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Comparative Demography of *Sesamia cretica* Lederer (Lepidoptera: Noctuidae) on Its Two the Most Important Natural Hosts, Maize and Sugarcane

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ABSTRACT

Demographic parameters of the pink stem borer, *Sesamia cretica* Lederer (Lepidoptera: Noctuidae) were estimated on its two main host plants, maize and sugarcane. The present study was conducted under laboratory conditions at 27±1˚C, 50±10% Relative Humidity (RH %), and a photoperiod of 0:24 (L:D) hour for the larval stage and 16:8 (L:D) hour for the other life stages. The raw data were analyzed based on the age-stage, two-sex life table theory. For estimating the *SE* of the population parameters, the bootstrap technique was applied. Total pre-adult developmental periods of the pink stem borer were 51.95 and 39.51 days on maize and sugarcane, respectively. The oviposition periods were 5.03 and 5.38 days and fecundity was 118.04 and 142.88 eggs on maize and sugarcane, respectively. Peaks of reproductive value occurred at ages 49 and 38 days when reared on maize and sugarcane, respectively. The net Reproductive rate R_0, intrinsic rates of increase *r* and finite rate of increase λ of *S. cretica* were 53.58 offspring, 0.0937 day^{-1} and 1.0983 day^{-1} on sugarcane and 39.54 offspring, 0.0672 day^{-1} and 1.0695 day^{-1} on maize, respectively. The mean generation Time (T) of the pink stem borer was 42.41 and 54.57 days on sugarcane and maize, respectively. There was significant difference between demographic parameters of *S. cretica* on maize and sugarcane. The results showed that there was higher reproductive performance and population growth of *S. cretica* on sugarcane than on maize.

Keywords: Life table parameter, Population, *Sesamia cretica.*

INTRODUCTION

The stem borers, *Sesamia* spp. (Lep., Noctuidae), are the most important pests of maize (*Zea mays* L.) and sugarcane (*Saccharum officinarum* L.) in Iran (Ranjbar Aghdam, 1999; Soltani Orang *et al*., 2014). There are two species of the stem borers in maize and sugarcane fields located in southern parts of Iran, *Sesamia cretica* Lederer and *Sesamia nonagrioids* Lefever (Danyali, 1976; Ranjbar Aghdam and Kamali, 2002; Taherkhani and Moazen-Rezamahaleh, 2012). Pink stem borer, *S. cretica*, is a dominant species of the stem borers in the mentioned sugarcane fields (Ranjbar Aghdam, 1999).

According to Moyal *et al.* (1997), Ranjbar Aghdam (1999) and Ranjbar Aghdam and Kamali (2002), maize and sugarcane were known as the most important natural hosts for *S. cretica* among its host plants. In addition to the mentioned crop plants, there are several other hosts among cultivated crops, such as *Avena sativa* L., *Hordeum vulgare* L., *Oryza sativa* L., *Pennisetum typhoideum* (L.), *Saccharum* spp., *Sorghum bicolor* (L.), *Sorghum halpense* (L.), *Triticum aestivum* L., unidentified bamboo, unidentified bulrush, and unidentified palms

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(Tams and Bowden, 1953; Rao and Nagaraja, 1969; Leslie, 1994; Meijerman and Ulenberg, 1996; Zaki *et al.*, 1997; Heinrichs ,1998; Polaszek and Khan, 1998). The pink stem borer may cause severe damage to maize plantations, particularly when infestation occurs shortly after plant emergence (Semeada, 1985; 1988). On sugarcane, it has characteristically been thought of as a shoot borer (Temerak and Negm, 1979), but it can damage more mature stalks (Semeada, 1985).

Life table studies are fundamental not only to demography but also to general biology. In such studies, development times and survival rates of each stage, longevity of adults, and the daily fecundity of females are recorded for every individual. Life table, as a convenient and comprehensive method, provides the description of the survival, and the developmental and reproductive rates of a population (Lotka, 1907; Lewis, 1942; Leslie, 1945; 1948; Birch, 1948; Messenger, 1964; Chi and Liu, 1985; Carey, 2003). In the application of traditional female age-specific life tables (e. g. Lewis, 1942; Leslie, 1945; Birch, 1948; Carey, 2003), researchers have excluded data from male individuals in their studies, have ignored stage differentiation, and used sex ratio to calculate the female offspring. Excluding male individuals and ignoring stage differentiation, however, will inevitably result in errors in life table analysis and interpretation (Huang and Chi, 2012). To take the variable developmental rate and male population into account, Chi and Liu (1985) and Chi (1988) developed the age-stage, two-sex life table.

The population dynamics vary with climate, crop and agro-practice (Greenberg *et al*., 2005; Barteková and Praslička, 2006; Yang and Chi, 2006; Atlihan and Chi, 2008; Wang *et al*., 2009).

The range of variation in development rate can depend on other factors such as food (Chi, 1988). Moreover, the intrinsic rate of increase, as the most important life table parameter of an insect, can vary with the larval host or diet (Carey, 2003). Therefore, using a life table one can compare the growth potential of an insect on different host plants (Morris and Miller, 1954; Chi, 1988; Yin *et al*., 2010).

In this research, we collected the life table data of *S. cretica* on maize and sugarcane, and analyzed them based on the age-stage, two-sex life table. In the current study, it has determined the effect of two host plants on life table parameters of *S. cretica*. Moreover, the pink stem borer was frequently used as natural host for mass rearing of its egg parasitoid wasp, *Telenomus busseolae* Gahan (Ranjbar Aghdam, 1999). In order to comprehensively understand the role of the pest insect in the proliferation of biological control agent, it is necessary to obtain the development, survival, and fecundity of the pest species on main host plants (Chi and Getz, 1988; Tuan *et al*., 2014). The results can be used not only to predict population dynamics of the pest on the studied natural hosts but also to improve mass rearing technique of the most important biological agent for using in Integrated Pest Management (IPM) program.

MATERIALS AND METHODS

This study was carried out in the Iranian Research Institute of Plant Protection, Tehran, Iran during the years 2014-2015. Stalk culture of *S. cretica* was originally collected in 2014 from the sugarcane fields (48º 40′ E, 31º 20′ N) located in Ahwaz region, Khuzestan province, southwest of Iran.

Plant Material

The cultivars of maize, *Z. mays* and sugarcane, *S. officinarum* are the most important host plants for the pink stem borer in Iran (Ranjbar Aghdam and Kamali, 2002). Therefore, most of the planted cultivars of the maize (Var. KSC 704) and sugarcane (Var. CP 69-1062) in Iran were selected as natural hosts of the pink stem borer in the present study.

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Maize seeds were planted in plastic pots with a 24 cm diameter and 26 cm deep and cut stems of sugarcane were planted in plastic pots with a 35cm diameter and 38cm deep. All the pots were filled with a mixture of sandy loam, loam and compost in equal proportions. Moreover, the water soluble fertilizer "Grow fast" (N: P: K= 15: 5: 30+TE, Iranian Behavaran Zarrin Mozhdeh Co., Ltd.) was applied during the vegetative period considering its technical recommendation. Irrigation of the pots was done as needed. No pesticides were used during the growing period of plants. All of the pots were planted in greenhouse units at a temperature of 27±2˚C (for maize) and 30±2˚C (for sugarcane), 50±10% RH and natural photoperiod.

Colony Establishment and Experimental Conditions

In order to establish laboratory colony, larval stage of the pink stem borer, *S. cretica* was collected from the sugarcane fields. Collected larvae (> 1,000 larvae) were divided to two groups and were reared on sugarcane (Var. CP 69-1062) and maize (Var. KSC 704) cutting stems in growth chamber at 27±1˚C, 50±10% Relative Humidity (RH%) and a photoperiod of 0:24 (L:D) h for the larval stage (Masoud *et al*., 2010) and 16:8 (L:D) h for the other stages. The fluctuations of environmental conditions were monitored by a temperature and %RH data logger (175-H2, Testo, Germany) during the study. The second established generation in laboratory (F_2) was used for the life table study.

Insect Rearing

Newly emerged moths (Age< 24 h) were paired in plastic jars with a 17cm diameter and 25 cm height, with sugarcane shoot or maize stem as an oviposition substrate and fed using a soaked piece of cotton ball by 10% water-honey solution (Ranjbar Aghdam, 1999). Cotton balls and oviposition substrates were refreshed every day. The opening side of the jars was covered with a fine mesh net for ventilation. During oviposition period, sugarcane shoot or maize stem were replaced daily by fresh ones and the eggs were picked up by an artistic fine brush (no 0.000) from the inner side of the leaf sheath. The eggs were sterilized (Ranjbar Aghdam and Kamali, 2002) and located in a glass Petri dish (9 cm in diameter) with a piece of wet cotton ball to prevent desiccation. After incubation period, neonate larvae were transferred to larval rearing containers. Larval rearing was carried out in a plastic container with 19×13×4 cm in size. Feeding of the larvae was done by using sugarcane and maize cutting stems as two examined treatments. Larval development and food quality were checked 2-3 times per week and old cutting stems were replaced by the fresh ones. In order to prevent microbial infestations, when the larvae were developed to the 2nd instar, they were isolated from the others and reared individually in plastic containers with 3 cm diameter and 2 cm height. After pupation, individuals were sexed and sterilized using 5% sodium hypochlorite solution (Ranjbar Aghdam and Kamali, 2002). Pupae were kept in fresh individual rearing containers until adult emergence. All of the containers were checked for adult emergence every day.

Life Table Study

In order to establish cohort, twenty egg masses laid on the same day were randomly selected from the different oviposition jars for each established colony on maize and sugarcane. Eggs were counted under stereomicroscope and 200 same-aged (< 24 h) eggs were picked as cohort for each treatment. Eggs were placed in a glass Petri dish (with 9 cm diameter) after surface sterilization. Eggs were checked daily and the number of hatched eggs was recorded. Newly hatched first instar larvae (Age< 24 h) were picked from each cohort using a fine brush and placed in a new

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Petri dish. All of the same-aged first and second larval instars were reared together in a plastic larval rearing container (19×14×4 cm) by using pieces of the maize or sugarcane cutting stems, depending on the treatment. Third instar larvae were placed individually in new larval rearing containers (3 cm diameter and 2 cm height). Fresh cutting stems of each treatment were supplied as needed until pupation occurred. Pupae were picked within 24 hours after pupation and sexed (Sreng, 1984) and kept individually until adult emergence. Larval and pupal containers were checked daily for recording development and survival of the individuals.

Based on the recorded data, incubation period, larval period and pupal period were determined for each studied individual. In addition, the developmental time of overall immature stages from the date of oviposition to the date of moth emergence were calculated based on recorded data in examined treatments.

Then newly emerged moths were paired and transferred to mating and oviposition jars. Survival and fecundity data were recorded daily until the death of all individuals. Egg masses laid at different times were kept separately until hatching to estimate the hatch rate of the eggs. Totally, taken data were regarding the number of eggs laid, the number of hatched eggs and the duration of each developmental stage of *S. cretica* on the two natural host plants. According to Tuan *et al.* (2014) the egg hatch rate varies with female age. Therefore, only hatched egg was used to determine age-specific female fecundity in the current study.

Life Table Data Analysis

The life table raw data of *S. cretica* individuals were analyzed by using the TWOSEX-MSChart computer program, (Chi, 2015), according to the age-stage two-sex life table theory (Chi and Liu, 1985) and the method described by (Chi, 1988).

The age-stage-specific survival rate (s_{xj}; where x= Age and j= Stage), which is the probability that a newly laid egg will survive to age x and stage j, and the age-stage-specific fecundity f_{xj}, which is the number of hatched eggs produced by female adult at age x were calculated. The age-specific survival rate l_x, and the age- specific fecundity m_x, as well as the population parameters, the intrinsic rate of increase r, the finite rate of increase λ, the net Reproductive rate R_0, and the mean generation Time (T), were estimated in sequence.

Age-specific survival rate (l_x) was calculated using the following equation (where m is the number of stages):

$$l_x = \sum_{j=1}^{m} s_{xj}$$

Age-specific fecundity (m_x) was calculated as follows:

$$m_x = \frac{\sum_{j=1}^{m} s_{xj} f_{xj}}{\sum_{j=1}^{m} s_{xj}}$$

The intrinsic rate of increase (r) was estimated by using the iterative bisection method from the Euler-Lotka equation with age indexed from zero (Goodman, 1982):

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

The net Reproductive rate (R_0) represents the mean number of offspring that an individual can produce during its lifetime and was calculated as follows:

$$R_0 = \sum_{x=0}^{\infty} l_x m_x$$

The finite rate of increase (λ) was calculated as follows:

$$\lambda = e^r$$

The mean generation time is defined as the period that a population needs to increase to R_0-fold of its size when time approaches infinity and the population reaches a stable age-stage distribution, and is calculated as follows:

$$T = \frac{\ln R_0}{r}$$

Age-stage-specific life expectancy (e_{xy}) is the time that an individual of age x and stage y is expected to live. This parameter was

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calculated according to the method described by Chi and Su (2006) as follows:

$$e_{xy} = \sum_{i=x}^{n} \sum_{j=y}^{m} s'_{ij}$$

Where s'_{ij} is the probability that an individual of age *x* and stage *y* will survive to age *i* and stage *j*. Fisher (1930) defined the reproductive value as the contribution of individuals of age *x* and stage *y* to the future population. According to Tuan *et al.* (2014), reproductive value in the age-stage, two-sex life table, was calculated using the following equation:

$$v_{xy} = \frac{e^{-r(x+1)}}{s_{xy}} \sum_{i=x}^{n} e^{-r(i+1)} \sum_{j=y}^{m} s'_{ij} f_{ij}$$

All life table parameters were estimated by using TWOSEX-MSChart software (Chi, 2015).

The bootstrap technique (Efron and Tibshirani, 1993; Yu *et al*., 2013) was used to estimate the variances, and standard errors of the population parameters. Because bootstrapping uses random sampling, a small number of replications will generate variable means and standard errors. To generate less variable results, we used 100,000 replications in this study.

The paired bootstrap test based on confidence interval (Efron and Tibshirani, 1993; Akca *et al.*, 2015; Reddy and Chi, 2015) was used to compare the difference in developmental time, adult longevity, Adult PreOviposition Period (APOP), Total PreOviposition Period (TPOP), oviposition period, and fecundity between treatments. The population parameters (*r*, λ, R_0, and *T*) between treatments were also compared by using the paired bootstrap test (Reddy and Chi, 2015).

RESULTS

Developmental Time and Fecundity

A number of 200 eggs (*N*) of *S. cretica* were used at the beginning of the life table study on each host plant. Out of 200 eggs, 185 eggs hatched on maize and 130 larvae successfully developed to pupa stage. Among 130 pupae, 113 pupae developed to adult stage. On sugarcane, the number of hatched eggs, completely developed larvae and pupae were 187, 147, and 136 individuals, respectively. Development times of egg, larva, pupa, and pre-adult stages of *S. cretica* on maize and sugarcane are presented in Table 1. *SEs* of the means for each developmental period was estimated using 100,000 bootstraps. Bootstrap paired test revealed a significant difference between means of developmental time of *S. cretica* on maize and sugarcane at 5% of probability level (Table 1). Development times of the larva, pupa, and pre-adult stages were higher on maize than sugarcane. Mean total development times of *S. cretica* on sugarcane was 12.44 days lower than that on maize.

Regarding adult stage, the male and female moths emerged earlier in sugarcane than maize. Females began oviposition at the

Table 1. Mean (±SE) developmental time of different immature stages of *Sesamia cretica* on maize and sugarcane.[a]

Developmental stages (Days)	Host plants			
	Maize		Sugarcane	
	n	Mean±*SE*	n	Mean±*SE*
Egg	185	5.03 ± 0.04[b]	187	5.38 ± 0.06[a]
Larva	130	36.20 ± 0.24[a]	147	24.24 ± 0.16[b]
Pupa	113	10.35 ± 0.12[a]	136	10.00 ± 0.07[b]
Preadult	113	51.95 ± 0.23[a]	136	39.51 ± 0.22[b]

[a] *SEs* were estimated by using 100,000 bootstraps. Means within rows followed by different letters are significantly different by using paired bootstrap test at *P= 5%.*

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38th and 49th days on sugarcane and maize, respectively. There was a bit of difference between Adult PreOviposition Period (APOP) on maize and sugarcane (Table 2). Despite this, Total PreOvipostion Period (TPOP) of *S. cretica* on sugarcane was clearly less than that on maize. The mean fecundity of moths was 142.88 eggs on sugarcane, significantly higher than that (118.04 eggs) on maize (Table 2).

According to the age-stage survival curve (Figure 1), the faster development of *S. cretica* on sugarcane could also be observed. The highest value for the age-stage survival rate of the male and female moths were 0.225 and 0.300 at 41 and 42 days, respectively on sugarcane; in contrast, values of the mentioned parameter for the male and female moth on maize were 0.135 and 0.235 both on the 54th day. Therefore, adult emergence on sugarcane was not only faster than maize, but survival rate of the male and female moth on sugarcane was also higher than for the latter. On the other hand, the female age-specific fecundity f_{xj} and age-specific fecundity m_x on sugarcane not only began much earlier (at the day 38th) than those on maize (at the day 49th) (Figure 2), but also were statistically significant.

The values of age-stage life expectancy of *S. cretica* on maize and sugarcane were 43.42 and 37.89 days, respectively at the age zero (Figure 3).

The reproductive values at the age zero (v_{01}) were 1.069 and 1.098 d^{-1} on maize and sugarcane, respectively. The values of the mentioned parameter at the age zero were equal to the finite rates of increase on the studied treatments (Figure 4). The values of

Table 2. Adult longevity, adult preoviposition period (APOP), total prepviposition period (TPOP), oviposition period and fecundity of *Sesamia cretica* on maize and sugarcane.[a]

Biological parameters	Host plants			
	Maize		Sugarcane	
	n	Mean±*SE*	n	Mean±*SE*
Female longevity (Day)	67	56.37 ± 0.32[a]	75	45.20 ± 0.29[b]
Male longevity (Day)	46	55.52 ± 0.41[a]	61	43.57 ± 0.31[b]
APOP (Day)	67	1.03±0.02[a]	75	1.00 ± 0.00[b]
TPOP (Day)	67	52.89 ± 0.28[a]	75	41.04 ± 0.29[b]
Oviposition period (Day)	67	2.17 ± 0.10[b]	75	3.07 ± 0.14[a]
Fecundity (Eggs)	67	118.04 ± 10.58[b]	75	142.88 ± 8.24[a]

[a] *SEs* were estimated by using 100,000 bootstraps. Means within rows followed by different letters are significantly different by using paired bootstrap test at *P= 5%*.

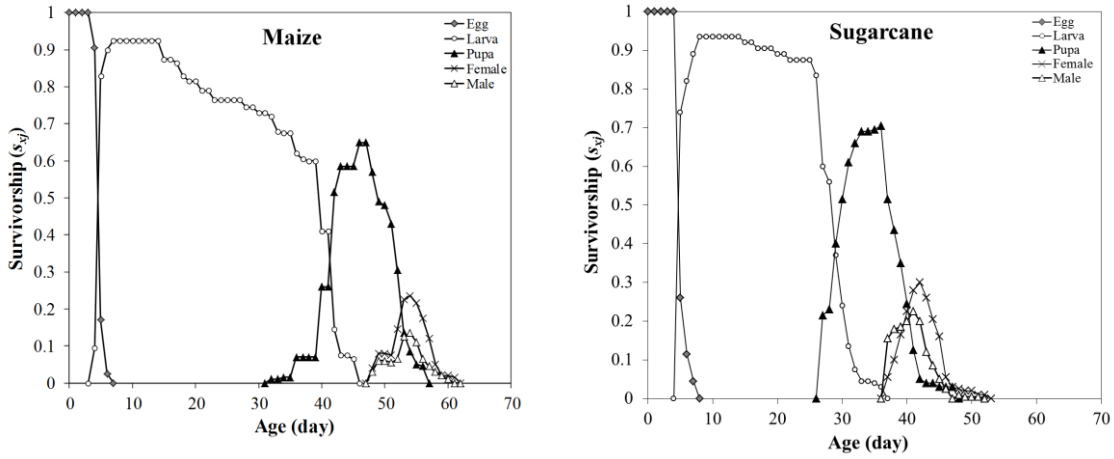

Figure 1. Age-stage survivorship (s_{xj}) of *Sesamia cretica* reared on maize and sugarcane.

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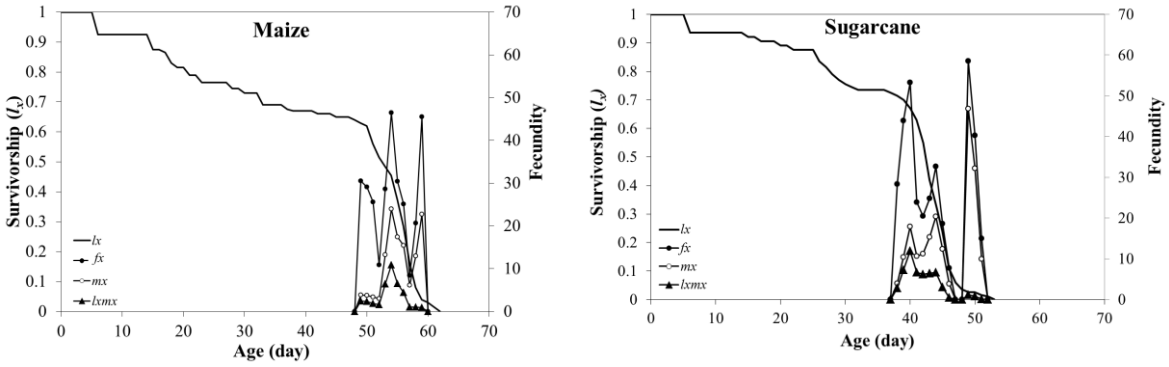

Figure 2. Age-specific survivorship (l_x,) age-stage fecundity (f_x) of the female stage, age-specific fecundity m_x, and age-specific maternity ($l_x m_x$) of Sesamia cretica reared on maize and sugarcane.

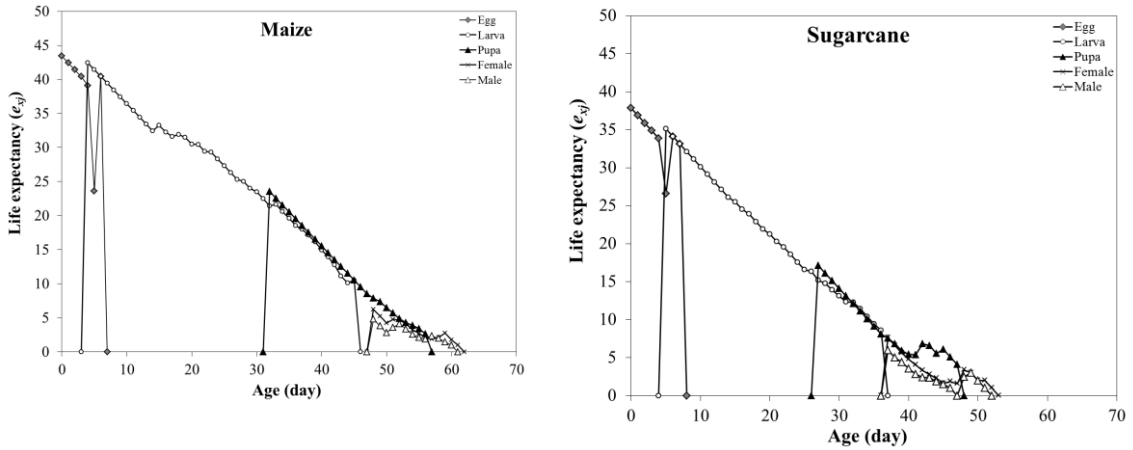

Figure 3. Age-stage specific life expectancy (e_{xj}) of *Sesamia cretica* reared on maize and sugarcane.

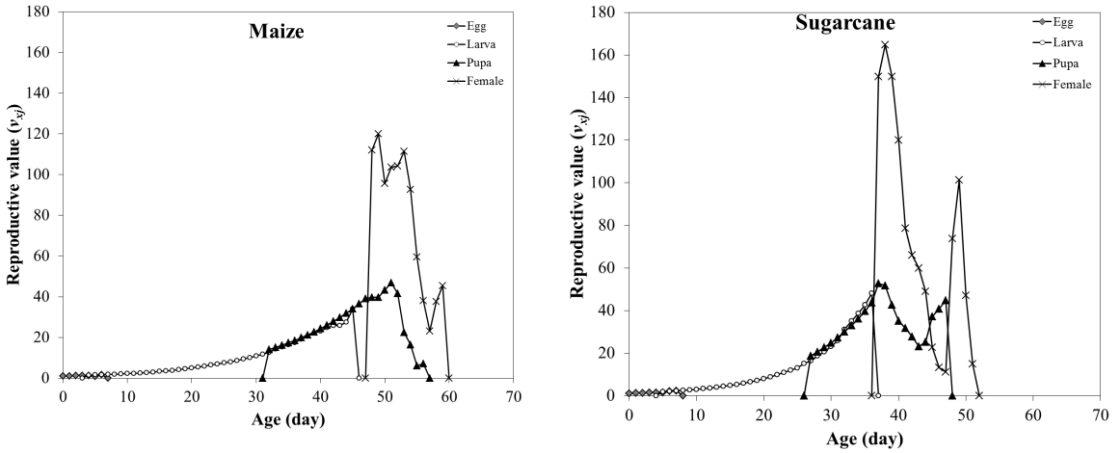

Figure 4. Reproductive value (v_{xj}) of each age-stage group of *Sesamia cretica* reared on maize and sugarcane.

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v_{xj} on sugarcane jumped to 164.72 d^{-1} on the 38th day, when female moths emerged; whereas the highest value of v_{xj} was 119.94 d^{-1} on the 49th day on maize.

The gross reproductive rate (GRR), net reproductive rate (R_0), intrinsic rate of increase (r), finite rate of increase (λ), and mean generation Time (T) of *S. cretica* are presented in Table 3. According to the paired bootstrap test, there was a significant difference between the values of the mentioned parameters of *S. cretica* on maize and sugarcane. However, sugarcane provided a better host than maize for population increase of *S. cretica*, considering all of the mentioned parameters (Table 3).

DISCUSSION

Due to the importance of maize and sugarcane, the effect of most planted cultivars of the mentioned crops on life table parameters of *S. cretica* was studied. Considering that the susceptibility of insects to environmental factors, natural enemies, pesticides (Chi, 1990; Greenberg *et al*., 2005; Barteková and Praslička, 2006; Yang and Chi, 2006; Atlihan and Chi, 2008; Wang *et al*., 2009), host plants (Morris and Miller, 1954; Chi, 1988; Yin *et al*., 2010) often varies depending on their developmental stage, information regarding the population parameters is critical to effective pest management (Chi, 1990). Moreover, the effect of host plants on life table parameters of herbivore insects were reported previously by many cited references (e.g. Goldasteh *et al.*, 2012; Goodarzi *et al.*, 2015; Reddy and Chi, 2015; Tazerouni *et al.* 2016). Food and temperature not only affect insect survival and development rate, but also fecundity and adult longevity (Shahout *et al*., 2011).

Previous studies regarding biological control of the sugarcane and maize stem borers, *Sesamia* spp., by using its specific egg parasitoid wasp, *T. busseollae*, have indicated that mass rearing of the mentioned egg parasitoid depends on mass rearing of *Sesamia* spp. (Ranjbar Aghdam and Kamali, 2002). According to Ranjbar Aghdam and Kamali (2002), larval period of *S. cretica* on maize and sugarcane was 17.44 and 21.16 days, respectively, at 29.5±0.5°C, 65% RH, and a photoperiod of 16:8h (L:D). Moreover, pupal period of the pink stem borer was 9.41, and 8.72 days at the mentioned environmental condition. Our findings regarding larval and pupal periods of the pink stem borer were more than Ranjbar Aghdam and Kamali (2002). This difference may rise due to difference in environmental temperature and planted cultivars. Previously, the effect of different temperatures on *S. cretica* was studied by Soltani Orang *et al.* (2014). Based on Soltani Orang *et al.* (2014), increasing temperature caused a decrease in development time of the pink stem borer.

To compare growth potential, the intrinsic rate of increase, finite rate, and net reproductive rate are usually used to show

Table 3. Life table parameters (mean±SE) of *Sesamia cretica* reared on maize and sugarcane.[a]

Life table parameters	Host plants	
	Maize	Sugarcane
	Mean±*SE*	MMean±*SE*
Gross reproductive rate (*GRR*) (Offspring)	126.18 ± 29.15[b]	193.96 ± 33.73[a]
Net reproductive rate (R_0) (Offspring)	39.54 ± 5.27[b]	53.58 ± 5.76[a]
Intrinsic rate of increase (r) (d^{-1})	0.0672 ± 0.0024[b]	0.0937 ± 0.0027[a]
Finite rate of increase (λ) (d^{-1})	1.0695 ± 0.0026[b]	1.0983 ± 0.0030[a]
Mean generation Time (T) (Day)	54.57 ± 0.29[b]	42.41 ± 0.27[a]

[a] *SEs* were estimated by using 100,000 bootstraps. Means within rows followed by different letters are significantly different by using paired bootstrap test at $P = 5\%$.

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the host suitability and environmental conditions (Greenberg *et al.,* 2001; Liu *et al.,* 2004; Jha *et al.,* 2012; Mehrkhou *et al,* 2012; Tuan *et al.,* 2014). In addition to the faster development, the intrinsic rate of increase, finite rate, and net reproductive rate of *S. cretica* on sugarcane were significantly higher than those reared on maize (Table 3). According to the relationship between the net Reproductive rate (R_0) and the mean female fecundity *F* was proven by Chi (1988) for the two-sex life table, in the current study all of the results for life table parameters of *S. cretica* on sugarcane and maize were consistent with this proven relationship.

The significant effect of host plants on life table parameters of different herbivorous species were shown by Golizadeh *et al.* (2009), Khanamani *et al*. (2013), Naseri *et al.* (2014) and Tazerouni *et al.* (2016), previously. Based on the obtained results here, it is confirmed that sugarcane is a better host for rearing the pink stem borer, *S. cretica* in comparison to maize; and population of the pest on sugarcane can increase rapidly, considering its demographic parameters on maize and sugarcane. This subject may cause the dominancy of this species in sugarcane fields of Iran in comparison to *S. nonagrioides.* Moreover, sugarcane can be considered as a better host for mass rearing of the pink stem borers than maize for biocontrol purposes.

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جمعیت نگاری مقایسه‌ای *Sesamia cretica* (Lepidoptera: Noctuidae) روی دو مورد از مهمترین میزبان‌های طبیعی آن، ذرت و نیشکر

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چکیده

فراسنجه‌های جدول زندگی ساقه‌خوار *Sesamia cretica* Lederer روی دو میزبان اصلی ذرت و نیشکر برآورد شدند. این پژوهش در شرایط دمای ۱±۲۷ درجه‌ی سلسیوس، رطوبت نسبی ۱۰±۵۰ درصد و دوره‌ی نوری ۲۴ ساعت تاریکی (بدون روشنایی) برای مرحله‌ی لاروی و ۱۶ ساعت روشنایی و ۸ ساعت تاریکی برای سایر مراحل زیستی اجرا شد. تجزیه‌ی فراسنجه‌های جدول زندگی بر اساس داده‌های به دست آمده از جدول زندگی دو جنسی انجام شد. برای برآورد میانگین فراسنجه‌های جدول زندگی و خطای استاندارد آنها از روش بوت‌استرپ استفاده شد. بر اساس نتایج به دست آمده، طول دوره‌ی مراحل نابالغ کرم ساقه‌خوار سزامیا روی ذرت و نیشکر به ترتیب ۵۱/۹۵ و ۳۹/۵۱ روز بود. همچنین طول دوره‌ی تخمریزی آن ۵/۰۳ و ۵/۳۸ روز، و میانگین میزان باروری آن به ترتیب ۱۱۸/۰۴ و ۱۴۲/۸۸ تخم تخمین زده شد. ارزش تولید مثلی افراد ماده روی میزبان‌های یاد شده در روزهای ۴۹ و ۳۸ به بیشترین مقدار خود رسید. نرخ خالص تولیدمثل (R_0)، نرخ ذاتی افزایش جمعیت (r) و نرخ متناهی افزایش جمعیت (λ) ساقه‌خوار *S. cretica* ، روی نیشکر به ترتیب ۵۳/۵۸ تخم، ۰/۰۹۳۷ بر روز، ۱/۰۶۹۵ بر روز و روی ذرت به ترتیب ۳۹/۵۴ تخم، ۰/۰۶۷۲ بر روز و ۱/۰۶۹۵ بر روز بود. میانگین طول نسل (T) ساقه‌خوار مورد بررسی روی نیشکر و ذرت به ترتیب ۴۲/۴۱ و ۵۴/۵۷ بود. در کل فراسنجه‌های جدول زندگی ساقه خوار سزامیا روی ذرت و نیشکر دارای اختلاف معنی‌داری بودند. بر اساس نتایج به دست آمده مشخص شد تولید مثل و افزایش جمعیت ساقه‌خوار سزامیا روی میزبان نیشکر بیشتر از ذرت می باشد.

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