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Effect of Eight *Cucumis* Genotypes on Life Table and Population Growth Parameters of Melon Aphid: An Approach to Assess Antibiosis Resistance

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ABSTRACT

The effect of eight *Cucumis* L. (Cucurbitaceae) genotypes, including native cucumber genotypes (Hormozgan, Bushehr and Gilan), greenhouse cucumber genotypes (Girtap, Negeen, Sepehr and Pouya) and Armenian cucumber (*Cucumis melo* var. *flexuosus*) was studied on the life table and population growth parameters of *Aphis gossypii* Glover to evaluate antibiosis resistance. The experiment was conducted at 25±1°C, 60±10% RH and a photoperiod of 16:8 hour (L:D). The data were analyzed by Two-Sex MSChart program. The most pre-adult mortality (22.6 %) and the shortest total life span (14.5 days) were recorded for 'Bushehr'. The net Reproductive rate (R_0) ranged from 43.70 for 'Bushehr' to 92.39 nymphs per individual in the case of 'Pouya'. The lowest value of the intrinsic rate of increase (r) and the finite rate of increase (λ) was observed in 'Gilan' (0.378 and 1.460 day^{-1}, respectively) and the highest in 'Pouya' (0.471 and 1.602 day^{-1}, respectively). The maximum and minimum mean generation Times (T) were 10.20 and 9.23 days in 'Gilan' and 'Negeen', respectively. On the basis of these parameters, 'Gilan' had the highest antibiosis resistance to *A. gossypii*. Information on life table of pests and subsequent host resistance evaluation improves IPM programs and leads us to genotype selection for crop breeding programs.

Keywords: Antibiosis, *Aphis gossypii*, *Cucumis*, Life table, Plant resistance.

INTRODUCTION

Aphis gossypii Glover (Hemiptera: Aphididae), cotton or melon aphid, is a highly polyphagous pest recorded on hundreds of host plants worldwide (van Emden and Harrington, 2007) and is the vector of more than 50 plant viruses (Blackman and Eastop, 2008). This pest is particularly damaging to cotton and cucurbits (Blackman and Eastop, 2008; van Emden and Harrington, 2007). Feeding on the leaves of watermelon, melons and cucumber causes leaf crumple and distortion and heavy infestations which can further result in yield loss. Excretion of honeydew on leaves and fruit help sooty mould to develop (van Emden and Harrington, 2007).

Because of melon aphid resistance to organophosphate (Herron *et al.*, 2001; van Emden and Harrington, 2007), carbamate, organochlorine and pyrethroid insecticides in various parts of the world, particularly in cotton, and also in cucurbits (van Emden and Harrington, 2007), we should find some other strategies to manage this pest. Due to ecological and economic benefits, use of resistant or less-favorable crop cultivars is considered as a key component of Integrated Pest Management (IPM) (Özgökçe and Atlıhan, 2005).

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Evaluating the influence of host plant on pest population development and investigating on the interaction between pest and its host plants can help us assess the suitability or resistance of different cultivars to pests (Safuraie-Parizi *et al.*, 2014) and develop more effective pest management methods (Li *et al.*, 2006; Takalloozadeh, 2010). However, not much information is currently available on the interaction between susceptible and resistant *Cucumis* L. (Cucurbitaceae) genotypes. A number of studies have been done on the performance of *A. gossypii* on cultivars of chrysanthemum, (Bethke *et al.*, 1998; Markkula *et al.*, 1969; Storer and Emden, 1995; Wyatt, 1969; Wyatt, 1965), melon (Shinoda and Tanaka 1987; Collins *et al.,* 1994), *Capsicum* spp. (Da Costa *et al.*, 2011), *Colocasia esculenta* (Coleson and Miller, 2005), and cotton (Razmjou *et al.*, 2006a; Razmjou *et al.*, 2006b; Weathersbee and Hardee, 1994; Weathersbee III *et al.*, 1994). In this study, we used life table and population parameters of melon aphid reared on eight *Cucumis* genotypes to assess the degree of antibiosis resistance. Because the traditional female-only life tables (Birch, 1948; Carey, 1993) ignore the variable developmental rates among individuals, its application may cause errors in demographic parameters (Chi and Liu, 1985; Yu *et al.*, 2013). In this study, the data were analyzed via age-stage two-sex life table to reveal the differences in the population parameters among the genotypes.

MATERIALS AND METHODS

Plant Materials

In this experiment, eight *Cucumis* genotypes, including three native cucumbers (Hormozgan (TN-186), Bushehr (TN-221) and Gilan (TN-250), four greenhouse cucumbers (Girtap, Negeen, Sepehr and Pouya) and Armenian cucumber (*Cucumis melo* var. *flexuosus*) were selected. The seeds of native genotypes were obtained from Seed and Plant Improvement Institute, Karaj, Iran. The seeds were sown in 20-cm plastic pots filled with fertilized field soil and maintained in the greenhouse condition at 25±1°C, 60±10% RH and a photoperiod of 16:8 hour (L:D).

Aphid Colonies

Colonies of *A. gossypii* used in this experiment were initiated by individuals of the aphids collected from cucumber fields in Tehran, Iran. The stock was maintained on potted *Cucumis sativus* var. Beith alpha in screened cages in greenhouse condition at 25±1°C, 60±10% RH and a photoperiod of 16:8 hour (L:D).

Life Table Experiment

Before conducting the demography experiment, the aphids from stock maintained on Beith alpha cucumber were transferred onto each genotype and reared on them for three consecutive generations to remove the host-shifting effect (Li *et al.*, 2006).

To obtain synchronized nymphs, apterous female adults of melon aphid were placed on the leaf disc and allowed to reproduce nymphs. After 24 hours, the females were removed and each first nymph instar was transferred to a leaf disc of *Cucumis* genotype. Each leaf disc was placed with the upper surface facing down on a cotton layer in a Petri dish (6 cm in diameter). Water was added daily to keep the leaves fresh. During the experiments, the leaf discs were replaced every three days. The experiment was conducted under laboratory condition as mentioned above. The experimental units were checked daily using a stereo-microscope. The development and survivorship of different immature stages were monitored. In reproduction period, after a nymph count, they were removed daily from the leaf discs. The data collection

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continued until the death of the last individual.

Life Table Analysis

The collected data were analyzed according to age-stage, two-sex life theory (Chi, 1988; Chi and Liu, 1985) using TWOSEX-MSChart 2015 program. According to this method, age-stage-specific survival rate (s_{xj}; the probability of a newborn nymph surviving to age x and stage j) and age-stage specific fecundity (f_{xj}; daily number of nymphs produced per female of age x) were calculated from the raw data. Then, the age-specific survival rate (l_x; the probability of a newborn nymph reaching to age x), the age-specific fecundity (m_x; daily number of nymphs produced per individual) and the net Reproductive rate (R_0) were calculated as:

$$l_x = \sum_{j=1}^{m} S_{xj} \quad (1)$$

$$m_x = \frac{\sum_{j=1}^{m} s_{xj} f_{xj}}{\sum_{j=1}^{m} s_{xj}} \quad (2)$$

$$R_0 = \sum_{x=0}^{\infty} \sum_{j=1}^{m} s_{xj} f_{xj} \quad (3)$$

The intrinsic rate of increase (r) is calculated using the bisection method from the Euler- Lotka formula with age indexed from zero (Goodman, 1982).

$$\sum_{x=0}^{\infty} e^{-r(x+1)} l_x m_x = 1 \quad (4)$$

The finite rate of increase (λ) was calculated as $\lambda = e^{r}$, and the mean generation Time (T) was calculated as $T = \frac{\ln R_0}{r}$ (5)

Based on the age-stage, two-sex life table, the life expectancy (e_{xj}; the time that an individual of age x and stage j is expected to be alive) was estimated according to Chi and Su (2006). The age-stage-specific reproductive Value (v_{xj}) was calculated according to Tuan *et al.* (2014). The means and standard errors of the measured parameters were estimated using bootstrap technique (Huang and Chi, 2012) by 40,000 bootstraps. Bootstrapping generated a normal frequency distribution that was essential for the following analysis and comparisons. The differences among the cultivars were compared using paired bootstrap test (Polat-Akköprü *et al.*, 2015).

RESULTS

The duration of different melon aphid stages is presented in Table 1. There was a significant difference among development time of each preadult instar as well as adult longevity of aphids reared on different *Cucumis* genotypes. The longest adult development time was 17.47 days that was observed in Pouya. Preadult duration was affected by the genotypes. The longest preadult duration was recorded for Girtap (5.200 days) and the lowest for Pouya (4.326 days). The total life span value ranged from 14.55 days for Bushehr to 21.39 days for Pouya (Table 1).

Total pre-reproduction period of melon aphid feeding on different *Cucumis* genotypes was significantly different. The female reared on Gilan and Girtap had the shortest total pre-reproduction period (5.61 and 5.63 days, respectively) compared to other genotypes. Preadult survival rates were 0.814, 0.774, 0.810, 0.903, 0.857, 0.900, 0.977 and 0.944 on Pouya, Sepehr, Armenian cucumber, Negeen, Girtap, Hormozgan, Gilan and Bushehr. Hence the immature mortality on these genotypes was 21.86, 22.6, 19, 9.7, 14.3, 10, 2.3 and 5.6 percent, respectively (Table 2).

There were significant differences among different genotypes in terms of fecundity (Table 2). The highest mean fecundity was

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Table 1. The mean (±SE) duration of stages of *Aphis gossypii* reared on different *Cucumis* genotypes under laboratory conditions.

Genotypes	Development time (Day)[a]						
	Nymph I	Nymph II	Nymph III	Nymph IV	Preadult	Adult longevity	Total life span
Hormozgan	1.163 ± 0.056 bcd	1.147 ± 0.055 bcd	1.077 ± 0.043 bc	1.343 ± 0.114 abc	4.715 ± 0.137 bcd	13.332 ± 1.316 b	15.440 ± 1.376 b
Bushehr	1.400 ± 0.089 a	1.234 ± 0.077 abc	1.240 ± 0.085 ab	1.208 ± 0.103 bcd	5.000 ± 0.145 ab	12.540 ± 1.532 b	14.545 ± 1.526 b
Gilan	1.268 ± 0.069 abc	1.385 ± 0.078 a	1.111 ± 0.053 bc	1.500 ± 0.086 a	5.264 ± 0.134 a	13.674 ± 1.347 ab	16.007 ±1.483 b
Armenian cucumber	1.073 ± 0.040 d	1.293 ± 0.070 ab	1.210 ± 0.066 b	1.325 ± 0.077 ab	4.946 ± 0.093 abc	12.114 ± 1.302 b	15.814 ± 1.349 b
Girtap	1.343 ± 0.080 ab	1.236 ± 0.073 ab	1.500 ± 0.108 a	1.133 ± 0.062 bcd	5.200 ± 0.120 a	15.928 ± 1.513 ab	18.710 ± 1.658 ab
Negeen	1.166 ± 0.047 bcd	1.102 ± 0.039 cd	1.077 ± 0.043 c	1.130 ± 0.046 cd	4.426 ± 0.077 c	15.265 ± 0.960 ab	18.025 ± 1.081 ab
Pouya	1.136 ± 0.051 cd	1.045 ± 0.031 d	1.135 ± 0.048 b	1.093 ± 0.044 d	4.326 ± 0.078 d	17.466 ± 1.504 a	21.386 ± 1.513 a
Sepehr	1.185 ± 0.053 bcd	1.151 ± 0.050 bc	1.070 ± 0.039 bc	1.176 ± 0.054 bcd	4.627 ± 0.088 c	16.427 ± 1.388 ab	20.088± 1.443 a

[a] Means followed by the same letters in t each column are not significantly different (paired bootstrap test at 5% significance level).

94.56 nymphs per female recorded on Pouya and the lowest on Bushehr, Gilan, Armenian cucumber and Girtap (56.41, 58.59, 54.06, 62.51 nymphs per female, respectively) (Table 2).

Based on the analysis, R_0 value of melon aphid on Pouya was significantly higher than those estimated for the other genotypes and the lowest belonged to Bushehr, Gilan and Armenian cucumber (43.70, 47.41 and 48.79 nymphs, respectively). The aphids on Pouya had the highest r value (0.471 day^{-1}), and on Gilan had the lowest quantity (0.378 day^{-1}). Moreover, there was a significant difference in finite rate of increase (λ) of melon aphid on *Cucumis* genotypes; the highest and lowest values of this parameter were obtained for Pouya and Gilan, respectively (1.602 and 1.460 day^{-1}). The mean generation Time (T) was significantly different among varieties. The highest was observed on Gilan (10.20 days) and the lowest was recorded for Negeen (9.23 days) (Table 3).

According to the curves of age-stage survival rate (s_{xj}), we can estimate the probability that a newly born nymph surviving to age x and stage j. Due to the variable developmental rates among individuals, stages' overlap can be observed in all s_{xj} curves. The probability that a newly born nymph would reach to an adult stage was 0.698, 0.742, 0.619, 0.878, 0.829, 0.900, 0.9318 and 0.926 for 'Hormozgan', 'Bushehr', 'Gilan', 'Armenian cucumber', 'Girtap, 'Negeen','Pouya' and 'Sepehr', respectively (Figure 1).

The curves of l_x (the age-specific survival rate of all individuals) and m_x (the age-specific fecundity of the total population) and $l_x m_x$ (the age-specific maternity) shows the trend of changes in survival and fecundity of this pest on the hosts (Figure 2). The curve of l_x is actually simplified overview of s_{xj} curves hence the overlap between stages cannot be seen. The highest age-specific fecundity (m_x) peak were 9.04, 8.07, 7.46, 7.52, 7.71, 9.65, 10.45 and 8.34 nymphs per female on 'Hormozgan',

Table 2. The mean (±SE) pre-reproduction period and fecundity of *Aphis gossypii* reared on different *Cucumis* genotypes.[a]

Genotypes	Total pre-reproduction period (Day)	Fecundity (Nymphs/Female)	Preadult survival rate
Hormozgan	5.177 ± 0.169 bc	67.943 ± 6.449 b	0.814 ± 0.059 bc
Bushehr	5.499 ± 0.119 ab	56.409 ± 6.259 b	0.774 ± 0.074 c
Gilan	5.606 ± 0.172 a	58.591 ± 5.616 b	0.810 ± 0.061 c
Armenian cucumber	5.405 ± 0.130 ab	54.057 ± 4.828 b	0.903 ± 0.046 abc
Girtap	5.634 ± 0.153 a	62.513 ± 4.859 ab	0.857 ± 0.059 abc
Negeen	5.148 ± 0.092 cd	73.698 ± 3.663 ab	0.900 ± 0.039 abc
Pouya	4.810 ± 0.091 d	94.555 ± 8.330 a	0.977 ± 0.023a
Sepehr	5.099 ± 0.107 c	77.044 ± 5.859 a	0.944 ± 0.031ab

[a] Means followed by the same letters in each column are not significantly different (paired bootstrap test at 5% significance level).

Table 3. Life table parameters of *Aphis gossyipii* on different *Cucumis* genotypes under laboratory conditions.[a]

Genotypes	R_0 (Offspring)	r (Day^{-1})	λ (Day^{-1})	T (Day)
Hormozgan	55.394 ± 6.670 bcd	0.417 ± 0.013 cd	1.517 ± 0.020 cd	9.616 ± 0.224 abc
Bushehr	43.703 ± 6.443 d	0.391 ± 0.014 de	1.478 ± 0.020 de	9.638 ± 0.224 abc
Gilan	47.406 ± 5.778 d	0.378 ± 0.014 e	1.460 ± 0.020 e	10.202 ± 0.272 a
Armenian cucumber	48.792 ± 5.045 d	0.418 ± 0.011 cd	1.519 ± 0.017 cd	9.296 ± 0.264 bc
Girtap	53.601 ± 5.581 cd	0.411 ± 0.013 cde	1.508 ± 0.019 cde	9.685 ± 0.207 abc
Negeen	66.362 ± 4.364 bc	0.454 ± 0.008 ab	1.575 ± 0.013 ab	9.228 ± 0.141 c
Pouya	92.390 ± 8.371 a	0.471 ± 0.009 a	1.602 ± 0.014 a	9.596 ± 0.176 abc
Sepehr	72.746 ± 6.071 ab	0.437 ± 0.009 bc	1.548 ± 0.0142 bc	9.808 ± 0.216 ab

[a] R_0: Net Reproductive rate; *r:* Intrinsic rate of increase; λ: Finite rate of increase, *T:* Mean generation Time. Means followed by the same letters in each column are not significantly different (paired bootstrap test at 5% significance level).

'Bushehr', 'Gilan', 'Armenian cucumber', 'Girtap, 'Negeen','Pouya' and 'Sepehr', respectively that occurred at the age of 11, 12, 9, 11, 10, 9 , 11 and 11 days.

The life expectancy (e_{xj}) of the adult aphids on Bushehr was the lowest in comparison to the other genotypes (Figure 3). The peak of age-stage-specific reproductive Values (v_{xj}), the contribution of an individual at age x and stage j to the future population, occurred at 11, 9, 9, 10, 8, 8, 8 and 8 days (Figure 4). The later peak of v_{xj} indicates a slower increase in aphid population of these genotypes (Polat-Akköprü *et al.*, 2015).

According to the results, resistance was the most in Gilan. Pouya was the most susceptible genotype and was very different from the others. Hormozgan, Bushehr and Girtap were very similar in the aspect of terms antibiosis and same degree of resistance.

DISCUSSION

Using resistant host plants is one of the most important components of integrated pest management programs. Plant resistance mechanisms to a pest are antixenosis, antibiosis, tolerance, or some combinations of these mechanisms (Smith, 2005).

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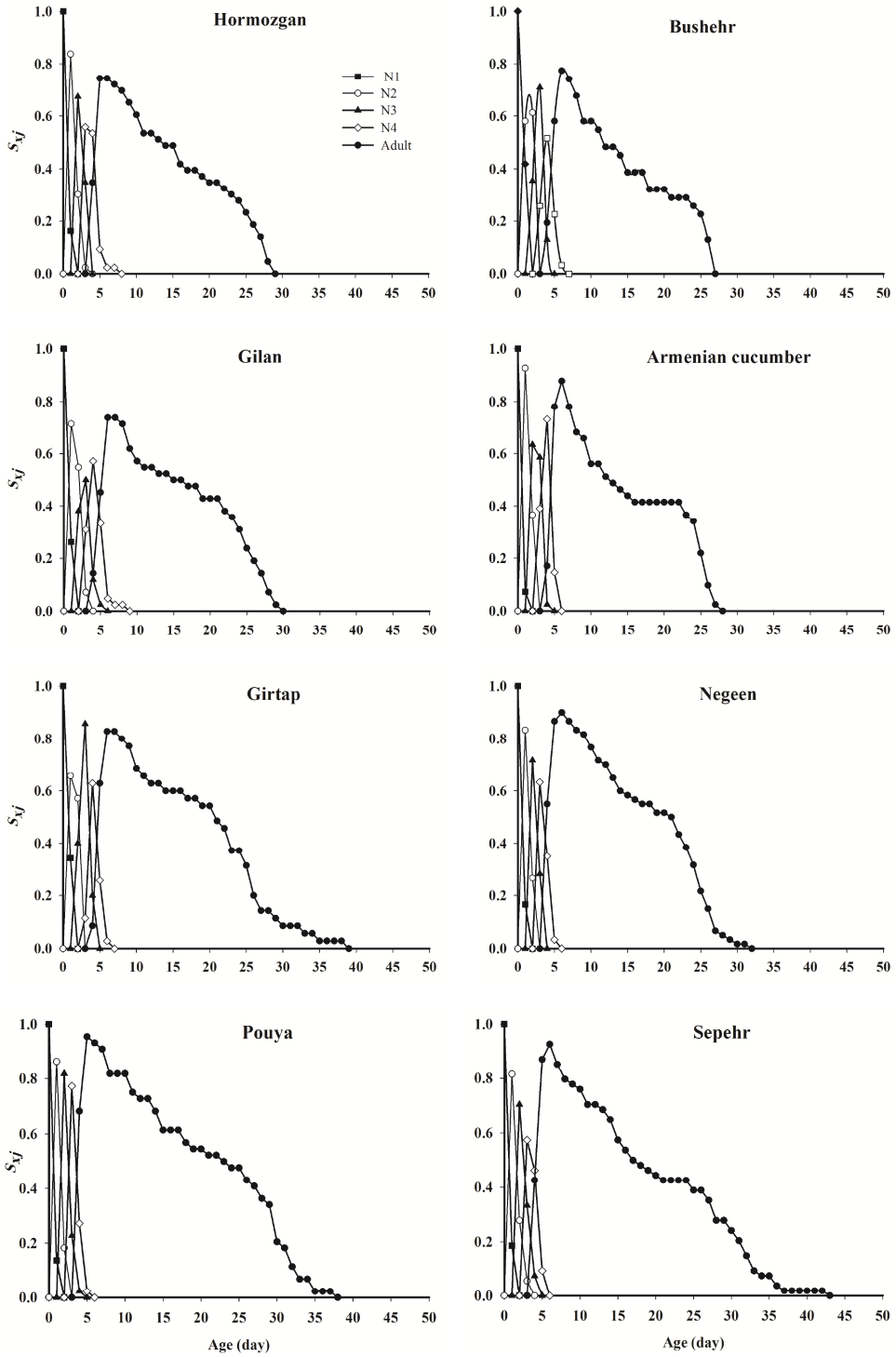

Figure 1. Age-stage specific survival rate (s_{xj}) of *Aphis gossypii* reared on different *Cucumis* genotypes.

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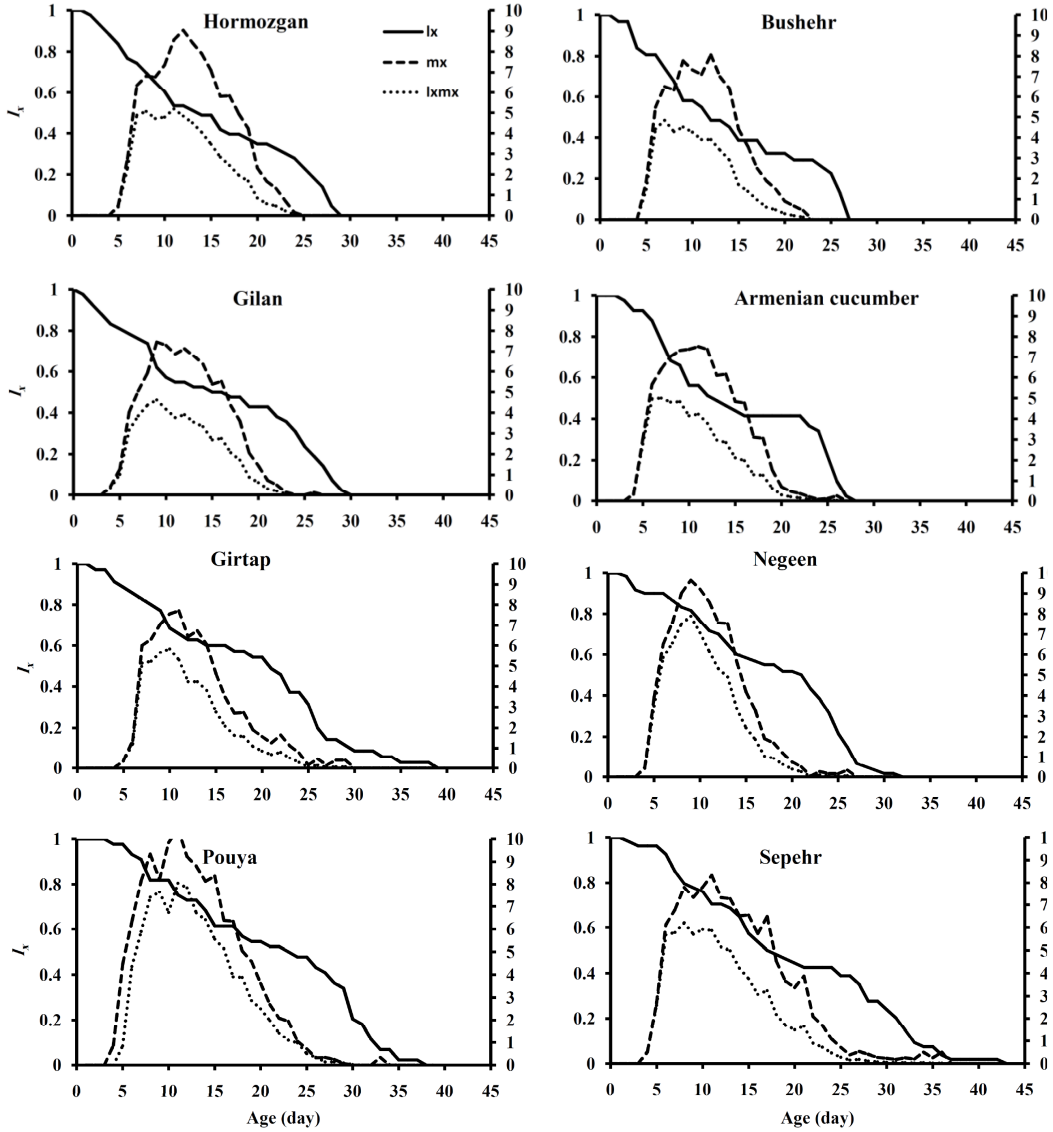

Figure 2. Age-specific survival rate (l_x), age-stage specific maternity (l_xm_x), and age-specific fecundity (m_x) of *Aphis gossypii* reared on different *Cucumis* genotypes.

Knowing the biology of the pest on host plants is fundamental to IPM programs (Sedaratian *et al.*, 2009). Therefore, because of the negative effects of antibiosis on the biology of pests, it can be considered in IPM programs (Smith, 2005). Hence, in this study, we evaluated the effects of different *Cucumis* genotypes on demography of melon aphid in laboratory conditions to assess antibiosis resistance.

As we cannot show the stage structure and stage differences using traditional female-based life tables, TWOSEX-MSChart program was performed in this study. Ignoring differences in the stages often results in errors in l_x and m_x curves (Chi and Liu, 1985). Moreover, the jackknife method may overestimate the variances of life table parameters. Therefore, bootstrap technique was used to estimate the parameters of life table (Huang and Chi, 2012).

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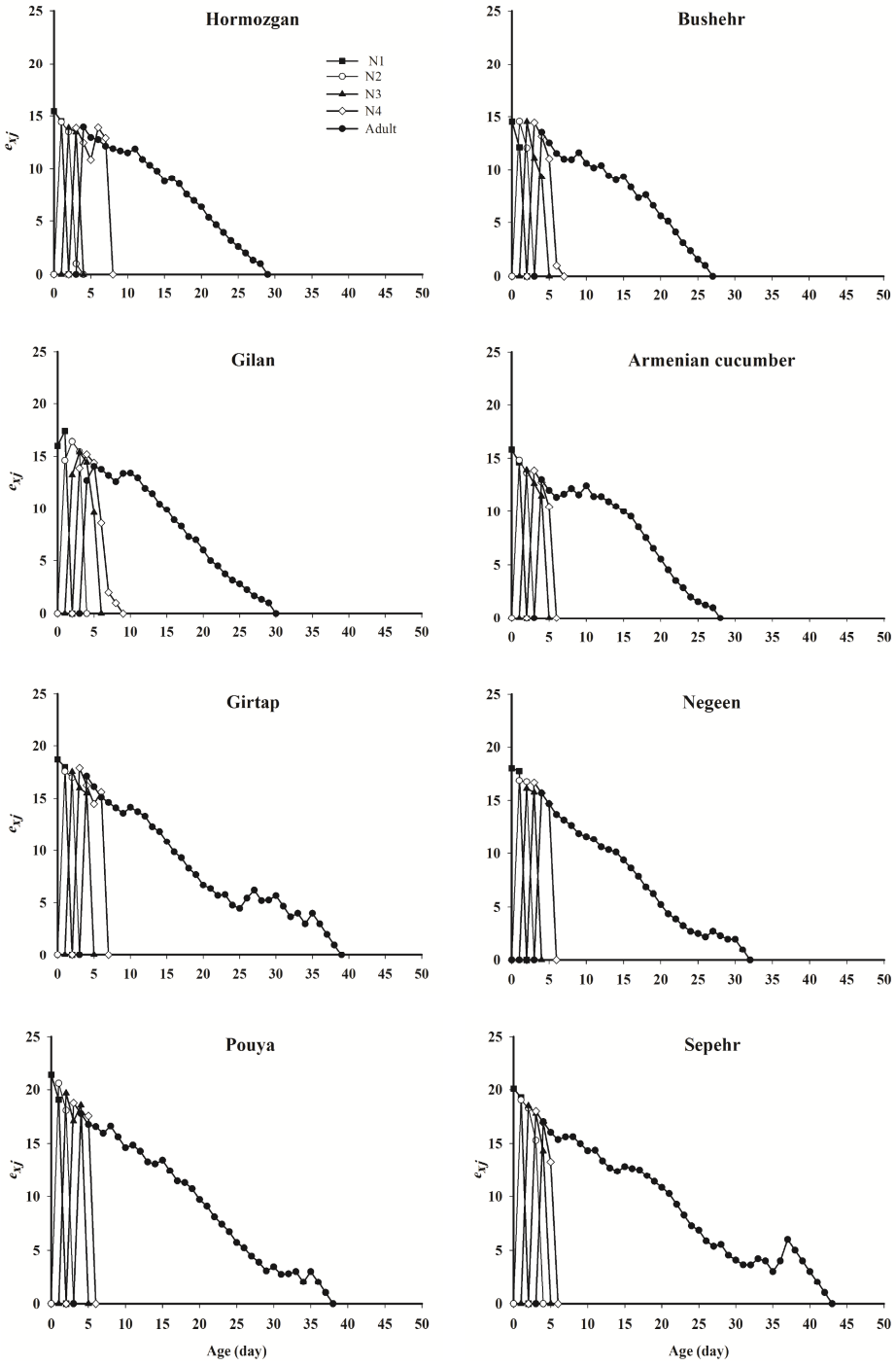

Figure 3. Age-stage-specific life expectancy (e_{xj}) of *A. gossyipii* reared on eight *Cucumis* genotypes.

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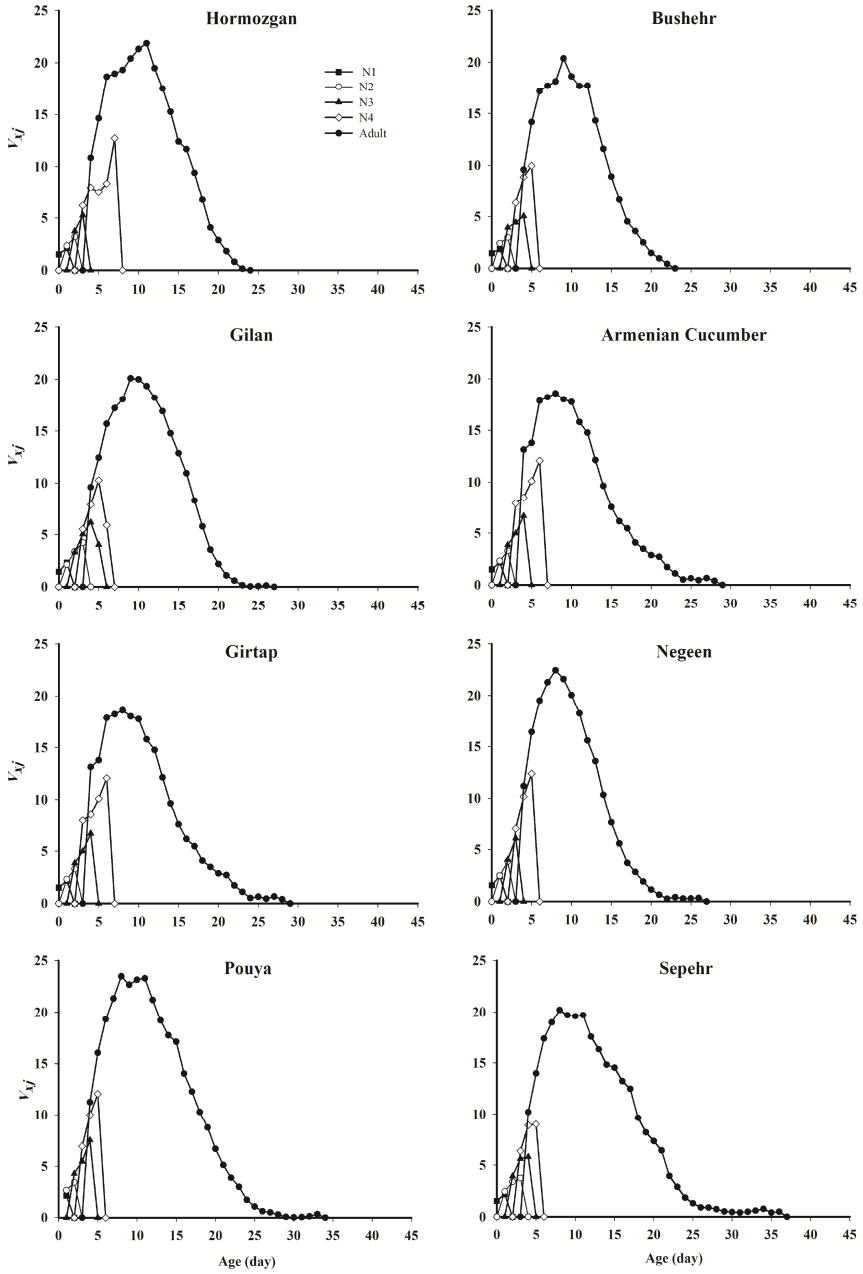

Figure 4. Age-stage-specific reproductive Value (v_{xj}) of *A. gossyipii* reared on eight *Cucumis* genotypes.

This method has been used not only for two sex insects, but also for parthenogenetic female populations such as *Panaphis juglandis* (Goeze) (Hemiptera: Callaphididae) can be applied (Polat-Akköprü *et al.*, 2015). There are limited works on performance of melon aphid on cucurbits. The demography of *A. gossypii* has been studied on several host plants from Cucurbitaceae such as field pumpkin *Cucurbita pepo* L. (Aldyhim and Khalil, 1993) and garden cucumber Cucumis sativus L. (Kocourek et al., 1994; Satar et al., 1999;

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Steenis and El-Khawass, 1995; Takalloozadeh, 2010). On the basis of our study, pre-adult developmental time of *A. gossyipii* on the studied genotypes ranged from 4.426 for Pouya to 5.265 for Gilan. These results are comparable to the development time of this aphid on Beith alpha (4.6±0.08 days) (Satar *et al.*, 1999) but do not overlap with the range of pre-adult development of this aphid on *Cucumis sativus* cv. Sporu that has been recorded 4.8 days at 20°C to 3.2 days at 30°C (Steenis and El-Khawass, 1995), the lower limit *i.e*. 3.2 is lower than our range that is due to the effect of temperature on development time (Steenis and El-Khawass, 1995). The warmer condition (30 vs. 25°C) has been resulted in faster development. It has been revealed that plant defense mechanism will increase pre-adult risk to predation or parasitism by slowing down the pre-adult growth (Coley *et al.*, 2006). Hence, the genotypes with longer pre-adult duration, *i.e*. Gilan and Bushehr are more resistant than the others. The results of population growth parameters in this study are in agreement with other studies on the demography of melon aphid on Aramon cucumber cultivar (R_0= 65.9, r= 0.556) (Steenis and El-Khawass, 1995); Beith alpha cucumber cultivar (R_0= 82.1, r= 0.526, T= 10.1) (Satar *et al.*, 1999); a cucumber cultivar (R_0= 61.201, r= 0.347, λ= 1.415, T= 11.85) (Takalloozadeh, 2010). Immature mortality was 2.27 to 22.58% which is in line with the 20% of pre-adult mortality on Aramon cucumber cultivar (Michaud, 1999) and 2.3% on Beith alpha (Satar *et al.*, 1999).

The life table parameters, particularly, the intrinsic rate of natural increase (r), are the most important parameters that can be used to assess plant resistance level to insects as reported in similar works (Goodarzi *et al.*, 2015; Khanamani *et al.*, 2013). Developmental and reproduction rates of the insects should be associated with other parameters, such as mortality, before making decisive conclusions on the host suitability (Liu *et al.*, 2004). Longer immature development time, higher mortality and lower fecundity of a pest indicate high resistance of its host as mentioned in other studies (Alami *et al.*, 2014; Khanamani *et al.,* 2013; Safuraie-Parizi *et al.,* 2014; Soufbaf *et al.,* 2010b). According to our results, among these genotypes, due to more pre-adult mortality, longer development period and lower net reproductive rate, intrinsic rate of increase and finite rate of increase; 'Gilan' had the highest antibiotic resistance degree to melon aphid and based on these parameters 'Pouya' was the most susceptible one.

Expression of antibiosis in these genotypes may result from both chemical (allelochemicals, toxins, growth inhibition, reduced levels of nutrients or the presence of inhibitors) and morphological (tissue toughness or physical tissue strength, epicuticular lipids, trichomes and *etc*.) plant features (Moharramipour *et al.*, 1997; Smith, 2005). In this study more resistant genotypes had more hair underside of the leaves and more total phenolic compounds (unpublished data). Host plant quality is a factor affecting the development, survivorship, reproduction and life table parameters of herbivorous pests (Golizadeh *et al.*, 2014; Khanamani *et al.*, 2013; Michaud, 1999; Razmjou *et al.*, 2006a; Safuraie-Parizi *et al.*, 2014; Soufbaf *et al.*, 2010a; Soufbaf *et al.*, 2010b; Wermelinger *et al.*, 1991) and it is a key determinant of the fecundity of herbivorous insects (Awmack and Leather, 2002). The plant suitability often depends on the level of primary plant metabolites or secondary metabolites (Akköprü *et al.*, 2015; Khanamani *et al.*, 2015; Ode, 2006). Thus, analysis of the sap composition of the host plants will help to clarify the factors affecting the population growth of a pest (Akköprü *et al.*, 2015). For an herbivore insect, two of the most important nutritional components of leaves are nitrogen and water. Both have been shown to affect growth and diet choice in laboratory and field studies with herbivorous insects. The higher nitrogen and water content of plant accelerates the growth rate of the pests

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(Coley *et al.*, 2006). Hence, secondary metabolite, plant toughness and nitrogen content of genotypes may be the key factor in the expression of antibiosis. Du *et al.* (2004) mentioned high gossypol of cotton as a reason for antibiosis to melon aphid. Mansour *et al.* (1997) reported a negative correlation between the tannins content of cotton and the population density of this aphid. Other authors have considered the negative effects of trichome density on the aphid performance in cotton (Maxwell and Jennings, 1980; Zarpas *et al.*, 2006).

In conclusion, the information obtained from this research will help us to use resistant and partially resistant cultivars to improve biological and chemical control methods in the IPM programs. In addition, further experiments are necessary to understand more details about plant–herbivore interactions to find out the chemical and physical basis of the resistance.

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تأثیر هشت ژنوتیپ خیار *Cucumis* بر پارامترهای رشد جمعیت و جدول زندگی شته‌ی جالیز: رویکردی برای ارزیابی مقاومت آنتی‌بیوزی

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چکیده

برای تعیین مقاومت آنتی‌بیوزی ژنوتیپ‌های خیار (Cucurbitaceae) *Cucumis* به شته‌ی جالیز، *Aphis gossypii* Glover، تأثیر ژنوتیپ‌های بومی (هرمزگان، بوشهر و گیلان)، گلخانه‌ای (گیرتاپ، نگین، پویا و سپهر) و خیار چنبر (*Cucumis melo* var. *flexuosus*) بر پارامترهای رشد جمعیت و جدول زندگی این شته مطالعه شد. این آزمایش در شرایط دمایی ۱ ± ۲۵ درجه‌ی سیلسیوس، رطوبت نسبی ۵ ± ۷۰ درصد و دوره‌ی نوری ۱۶ ساعت روشنایی و ۸ ساعت تاریکی انجام شد. داده‌ها با استفاده از نرم‌افزار Two-Sex MSChart تجزیه و تحلیل شدند. بیش‌ترین میزان مرگ و میر پیش از بلوغ (۲۲/۵۸ درصد) و کوتاه‌ترین طول عمر (۱۴/۵۴۸) مربوط به ژنوتیپ بوشهر بود. نرخ خالص تولیدمثل (R_0) بین ۴۳/۷۰ روی ژنوتیپ بوشهر تا ۹۲/۳۹ پوره به ازای هر فرد ماده روی ژنوتیپ پویا بود. کم‌ترین میزان نرخ ذاتی افزایش جمعیت (r_m) و نرخ متناهی افزایش جمعیت (λ) روی رقم گیلان (به ترتیب ۰/۳۷۸ و ۱/۴۶۰ بر روز) و بیشترین آن‌ها روی ژنوتیپ پویا (به ترتیب ۰/۴۷۱ و ۱/۶۰۲ بر روز) مشاهده شد. بیش‌ترین و کم‌ترین میانگین مدت زمان یک نسل (T) ۱۰/۲۰ و ۹/۲۳ روز و به ترتیب روی ژنوتیپ گیلان و نگین بود. بر اساس پارامترهای اندازه‌گیری شده، ژنوتیپ گیلان بیش‌ترین و پویا کم‌ترین مقاومت آنتی‌بیوزی به شته‌ی جالیز را داشتند. اطلاعات در مورد جدول زندگی آفات و به دنبال آن ارزیابی مقاومت، می‌تواند برنامه‌های مدیریت تلفیقی آفات را بهبود بخشد و ما را به سمت انتخاب ژنوتیپ‌های مناسب برای برنامه‌های به‌نژادی رهنمون سازد.

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