproductive potential among cereals on winter wheat, with rye (*Secale cereale* L.) barley (*Hordeum vulgare* L.) oats (*Avena sativa* L.). Green peach aphid was found to colonize barley, rye, and winter wheat, but not oats. Mean generation time, net reproductive rate, doubling time, and finite rate of increase were significantly different between host plants.

The estimated low temperature thresholds for biological attributes suggest that *M. persicae* may be able to establish in regions with mild to warm climates and the mean temperature ranging from 20 to 30°C will be suitable for *M. persicae* populations' quick building-up.

It could be concluded from the present study that the most suitable temperature for aphid population growth was 28°C. These results may explain why the populations of the tested species significantly higher in April, May, August, and September than the other months in Egypt. In addition, the rate of increase of *M. persicae* even at the lowest density is useful in portraying the principles of aphid population management by any control measure. Life table parameters at constant temperatures are also needed to construct models of predicting aphid outbreaks and to enhance the effect of various methods of suppression.

REFERENCES

Abou-Setta, M. M.; Sorrell, R. W. and Childers, C. C. 1986. Life 48: A BASIC computer program to calculate life table parameters for an insect or mite species. Fla. Entomol. 69: 690-697.

Birch, L. C. 1948. The intrinsic rate of natural increase of an insect population. J. Anim. Ecol. 17:15-26.

Blackman, R. L. and Eastop, V. F. 2000. Aphids on the world's crops: an identification and information Guide. Wiley, New York.

Campbell, A., B. Frazer, N. Gilbert, A. Guitierrez, and M. Mackauer. 1974. Temperature requirements of some aphids and their parasites. J. Appl. Ecol. 11: 431-438.

Cividanes, F. J. and Souza, A. P. 2003. Thermal requirements and age-specific life tables of the green peach aphid, *Myzus persicae* (Sulzer) (Hemiptera: Aphididae) in laboratory. Neotropical Entomol. 32(3): 413-419.

CoHort Software. 2004. CoStat. www.cohort.com. Monterey, California, USA.

Davis, J. A. and Radcliffe, E. B. 2008. Reproduction and feeding behavior of *Myzus persicae* on four cereals. J. Econ. Entomol. 101(1):9-16.

Davis, J. A., Radcliffe, E. B. and Ragsdale, D. W. 2006. Effects of high and fluctuating temperatures on *Myzus persicae* (Hemiptera: Aphididae). Environ. Entomol. 35(6): 1461-1468.

Devonshire, A. L., Field, L. M. ; Foster, S. P. ; Moores, G. D.; M. S. Williamson, M. S. and Blackman, R. L. 1998. The evolution of insecticide resistance in the peach-potato aphid, *Myzus persicae*. Phil. Trans. R. Soc. Lond. B 353: 1677-684.

Gullan, P. J., and P. S. Cranston. 2005. The insects: an outline of entomology. Blackwell Publishing, Malden, MA.

Hulting, F. L.; Orr, D. B. and Obrycki, J. J. 1990. A computer program for calculation and statistical comparison of intrinsic rates of increase and associated life table parameters. Fla. Entomol. 73: 601-612.

Kersting, U.; Satar, S. and Uygun, N. 1999. Effect of temperature on development rate and fecundity of apterous *Aphis gossypii* Glover (Hom.: Aphididae) reared on *Gossypium hirsutum* L. J. Appl. Ent. 123: 23-27.

Lawton, J. H. 1995. The response of insects to environmental change, pp. 3-26. In R. Harrington and N. E. Stork (eds.), Insects in a changing environment. Academic, San Diego, CA.

Liu, T. X. and Yue, B. 2000. Effects of constant temperatures on development, survival, and reproduction of apterous *Lipaphis erysimi* (Homoptera: Aphididae) on cabbage. Southwest. Entomol. 25: 91-99.

Mackauer, M. 1983. Quantitive assessment of *Aphidius smithi* (Hymenoptera: Aphidiidae): fecundity, intrinsic rate of increase, and functional response. Can. Entomol. 115: 399-415.

McCornack, B. P.; Ragsdale, D. W. and Venette, R. C. 2004. Demography of soybean aphid (Homoptera: Aphididae) at summer temperatures. J. Econ. Entomol. 97: 854-861.

Porter, J. 1995. The effects of climate change on the agricultural environment for crop insect pests with particular reference to the European corn borer and grain maize, pp. 94-113. In R. Harrington and N. E. Stork (eds.), Insects in a changing environment. Academic, San Diego, CA.

Ricci, E. M.; Vasicek, A. and Rossa, F. R. (1999). Life cycle stages of *Myzus persicae* (Sulzer) (Homoptera: Aphididae) on three lettuce cultivars. CEIBA, 40(1): 69-71.

Saxena, K. N. 1969. Patterns of insect-plant relationships determining susceptibility or resistance of different plants to an insect. Eat. Exp. and Appl. 12: 751-766.

Sood, A. and Singh, G. 1997. Life table studies of *Myzus persicae* (Sulzer) (Homoptera: Aphididae) on cauliflower *Brassica oleracea* var. *botrytis.* Pest Management in Horticultural Ecosystems, 3(2):75-78.

Southwood, T. R. E. 1978. Ecological methods, 2nd ed. Chapman and Hall. London.

Tang, Y. Q. ; Lapointe, S. L.; Brown, L. G. and Hunter, W. B. 1999. Effects of host plant and temperature on the biology of *Toxoptera citricida* (Homoptera: Aphididae). Environ. Entomol. 28: 895-900.

Xia, J. Y. ; Werf, W. V. and Rabbinge, R. 1999. Influence of temperature on bionomics of cotton aphid, *Aphis gossypii* on cotton. Entomol. Exp. Appl. 90: 25-35.

المقاييس البيولوجية وجداول الحياة لحشرة منّ الخوخ الأخضر وعلاقة ذلك بكل من الأحتياجات الحرارية والعائل النباتى

عادل حسن عبد السلام[1] ، عبدالبديع عبدالحميد غانم[1] ، هالة احمد كامل الصيرفى[1] ، أحمد حسين الهنيدى[2] و مرفت قاسم جبر الشربينى[2]
[1]قسم الحشرات الإقتصادية – كلية الزراعة – جامعة المنصورة.
[2] معهد بحوث وقاية النباتات ، مركز البحوث الزراعية ، وزارة الزراعة

تم دراسة تأثير درجات الحرارة ٢٠ ، ٢٤ ، ٢٨ °م على كل من فترات النمو وفهرس النمو Growth Index ومعدل النمو والبقاء وفترات الحياة ومقاييس جداول الحياة لحشرة منّ الخوخ الأخضرعلى عائلين نباتين هما المشمش والخوخ.

أوضحت النتائج وجود فروق معنوية فى طول فترة النمو لأعمار الحورية الأربعة لحشرة منّ الخوخ الأخضر بين درجات الحرارة المختبرة. بينما أظهرت نتائج التحليل الإحصائى عدم وجود إختلافات معنوية فى فترة النمو للحشرة على العائلين النباتين. كما أوضحت النتائج أن نسبة وصول الحوريات لطور الحشرة الكاملة البقاء إختلفت معنوياً عند درجات الحرارة لحشرة منّ الخوخ الأخضر حيث كانت درجة الحرارة ٢٨ °م هى الأفضل فى الوصول لطور الحشرة الكامل.

أشارت النتائج أن اقل حد حرارى حرج إختلف إختلافا معنويا بين كل من المشمش والخوخ. وكانت الوحدات الحرارية المتجمعة واللازمة لنمو الحوريات ووصولها إلى طور الحشرة الكامل هى ٥٧,٤٧ على المشمش ، ٥٦,٨٢ علىالخوخ.

وقد أظهرت النتائج أنه لايوجد إختلاف معنوى بين طول فترة حياة الحشرة الكاملة عندما ربيت الحشرة على كل من المشمش والخوخ ووجد أيضاً أنه يوجد فرق معنوى بين فترة الحياة الكلية على درجات الحرارة المختبرة.أشارت النتائج أن معدل التوالد اليومى للإناث هو ٢٥,٦ ، ٣٠,٣ ، ٦٠,٠ حورية على المشمش ، ٢٥,٠ ، ٢٨,٠ ، ٥٩,٠ على الخوخ مع وجود إختلاف معنوى.

وأظهرت النتائج أيضا أن قيم جدول الحياة المحسوبة لفترة الجيل (T) كانت ١٩,٥٥ ، ١٣,٥٦ ، ٨,٣٨ يوم على درجات الحرارة الثلاثة المختبرة على المشمش ، ٢٠,٠١ ، ١٣,٣٢ ، ٨,٣٠ يوم على الخوخ. أما الزمن اللازم للتضاعف (DT) فكان ٤,٦٥ ، ٢,٨٤ ، ١,٤١ يوم على المشمش ٤,٥١ ، ٢,٨٦ ، ١,٤٣ يوم. أما قيم معدل التكاثر (GRR) ، معامل التضاعف (R_o) ، معدل الزيادة الطبيعى (r_m) ، معدل الزيادة النهائى (λ) وقيم معدل الحياة (Lx) فكانت مرتفعة على درجة حرارة ٢٨ °م بالمقارنة بدرجتى حرارة ٢٠ ، ٢٤ °م وذلك على كل من المشمش والخوخ.