J. Crop Prot. 2012, 1 (2): 121-129

Effect of four wheat cultivars on life table parameters of *Schizaphis graminum* (Hemiptera: Aphididae)

Sheyda Goldasteh[1], Ali Asghar Talebi[2*], Ehsan Rakhshani[3] and Shila Goldasteh[1]

1. Department of Entomology, Faculty of Agriculture, Islamic Azad University, Arak, Iran.
2. Department of Entomology, Faculty of Agriculture, Tarbiat Modares University, P. O. Box: 14115-336, Tehran, Iran.
3. Department of Plant Protection, Faculty of Agriculture, University of Zabol, Zabol, Iran.

Abstract: The life table parameters of *Schizaphis graminum* (Rondani) (Hemiptera: Aphididae) on four commercial cultivars of wheat (Kohdasht, Pastor, Tajan and Zagros) were determined in laboratory conditions. Fertility life table were constructed using age-specific survivorship (l_x) and age-specific fecundity (m_x) and subsequently analyzed using jackknife method and ANOVA. There were significant differences among pre-imaginal period and adult longevity of the aphid on the four wheat cultivars. The highest mortality occurred at first nymphal instar on all of wheat cultivars tested. The life expectancy (e_x) of one-day-old adults was estimated to be 23.5, 24.6, 30.36 and 26.83 days on Kohdasht, Pastor, Tajan and Zagros, respectively. The gross reproductive rate was significantly higher on Tajan (102.39 ± 1.42 females/female/generation) compared with other three cultivars. The net reproductive rate (R_0) significantly differed on different wheat cultivars examined. The R_0-value was highest on Tajan (82.21 ± 1.21) and lowest on Zagros (38.23 ± 0.63 females/female/generation). The highest and lowest values of the intrinsic rate of increase (r_m) were 0.276 ± 0.002 (on Pastor) and 0.222 ± 0.001 day^{-1} (on Zagros), respectively. The finite rate of increase (λ) differed significantly among four wheat cultivars, ranging from 1.25 ± 0.00 (on Zagros) to 1.32 ± 0.00 $days^{-1}$ (on Pastor). Doubling time ranged from 2.51 ± 0.02 (on Pastor) to 3.12 ± 0.02 days (on Zagros). The longest mean generation time (T) of the aphid was obtained on Tajan cultivar. The results showed that the Zagros cultivar had the highest antibiotic effect on population growth of *S. graminum*.

Keywords: *Schizaphis graminum*, wheat cultivars, life table, population growth parameters

Introduction

The greenbug, *Schizaphis graminum* (Rondani) is native to Palaearctic, but it has been introduced to other parts of the world and is now found in North and South America, Europe, Asia, and Africa (Blackman and Eastop 1985). Adults and nymphs of *S. graminum* feed on different graminaceous plants and it has been recognized as a major pest of small grains (e. g., wheat, barley and sorghum) (Anstead *et al.*, 2003; Kindler *et al.*, 2002). Damage caused by *S. graminum* can significantly limit profitable wheat production either through direct feeding or by transmitting viruses (Kindler *et al.*, 2002; Royer *et al.*, 2005; Yang *et al.*, 2008).

Several control methods including chemical pesticides have been used to prevent losses by cereal aphids. Due to extensive use of chemical

Handling Editor: Dr. Yaghoub Fathipour

* **Corresponding author**, e-mail: talebia@modares.ac.ir
Received: 21 April 2012, Accepted: 29 June 2012

[DOR: 20.1001.1.22519041.2012.1.2.2.5]

insecticides, aphids have developed resistance to various groups of pesticides (Wilde *et al.*, 2001). Host plant resistance is one of the most important methods for control of the wheat aphids (Dogramaci *et al.*, 2007; Messina and Bloxham, 2004; Burd and Puterka, 2009; Berzonsky *et al.*, 2003). Host plant resistance is the relative amount of heritable qualities of a plant that reduces the degree of damage by pests (Painter, 1951). Among different types of the host plant resistance, antibiosis is a heritable quality possessed by a plant that adversely affects the life history or biology of the insect pests (Panda and Khush, 1995). The incidence of *S. graminum* has been reported to be significantly different on different wheat cultivars (Ciepiela, 1993; Ahmad and Nasir, 2001). The host plant variety can affect the reproductive periods and fecundity of aphids (Saikia and Muniyappa, 1989). The type and level of resistance in wheat cultivars to the pest aphids have been studied using different assays (Webster and Porter, 2000; Radchenko, 2000; Castro *et al.*, 1998; Akhtar and Mujahid, 2006) including the effects of barley cultivars on life table parameters (Elek *et al.*, 2009; Tofangsazi *et al.*, 2011; Vasicek *et al.*, 2010).

No data are available on the effects of the wheat cultivars on demographic parameters of Iranian populations of *S. graminum*. The objective of this study was to determine the life table parameters of *S. graminum* on four wheat commercial cultivars. The obtained data will be useful to develop an IPM program on wheat.

Materials and Methods

Plant and insects culture

The aphids were collected from wheat fields in Gorgan, northern Iran, from February to May 2008. Four commercial wheat cultivars including Kohdasht, Pastor, Tajan and Zagros were selected to examine their effects on the life table parameters of *S. graminum*. The wheat cultivars were sown in 14.5 × 12 cm plastic pots filled with fertilized field soil and kept in a greenhouse with a 70 ± 5 % relative humidity and day/night temperatures ranging from 25 to 22 ºC, respectively. The seedlings with 15cm in height were used for the experiments. Aphid colonies were established and maintained on wheat seedlings, inside fine mesh cages (80 × 80 × 60 cm) within a greenhouse under the aforementioned conditions. The aphid populations were maintained for several generations on each cultivar before experiments.

Life table parameters

The experiments were conducted in a growth chamber at 22 ± 1 ºC, 70 ± 5 % RH and a photoperiod of 16L: 8D h. The adult apterous aphids were randomly chosen from the stock culture and placed on the wheat leaves. A fine hair brush was used for transferring aphids on the tested wheat cultivars. They were then allowed to produce nymphs for 12h. All aphids except one newly laid nymph per wheat pot were removed. Totally, 100 young nymphs were prepared for these experiments on each wheat cultivar, and allowed them to develop to adult stage. Each newly laid nymph of the aphid was reared on a wheat seedling of about 15 cm height. The development and mortality of individual aphids were recorded daily. When the immature nymphs became adults, they were observed daily for reproduction and all newborn nymphs were counted and removed from wheat seedlings.

Survivorship curves between aphid populations (cohorts) on various wheat cultivars were prepared based on the method of Pyke and Thomson (1986). For each population, a distribution of life-span were obtained and tested by Kolmogorov-Smirnov nonparametric test.

Fertility life tables were constructed using age-specific survivorship (l_x) and age-specific fecundity (m_x) of aphids on each host plant variety. The Net reproductive rate (R_0), intrinsic rate of natural increase (r_m), finite rate of increase (λ), mean generation time (T), doubling time (DT) and life expectancy (e_x) were calculated based on Carey (1993). The pseudo-values of the life table parameters were calculated using jackknife procedure (Meyer *et al.*, 1986; Maia *et al.*, 2000). The estimated pseudo-values of the life table parameters on different wheat cultivars were subjected to a one-way ANOVA. If significance

[DOR: 20.1001.1.22519041.2012.1.2.2.5]

differences were detected, multiple comparisons were made using the SNK procedure ($P < 0.05$). Statistical analyses were done using SPSS ver. 13.0 (SPSS, 2004).

Results

Development and Fecundity

Development times of viviparous wingless aphids were significantly different among wheat cultivars ($F = 49.863$; $df = 3, 291$; $P < 0.01$) (Fig 1A), indicating some patterns for the effect of host plant cultivar on the development of aphid nymphs. Shortest and longest development times were observed on Tajan (5.19 ± 0.07 days) and Zagros (7.03 ± 0.12 days). The subsequent results revealed the significant effects of the wheat cultivars on adult longevity ($F = 442.73$; $df = 3, 291$; $P < 0.01$) (Fig. 1B) and total number of newly laid nymphs per female ($F = 228.715$; $df = 3, 291$; $P < 0.01$) (Fig 1 C). Both longest adult longevity and highest total number of nymphs were observed on the Tajan cultivar. The mean number of newly laid nymphs per female per day showed significant differences on four examined wheat cultivars ($F = 63.286$; $df = 3, 291$; $P < 0.01$). This parameter was highest on Pastor (3.64 ± 0.10 nymphs per day) and lowest on Zagros (2.42 ± 0.09) (Fig. 1 D). The pre-imaginal mortalities were 41, 27, 21 and 17 % on Zagros, Kohdasht, Pastor and Tajan, respectively (Fig. 2)

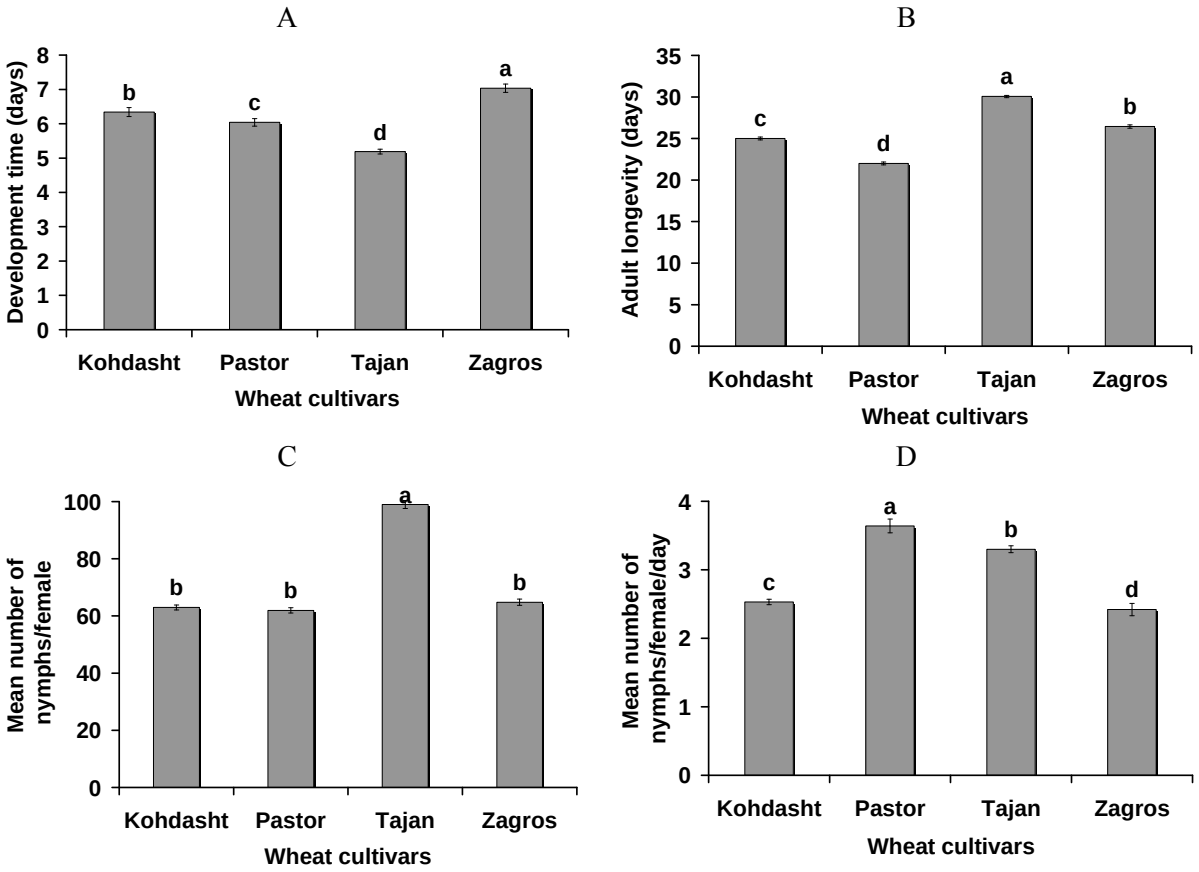

Figure 1 Biological parameters of *Schizaphis graminum* on four wheat cultivars A. Developmental time, B. Adult longevity, C. Number of the offspring per day, D. Total number of the offspring per female. For each parameter, differences among wheat cultivars were determined by SNK tests. Within columns, means indicated by different letters are significantly different ($P < 0.05$).

[DOR: 20.1001.1.22519041.2012.1.2.2.5]

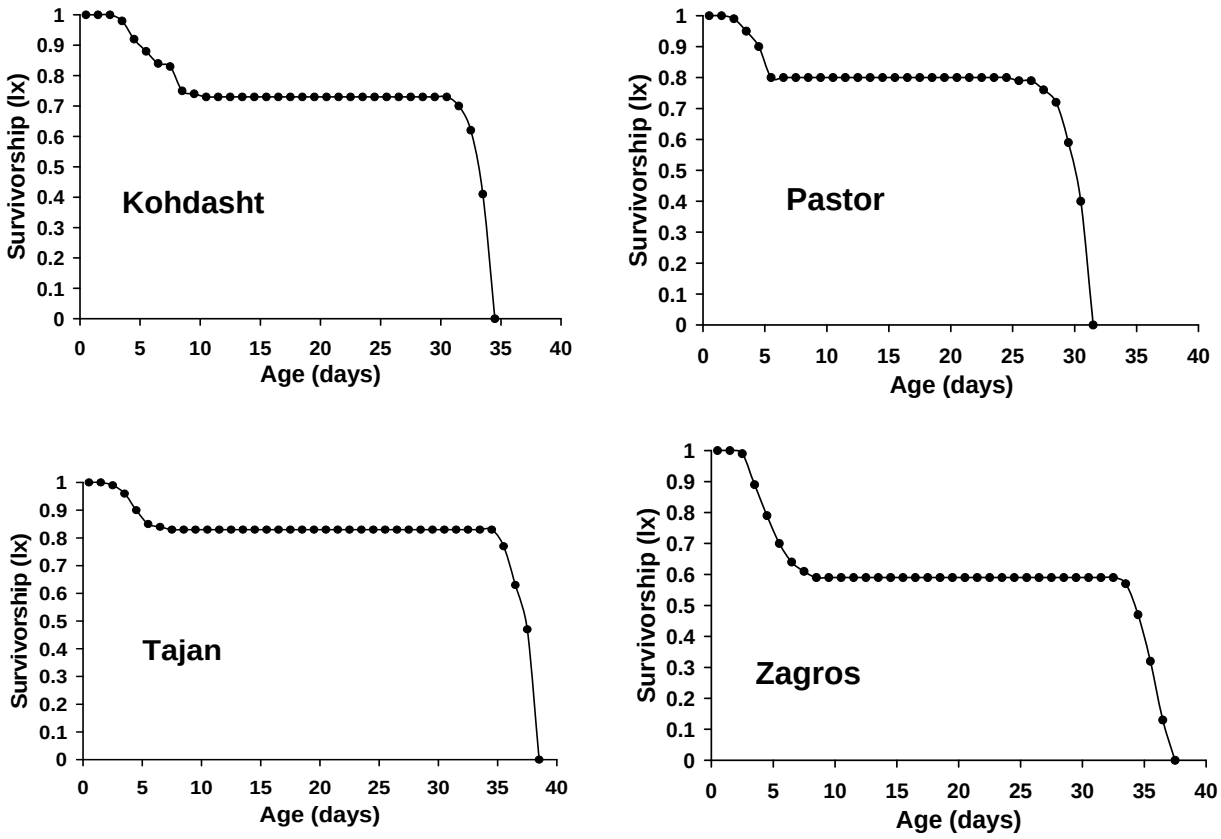

Figure 2 Age-specific survivorship (l_x) of *Shizaphis graminum* on four wheat cultivars.

Life table parameters

The life expectancy (e_x) at adult emergence time was 23.50, 24.60, 30.36, and 26.83 days on cultivars Kohdasht, Pastor, Tajan and Zagros, respectively. In the meantime, the highest and lowest life expectancies were found on Tajan and Kohdasht, respectively. The deaths of all examined aphids were occurred in 34, 31, 37 and 38 days on Kohdasht, Pastor, Zagros and Tajan cultivars, respectively (Fig. 2). Survival analysis showed that there was no significant difference among life-span of *S. graminum* on four wheat cultivars (Table 1). Similar patterns of m_x (female nymphs per female per day) were observed on all wheat cultivars. The number of nymphs at the peak of nymphiposition of females was determined to be 3.81, 3.81, 4.34 and 3.75 on Kohdasht, Pastor, Tajan and Zagros, respectively. The peak of oviposition occurred at age of 10, 10, 10 and 11 days after nymph deposition on Kohdasht, Pastor, Tajan and Zagros, respectively (Fig. 3). There were significant differences among the net reproductive rates (R_0) of *S. graminum* on different host plants ($F = 475.252$; $df = 3, 291$; $P < 0.01$). The highest and lowest R_0 values of *S. graminum* were obtained on Tajan and Zagros, respectively (Table 2). The intrinsic rates of natural increase (r_m) of viviparous aptera of *S. graminum*s were found to be significantly different among the four wheat cultivars ($F = 153.139$; $df = 3, 291$; $P < 0.01$). The r_m values of *S. graminum* calculated on the four cultivars in the current study ranged from 0.222 to 0.276 day^{-1} on cultivars Zagros and Pastor, respectively (Table 2). Additionally, the mean generation time (T) of *S. graminum* showed significant differences ($F = 174.848$;

[DOR: 20.1001.1.22519041.2012.1.2.2.5]

df = 3, 291; P < 0.01) among the four wheat cultivars so that, the shortest and longest values were estimated to be 14.18 ± 0.11 and 16.92 ± 0.09 days on cultivars Pastor and Tajan, respectively. *DT* values (Table 2) of *S. graminum* showed significant differences among the four cultivars (F = 175.139; df = 3, 291; P < 0.01), as well as the finite rate of increase (λ) (F = 49.971; df = 3, 291; P < 0.01).

Table 1 Comparison of life-span of *Schizaphis graminum* on four wheat cultivars using the Kolmogorov-Smirnov test.

Wheat cultivars	Life span (Days)	
	(Mean ± SEM)	Range
Kohdasht	24.97 ± 1.22[a]	2-33
Pastor	30.62 ± 1.25[a]	1-37
Tajan	23.66 ± 1.08[a]	1-30
Zagros	21.86 ± 1.53[a]	1-36

Different letters in the column indicate significant differences within various cultivars ($P < 0.05$).

Table 2 Estimated life table parameters of *Schizaphis graminum* on four wheat cultivars.

Wheat cultivars	Parameter (mean ± SE)				
	R_0	r_m	λ	*T*	*DT*
Kohdasht	45.96 ± 0.63c	0.247 ± 0.002c	1.28 ± 0.00c	15.49 ± 0.09c	2.81 ± 0.02b
Pastor	50.17 ± 0.81b	0.276 ± 0.002a	1.32 ± 0.00a	14.18 ± 0.11d	2.51 ± 0.02d
Tajan	82.21 ± 1.21a	0.260 ± 0.001b	1.29 ± 0.00b	16.92 ± 0.09a	2.66 ± 0.01c
Zagros	38.23 ± 0.63d	0.222 ± 0.001d	1.25 ± 0.00d	16.42 ± 0.07b	3.12 ± 0.02a

For each parameter, differences among wheat cultivars were determined by SNK tests. Within columns, means followed by different letters are significantly different ($P < 0.05$).

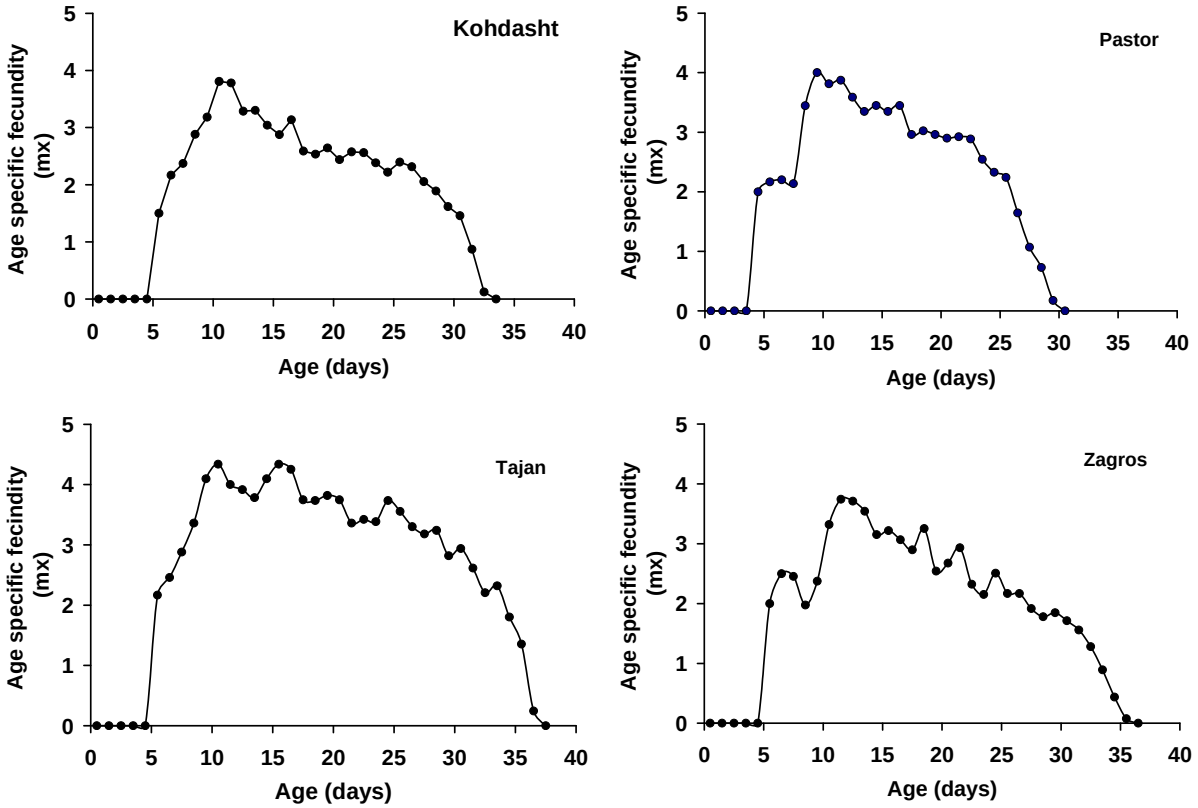

Figure 3 Age-specific fecundity (m_x) of *Schizaphis graminum* on four wheat cultivars.

[DOR: 20.1001.1.22519041.2012.1.2.2.5]

Discussion

The results revealed significant effects of four examined wheat cultivars on the development and reproduction of *S. graminum*. The *S. graminum* developed significantly faster on Tajan than in the other wheat cultivars. Also, the adult longevity was highest on Tajan indicating that this cultivar has the best feeding quality for *S. graminum*. Buriro *et al.* (1997) found significant differences among adult longevity of *S. graminum* on different wheat cultivars. Based on Buriro *et al.* (1997) findings, the longevity of *S. graminum* adults on the Kohinoor cultivar was 31 days, which is similar to our data on the Tajan cultivar. The mean total offspring per female per generation of *S. graminum* were highest on Tajan followed by Zagros. The fecundity of *S. graminum* was estimated to be 89.4 ± 6.5 nymphs /female/generation by Goussain *et al.* (2005), which is nearly similar to the fecundity value of *S. graminum* on Tajan cultivar in this study. While, Buriro *et al.* (1997) reported that the total fecundity of *S. graminum* ranged from 2.37 to 23.49 nymphs/female/generation on different wheat cultivars and obviously shows that our findings on all examined wheat cultivars are much higher than those obtained by Buriro *et al.* (1997). These differences revealed that Iranian population of *S. graminum* has higher potential to increase than those populations studied by Goussain *et al.* (2005) and Buriro *et al.* (1997). The host plant cultivars showed significant effects on r_m values of *S. graminum* and the highest value was obtained on Pastor followed by Tajan. The lowest pre-imaginal mortality and shortest developmental time were observed on Tajan, two parameters that favor a larger value for r_m (0.260 ± 0.001 day^{-1}). On the other hand, the largest value of r_m was estimated on the cultivar Pastor (0.276 ± 0.002 day^{-1}). Significant difference between r_m values on these two cultivars arises from the mean generation time that showed the highest value on the cultivar Tajan.

According to the life table parameters, the Tajan cultivar was the most susceptible host plant to *S. graminum* compared with Kohdasht, Pastor and Zagros cultivars. Among the life table parameters, the intrinsic rate of increase (r_m) is the best parameter for evaluating the host plant species or cultivar effects, because it reflects the overall effects on both survivorship and fecundity (Soufbaf *et al.*, 2010). A population with a higher intrinsic rate of increase (r_m) will grow faster than one with a lower rate of increase (Carey, 1993). However more studies are needed to evaluate crop loss assessment of different wheat cultivars at different *S. graminum* densities, because some cultivars may be able to tolerate or compensate pest damage (Smith, 2005). The r_m values of five *S. graminum* biotypes on sorghum, *Sorghum bicolor* (L.) were estimated from 0.16 to 0.38 day^{-1} at 28 ± 1 ºC, 60 ± 2 % RH and a photoperiod of 13: 11 (L: D) h (Gorena, 2004). This clearly shows the different performance of various biotypes of *S. graminum*. Also, there were significant differences among *T* and *DT* of *S. graminum* on four studied wheat cultivars. The values of mean generation time in current study were not close to those estimated for several biotypes of *S. graminum* reared on sorghum that ranged from 5.7 to 8.8 days (Gorena, 2004). The higher mean generation time in the current study is probably because of the higher longevity of *S. graminum* on these cultivars and shows that sorghum has a better food quality for *S. graminum*.

Resistant plants play a key role in IPM programs. Identification of resistant host plants is therefore the first step for an IPM program construction. The obtained results in this study revealed that among the current wheat cultivars in Golestan province, Zagros is the most resistant cultivar. On the contrary, for mass rearing natural enemies of *S. graminum* in insectariums and applying them in augmentative biological control programs, Tajan cultivar would be the best choice. Because in insectariums, we should select those host plants, which have the greatest food quality for host insects. However, more studies

[DOR: 20.1001.1.22519041.2012.1.2.2.5]

are needed to learn more about the performance of *S. graminum* on different host plants in field conditions and on the effects of host plants on efficiency of *S. graminum* natural enemies.

Acknowledgments

We are grateful to the Agricultural Research Center of Golestan province for providing seeds of the wheat cultivars. We cordially thank to handling editor, Prof. Y. Fathipour and three anonymous reviewers for their valuable comments and suggestions on the earlier version of this paper.

References

Ahmad, F., and Nasir, S. 2001. Varietal resistance of wheat germplasm against wheat aphid (*Sitobion avenae* F.). Pakistan Entomologist, 23: 5–7.

Akhtar, N., and Mujahid, M. Y. 2006. Patterns of resistance against *Schizaphis graminum* (Rondani) in rainfed wheat varieties. Pakistan Journal of Zoology, 38: 153–157.

Anstead, J. A., Burd, J. D. and Shufran, K. A. 2003. Over-summering and biotypic diversity of *Schizaphis graminum* (Homoptera: Aphididae) populations on noncultivated grass hosts. Environmental Entomology, 32 : 662–667.

Berzonsky, W. A., Ding, H. J., Haley, S. D., Harris, M. O., Lamb, R. J., McKenzie, R. I. H., Ohm, H. W., Patterson, F. L., Peairs, F. B., Porter, D. R., Ratcliffe, R. H. and Shanower, T. G. 2003. Breeding wheat for resistance to insects. Plant Breeding Reviews, 22: 221–296.

Blackman, R. L. and Eastop, V. F. 1985. Aphids on the World's Crops: An Identification and Information Guide. A Wiley-Interscience Publication, 466 pp.

Burd, J. D. and Puterka, G. J. 2009. Plant resistance management strategies for greenbug (*Schizaphis graminum* (Rondani) (Homoptera: Aphididae) in wheat-sorghum cropping systems. Redia Journal of Zoology, 92: 227–229.

Buriro, A. S., Khuhro, R. D., Khuhro, I. U. and Nizamani, S. M. 1997. Demography of greenbug on wheat. Pakistan Journal of Zoology, 29: 165–170.

Carey, J. R. 1993. Applied Demography for Biologists, with Special Emphasis on Insects. Oxford University Press, 205 pp.

Castro, A. M., Vasicek, A., Ramos, S., Martin, A., Martin, L. M. and Dixon, A. F. G. 1998. Resistance against greenbug, *Schizaphis graminum* Rond., and Russian wheat aphid, *Diuraphis noxia* Mordvilko, in tritordeum amphiploids. Plant Breeding, 117: 515–522.

Ciepiela, A. P. 1993 The harmful effect of cereal aphid on winter wheat crop. Ochrona Roslin, 37: 9–10

Dogramaci, A., Mayo, Z. B., Wright, R. and Reese, J. 2007. Categories of resistance, antibiosis and tolerance, to biotype I greenbug (*Schizaphis graminum* (Rondani) Homoptera: Aphididae) in four sorghum (*Sorghum bicolor* (L.) Moench., Poales: Gramineae) hybrids. Journal of the Kansas Entomological Society, 80: 183–191.

Elek, H., Werner, P., Smart, L., Gordon-Weeks, R., Nádasy, M. and Pickett, J. 2009. Aphid resistance in wheat varieties. Communications in Agricultural and Applied Biological Sciences, 74: 233–41.

Gorena, R. 2004. Characterization of *Schizaphis graminum* (Rondani) (Homoptera: Aphididae) biotype evolution via virulence and fitness on *Sorghum bicolor* (L.) Moench and *Sorghum halepense* (L.) Persoon. Ph. D. Thesis, Texas A & M University, USA.

Goussain, M. M., Prado, E. and Moraes, J. C. 2005. Effect of silicon applied to wheat plants on the biology and probing behaviour of the greenbug *Schizaphis graminum* (Hemiptera: Aphididae). Neotropical Entomology, 34: 807– 813.

Kindler, S. D., Elliott, N. C., Giles, K. L., Royer, T. A., Fuentes-Granados, R. and Tao, F. 2002. Effect of greenbugs (Homoptera: Aphididae) on yield loss of winter wheat. Journal of Economic Entomology, 95: 89–95.

[DOR: 20.1001.1.22519041.2012.1.2.2.5]

Messina, F. J. and Bloxham, A. J. 2004. Plant resistance to the Russian wheat aphid: effects on a nontarget aphid and the role of induction. Canadian Entomologist, 136: 129–137.

Maia, A. H. N., A. J. B. Luiz, and C. Campanhola. 2000. Statistical influence on associated fertility life table parameters using jackknife technique: computational aspects. J. Econ. Entomol. 93: 511-518.

Meyer, J. S., Ingersoll, W. R., McDonald, L. L. and Boyce, M. S. 1986. Estimating uncertainty in population growth rates jackknife vs. bootstrap techniques. Ecology, 67: 1156–1166.

Painter, R. H. 1951. Insect Resistance in Crop Plants. The Macmillan Co., New York, 520 pp.

Panda, N. and Khush, S.G. 1995. Host Plant Resistance to Insects. CABI, Wallingford, UK.

Pyke, D. A. and Thomson, J. N. 1986. Statistical analysis of survival and removal rate experiments. Ecology, 67 (1): 240-245.

Radchenko, E. E. 2000 Identification of genes for resistance to greenbug in sorghum. Genetika, 36: 510–519.

Royer T. A., Giles, K. L. Nyamanzi, T., Hunger, R. M., Krenzer, E. G., Elliott, N. C., Satar, S., Kersting, U. and Ulusoy, M. R. 2005. Temperature dependent life history traits of *Brevicoryne brassicae* (L.) (Hom.: Aphididae) on white cabbage. Turkish Journal of Agriculture and Forestry, 29: 341–346.

Saikia, A. K. and Muniyappa, V. 1989. Epidemiology and control of tomato leaf curl virus in Southern India. Tropical Agriculture, 66: 350–354.

Smith, C. M. 2005. Plant Resistance to Arthropods, Molecular and Conventional Approaches. Springer, Dordrecht, The Netherlands, 423 p.

Soufbaf, M., Fathipour, Y., Karimzadeh, J. and Zalucki, M. P. 2010. Bottom-Up effect of different host plants on *Plutella xylostella* (Lepidoptera: Plutellidae): A life-table study on canola. Journal of Economic Entomology, 103 (6): 2019-2027.

SPSS 2004. SPSS base 13.0 user's guide. SPSS Incorporation, Chicago, IL.

Tofangsazi, N., Kheradmand, K., Shahrokhi, S. and Talebi, A. A. 2011. Demography of greenbug, *Schizaphis graminum* (Rondani) (Hemiptera: Aphididae) on six barley cultivars. Archive of Phytopathology and Plant Protection, 44: 484–492.

Vasicek, A., Rossa, F., la-Paglioni A. and Lopez, M. C. 2010. Biological and demographical statistics of *Diuraphis noxia* (Mordv.), *Metopolophium dirhodum* (Wlk.), *Rhopalosiphum padi* (L.), *Schizaphis graminum* (Rond.) and *Sipha maydis* (Pass.) (Hemiptera: Aphididae) on different cultivars of *Avena sativa* L. under controlled conditions. Boletin de la Sociedad Entomologica Aragonesa, 46: 591–596.

Webster J. A. and Porter, D. R. 2000. Plant resistance components of two greenbug (Homoptera: Aphididae) resistant wheats. Journal of Economic Entomology, 93: 1000–1004.

Wilde G. E., Shufran, R. A., Kindler, S. D., Brooks, H. L. and Sloderbeck, P. E. 2001. Distribution and abundance of insecticide resistant greenbugs (Homoptera: Aphididae) and validation of a bioassay to assess resistance. Journal of Economic Entomology, 94: 547–551.

Yang X. L., Thannhauser, T. W., Burrows, M., Cox-Foster, D., Gildow, F. E. and Gray, S. M. 2008. Coupling genetics and proteomics to identify aphid proteins associated with vector-specific transmission of polerovirus (Luteoviridae). Journal of Virology, 82: 291–299.

[DOR: 20.1001.1.22519041.2012.1.2.2.5]

تاثیر چهار رقم گندم روی پارامترهای جدول زندگی شته *Schizaphis graminum* (Hemiptera: Aphididae)

شیدا گلدسته[1]، علی اصغر طالبی[2*]، احسان رخشانی[3]، شیلا گلدسته[1]

۱- گروه حشره‌شناسی کشاورزی، دانشکده کشاورزی، دانشگاه آزاد اسلامی اراک، صندوق پستی ۵۶۷-۳۸۱۳۵، اراک، ایران
۲- گروه حشره‌شناسی، دانشکده کشاورزی، دانشگاه تربیت مدرس، صندوق پستی ۳۳۶-۱۴۱۱۵، تهران، ایران
۳- گروه گیاهپزشکی، دانشکده کشاورزی، دانشگاه زابل، زابل، ایران
* پست الکترونیکی مسئول مکاتبه: talebia@modares.ac.ir

چکیده: پارامترهای جدول زندگی شته *Shizaphis graminum* (Rondani) (Hemiptera: Aphididae) روی چهار رقم تجاری گندم شامل کوهدشت، پاستور، تجن و زاگرس در شرایط آزمایشگاهی مورد بررسی قرار گرفت. جدول زندگی ویژه باروری با استفاده از بقای ویژه سن (lx) و باروری ویژه سن (m_x) و روش جک‌نایف و تجزیه واریانس مورد مطالعه قرار گرفت. بین طول دوره رشد نابالغ و طول عمر حشرات کامل شته روی چهار رقم گندم تفاوت معنی‌دار وجود داشت. بیشترین مرگ و میر روی هر چهار رقم گندم در اولین سن پورگی شته مشاهده شد. امید به زندگی در شته‌های بالغ یک روزه به میزان ۲۳/۵، ۲۴/۶، ۳۰/۳۶ و ۲۶/۸۳ روز به‌ترتیب روی ارقام کوهدشت، پاستور، تجن و زاگرس محاسبه شد. نرخ ناخالص تولید مثل روی رقم تجن (۱/۴۲ ± ۱۰۲/۳۹) به‌طور معنی‌داری بیشتر از سایر ارقام بود. نرخ خالص تولید مثل (R_0) شته روی چهار رقم گندم تفاوت معنی‌دار داشت. مقدار R_0 روی رقم تجن (۱/۲۱ ± ۸۲/۲۱) بیشترین و روی رقم زاگرس (۰/۰۶۳ ± ۳۸/۲۳ ماده/ ماده/ نسل) کمترین مقدار تعیین شد. بیشترین و کمترین مقدار نرخ ذاتی افزایش جمعیت (r_m) به‌ترتیب ۰/۰۰۲± ۰/۲۷۶ (روی رقم پاستور) و ۰/۰۰۱ ± ۰/۲۲۲ روز$^{-1}$ (روی رقم زاگرس) محاسبه شد. نرخ متناهی افزایش جمعیت (λ) روی چهار رقم گندم تفاوت معنی‌دار داشت و دامنه آن از ۰/۰۰± ۱/۲۵ (روی رقم پاستور) تا ۰/۰۰ ± ۱/۳۲ روز$^{-1}$ (روی رقم زاگرس) متغیر بود. بلندترین طول هر نسل شته (T) روی رقم تجن به‌دست آمد. نتایج نشان داد رقم زاگرس دارای بیشترین اثر آنتی‌بیوتیک روی پارامترهای رشد جمعیت شته *S. graminum* می‌باشد.

واژگان کلیدی: *Schizaphis graminum*، ارقام گندم، جدول زندگی، پارامترهای رشد جمعیت

[DOR: 20.1001.1.22519041.2012.1.2.2.5]