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Influence of the Temperature Degrees on the Biological Aspects of Cotton Mealybug *Phenacoccus solenopsis* Tinsley, (Hemiptera: Pseudococcidae) on Hibiscus Plants

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ABSTRACT

The aim of this study shed light on the influence of two constant temperature degrees, 25±1°C, 30±1°C and fluctuate laboratory temperature ranged from 21.9±3.19°C to 31.7±3.91°C with an average of 26.8±3.5°C., on certain biological aspects of the cotton mealybug *Phenacoccus solenopsis* Tinsley (1989) (Hemiptera: Pseudococcidae). The results showed that the total life cycle of the *solenopsis* mealybug was shorter for females compared to males and it was significantly affected by the tested temperature degrees, the females lasted 17.0±1.8, 14.7±1.5 and 20.6±2.4 days at 25±1°C, 30±1°C and fluctuated temperatures 26.8±3.5°C, respectively, Whereas the male life cycle required 18.8±1.5, 15.9±2.1 and 21.9±2.9 days at 25±1°C, 30±1°C and 26.8±3.5°C, on the Hibiscus plant leave (China rose), *Hibiscus rosa-sinensis* L. respectively. The generation periods also significantly affected by the tested temperatures it was 28.2±3.0, 23.9±2.1 and 20.1±1.2 days for the insects reared at 25±1°C, 30±1°C and 26.8±3.5°C, respectively. Adult males lived shorter than females; the adult female's longevity required 24.9±2.2, 22.2±3.2 and 24.3±2.0 days at 25±1°C, 30±1°C and 26.8±3.5°C, respectively, while adult males longevity lasted 2.5±1.1, 2.3±0.9 and 2.3±0.8 days at 25±1°C, 30±1°C and 26.8±3.5°C, respectively. The fecundity of the *solenopsis* mealybug also significantly affected by the tested temperatures; the females laid 349.3±85.8, 382.0±49.9 and 309.8±69.0 Eggs/female at 25±1°C, 30±1°C and 26.8±3.5°C, respectively. Sex ratio between males and females of *P. solenopsis* are not affected by the different tested temperatures. From the obtained results, it could be concluded that the cotton mealybug, lasted short time for the development at constant temperature degree of 30±1°C than the other temperatures of 25±1°C and fluctuated temperature of 26.8±3.5°C.

Keywords: Cotton mealybug, *Phenacoccus solenopsis*, biology, temperature, Egypt.

INTRODUCTION

In view of potential threat of the cotton mealybug (CMB), *Phenacoccus solenopsis* Tinsley (Hemiptera: Pseudococcidae) to agricultural crops especially for cotton, the present studies were conducted to study the biology of the pest in the laboratory on Hibiscus plant leaves (a preferred host), Aheer *et al*. (2009). Hibiscus plant (*Hibiscus rosa-sinensis* L.*),* known as Chinese hibiscus, China rose or Shoe flower plant, an evergreen flowering shrub belonging to Family Malvaceae Order: Malvales used in home gardens, and attacked by the cotton mealybug which affecting on its growth and shape, Akintola and Ande (2008).

The cotton mealybug (CMB) recently emerged as a great threat for many agricultural crops particularly cotton. It has been recorded on about 100 plant species including vegetable crops, herbs, shrubs, fruits and ornamental plants, Aheer *et al*. (2009). *Phenacoccus solenopsis* first appeared on cotton in 2005 and caused serious damage in Sindh and Punjab districts of Pakistan and north-western India (Abbas *et al*., 2010). The mealybugs have also been found on a wide variety of host plants including economic species (Arif *et al*., 2012). Solenopsis mealybug was recorded as a polyphagous pest feeds on a wide range of plant species by Kumar and Kontodim, (2012). *P. solenopsis* was reported as a new insect pest of *Hibiscus rosa-sinensis* L. in Guangzhou city, which is the first report of this kind of pests in mainland China (Wu and Zhang, 2009). Also Akintola and Ande recorded Solenopsis mealybug on *Hibiscus sp.,* in Nigeria (2008).

In Egypt, An invasive mealybug *Phenacoccus solenopsis* has attacked cotton (*Gossypium hirsutum* L.) and caused great loss in the production of cotton in recent years. The first record of CMB *P. solenopsis* on some weeds was in (2010) by Abd–Rabou *et al*. While on tomato plants, *Lycopersicon esculentum* as a new tomato insect pest was reported by Ibrahim *et al*., (2015), also this insect was recorded on cotton crop *Gossypium hirsutum* L. during (2016) season by El-Zahi *et al.*, In Al-Fayoum Governorate the cotton mealybug was first record as a new pest on some vegetable crops i.e. pepper, eggplant, tomato and maize plants by Abd El-Wareth (2016), El-Sarand, (2017), recorded the cotton mealybug on soybean plants as first time.

The CMB insects caused serious damage to its host plants, the direct damages caused by feeding nymphal instars and adult stage of insect on the plant sap, also the insect cause indirect damages by secreting large amount of honeydew which help in growth of the black sooty mold and affecting on photosynthesis process in the plant leaves Arif *et al*., (2012). The cotton mealybug insects also playing a role in transmitting plant diseases to its host plants by Culik and Gullan, (2005).

The environmental temperature is the most effective weather factors that affecting on some biological aspects of the cotton mealybug. The decrease in incubation period from 32 hours to 19 hours at 20°C to 35°C, respectively and the duration of 1st instar was 8.31 and 3.32 days at 20°C and 35°C and 3.0 days at 40°C., found by Ali *et al*., (2012). Aheer *et al*. (3 2009) reported that eggs hatching time of CMB was 30-45 minutes and the duration of 1st nymphal instar at 25°C was 7 to 9 days. The prolonged duration at lower temperature and shortened at higher temperature found by Chong *et al*. (2008), Emana (2007), and Rees and Walker (1990). Decreased survival of the cotton mealybug at extremes temperature above 35°C and prolonged duration at low temperature was found by Duale (2005). Similarly, Piesik (2007) and Torrent and McCoy (1989) reported a decrease in survival of neonates from 60 days to 30 days at 30°C. They further concluded that temperature and photoperiod significantly affected larval body weight. Increase in damage to agricultural crops caused by CMB was observed due to increased environmental temperature, Gandolofo *et al*. (2008) and Child (2007).

Therefore, the present study was conducted to evaluate the influence of three temperature degrees on certain biological aspects of CMB that was achieved in the laboratory, so that the generated information may be help in formulate the management programs of the pest.

MATERIALS AND METHODS

Sources of insect:

All biological studies on the cotton mealybug *Phenacoccus solenopsis* Tinsley were achieved in the laboratory of Economic Entomology Department, Faculty of Agriculture, Damietta University. Colonies of *P. solenopsis* were collected from cotton fields free from

chemical pesticides, at the Station of Agricultural Research, Kafr El-Sheikh, during August 2018.

Insect rearing:

The biological studies were extended from beginning of September to end of November 2018, to study the influence of two constant temperature degrees of 25±1°C and 30±1°C and laboratory fluctuate temperature ranged from 21.9±3.19°C to 31.7±3.91°C with an average of 26.8±3.5°C., on certain biological aspects of CMB, Chinese hibiscus (*H. rosa-sinensis L.*) leaves were used for feeding the insect in this study and the hibiscus leaves were changed within every 3 days.

To rearing the various nymphal instars and adult stage of CMB and carry out further biological studies in the laboratory, Plastic Petri dishes (8 cm in diameter) were used, each Petri dish containing single plant leaf. Hibiscus leaves free from chemical pesticide and the infestation with mealybug carefully washed with tap water and shade dried then placed in Petri dishes to use as a food source for all various insect stages.

To prevent leaf desiccation bases of leaves petiole individually covered using a water soaked cotton swab. Obtained samples of mealybugs used in the study were identified as *P. solenopsis* by the Insect Identification Service of Agricultural Research Institute, Cairo, Egypt. The biological data of various stages or instars of the insect observed and recorded daily until they became adults using stereoscopic microscope.

Nymphs moulting and the duration of immature stages were daily observed and recorded, the emerged adults of both males and females were observed to determine the adult longevity, the pre-oviposition period, oviposition period, post-oviposition period and fecundity of females.

To determine the sex ratio of CMB (100 newly hatched nymphs) were reared up to 3rd nymphal instar at the three tested temperatures. The 3rd nymphal instar of males forming white cocoons, while in the case of females the 3rd nymphal instar doesn't forming the same cocoons, so it is easy to separated males and females and determine the sex ratio.

Statistical analysis

One-way analysis of variance (ANOVA) in SPSS system was performed to determine the effect of the tested temperatures on the development durations of different instars of the cotton mealybug and to compare the significance between the means Duncan's Multiple Range Test (Duncan 1955) at 0.05 probability level was used.

RESULTS AND DISCUSSION

The results in Table (1), revealed that the cotton mealybug *Phenacoccus solenopsis* during its growth passed through different stages, male and female are not equal in numbers of moulting and nymphal duration, the female nymph's moulte three times and males four times. In male insects, the egg, 1st instar, 2nd instar, pre-pupae, pupae and adult male appeared, while in female, egg, 1st instar, 2nd instar, 3rd instar and adult female stages were appeared. There was no pupal stage in female specimens.

Table 1. Influence of the laboratory fluctuated temperature and two constant temperature degrees on immature stages and the life cycle of the cotton mealybug *P. solenopsis* reared on Hibiscus plant leaves.

Temperature degrees	Egg + I Instar	II Instar	Female III Instar	Female life cycle	Male pupa III +IV Instars	Male life cycle
Fluctuated temp. with average 26.8±3.5°C	6.5±1.4 a	7.8±1.3 a	6.3±1.0 a	20.6±2.4 a	7.7±1.4 a	21.9±2.9 a
Constant temp. 25±1°C	5.6±0.9 b	6.3±0.8 b	5.2±0.9 b	17.0±1.8 b	6.9±1.0 a	18.8±1.5 b
Constant temp. 30±1°C	4.8±0.8 c	5.3±1.0 c	4.6±0.7 b	14.7±1.5 c	5.8±1.5 b	15.9±2.1 c
L.S.D 5%	0.89	0.85	0.73	1.58	1.11	1.85

Means with the same letter in a column are not significantly different (P= 0.05; Duncan's Multiple Range Test) Duncan, 1955

Combined Egg and First instar

The results in Table (1) revealed that the nymphal period of CMB that reared on hibiscus plant leaves significantly affected by the two tested constant temperature degrees, 25±1°C and 30±1°C and laboratory fluctuated temperature 26.8±3.5°C. The data indicated that the combined egg incubation period and 1st instar nymph was decreased at higher temperatures as compared to the lower temperatures. The duration of combined egg incubation period and 1st instar nymph under two constant temperatures and laboratory fluctuated temperatures of 25±1°C, 30±1°C and 26.8±3.5°C, required 5.6±0.9, 4.8±0.8 and 6.5±1.4 days respectively. Thus increase in temperature resulted in rapid growth of cotton mealybug.

Similar results were reported by Ali *et al.*, (2012), who found that the decrease in incubation period from 32 hours to 19 hours at 20°C to 35°C, respectively and the duration of 1st instar was 8.31 and 3.32 days at 20°C and 35°C while, just 3.0 days recorded at 40°C. Also the results in agreement with Aheer *et al*. (2009) they reported that eggs hatching time of CMB was 30-45 minutes and the first instar lasted 7 to 9 days at 25°C. Also similar results were found by Chong *et al*. (2008), Emana (2007), Duale (2005) and Rees and Walker (1990) they found prolonged duration at lower temperature and shortened at higher temperature. Similarly, Piesik (2007) and Torrent and McCoy (1989) reported a decrease in survival of neonates from 60 days to 30 days at 30°C. They further concluded that temperature and photoperiod significantly affected larval body weight. Gandolofo *et al*. (2008) and Child (2007) reported that increase in damage to agricultural crops was observed due to increased environmental temperature. Anonymous, (2008), recorded that the egg incubation time lasted 4 to 6 hours.

Second nymphal instar

The 2nd nymphal instar under constant and laboratory fluctuated temperatures required 6.3±0.8, 5.3±1.0 and 7.8±1.3 days at 25±1°C, 30±1°C and 26.8±3.5°C, respectively, and it was the longest nymphal instar of *P. solenopsis*, Table (1). These results revealed that life duration of 2nd instars both male and female, decreased as the temperature increased. Thus increase in temperature resulted in rapid growth of cotton mealybug at 2nd instar of both the sexes.

The results were agreed with Hodgson *et al*. (2008) and Ali *et al.*, (2012), they found that the duration of 2nd instar of the cotton mealybug varied at different temperatures and relative humidity. The duration of 2nd instar was 4.6 days at 20°C., which gradually reduced to 3.0 days at 40°C.

Third nymphal instar

The nymphs of males and females of CMB can be distinguished after 2nd instar onwards. The 3rd nymphal instar

of males formed a cylindrical silken cocoon, but females didn't formed white cocoon. The 3rd nymphal instar which the last nymphal instar for female under constant and laboratory fluctuated temperatures required 5.2±0.9, 4.6±0.7 and 6.3±1.0 days at 25±1°C, 30±1°C and 26.8±3.5°C, respectively, the period that recorded in the 3rd instar was similar to the 1st instar Table (1). The data indicated that the duration of the 3rd nymphal instar was decreased at higher temperatures as compared to the lower temperatures.

The obtained data are agreed with Ali *et al.*, (2012); they showed that the 3rd instars appeared only in the female specimens while in male specimens pupae were formed. The duration of 3rd instar was 7.42 days at 20°C and 6.92 days at 25°C. It gradually decreased to 2.42 days at 40°C. Aheer *et al.* (2009) showed that 3rd nymphal instar of female required about 6.5 - 8.0 days at 25°C to complete. Hodgson *et al.* (2008) conducted studies on *P. solenopsis* and found similar results. Duale (2005) who reported that low temperature resulted in longer development period.

Male-Pupal stage

The data indicated that the duration of male pre-pupa and pupa (combined 3rd and 4th instars) recorded as pupale stage was decreased at higher temperatures as compared to the lower temperatures, it was lasted 6.9±1.0, 5.8±1.5 and 7.7±1.4 days under constant and laboratory fluctuated temperatures of 25±1°C, 30±1°C and 26.8±3.5°C, respectively then the adult male emerged.

The present studies are agreement with thus obtained by Aheer et al. (2009) they found that male pupae were formed after 2nd instar and pupal duration was 7 to 8 days at 25°C. Also, Ali et al., (2012), showed that the period of pupal stage decreased from 9.57 days to 3.78 days at 20°C and 35°C, respectively. No male emerged at 40°C with 40±5% RH due to high temperature and low humidity. According to Punzo and Mutchmor (1980) high temperature and low RH resulted in increased mortality in young nymphs and pupal stage at extreme of temperature and relative humidity due to desiccation and inability to moult.

The total life cycle

The total life cycle duration of CMB both sexes male and female (it was calculated from the egg lying to appear the adult stage) significantly affected by the two tested constant temperatures and the laboratory fluctuated temperatures, the female life cycle required 17.0±1.8, 14.7±1.5 and 20.6±2.4 days at 25±1°C, 30±1°C and 26.8±3.5°C, respectively. Whereas the male life cycle required 18.8±1.5, 15.9±2.1 and 21.9±2.9 days at 25±1°C, 30±1°C and 26.8±3.5°C, respectively, Table (1). The obtained results showed that decrease in temperature increased the total life cycle and increase in temperature decreased the duration of total life cycle.

Although, the average of laboratory fluctuated temperature of 26.8±3.5°C is higher than the constant temperature of 25±1°C, the duration of the total life cycle was longer at the laboratory fluctuated temperature; these findings may be due to the differences between the maximum temperature at light and the minimum of temperature at night, (the daily range of temperature).

These results confirm the findings of Ali et al., (2012), they reported that total nymphal stage duration varied significantly with increase in temperature and relative humidity. At 40°C only ten days were required to complete the development of insects. The duration of total nymphal stage was 23.64 days at 20°C, 22.14 days at 25°C and decreased to 10.0 days at 40°C. These results also are agreement with Kamariya (2009), who recorded that the three nymphal instars of female lasted 4.82 ± 1.12, 5.64 ± 1.14 and 6.42 ± 1.14 days for the 1st, 2nd and 3rd nymphal instars respectively. The developmental time for the 1st, 2nd and 3rd nymphal instars of CMB reared on hibiscus plant were 6, 8 and 10 days respectively, Akintola and Ande (2008).

The generation period of CMB (calculated from the egg to the egg laying in the offspring) significantly affected by the two tested constant and the laboratory fluctuated temperatures. The generation period was 28.2±3.0, 23.9±2.1 and 20.1±1.2 days for the insects reared at 25±1°C, 30±1°C and 26.8±3.5°C, respectively. The data indicated that duration of generation was decreased at higher temperatures as compared to the lower temperatures Table (2).

These findings are in agreement with Ali et al., (2012), they reported that the total nymphal stage period varied significantly with increase in temperature and relative humidity. At 40°C only ten days were required to complete the development of insects. The duration of total nymphal stage was 23.64 days at 20°C, 22.14 days at 25°C and decreased to 10.0 days at 40°C.

Table 2. Influence of the laboratory fluctuated temperature degree and two constant temperature degrees on the ovipositional periods, adult longevity, female's fecundity and sex ratio of the cotton mealybug *P. solenopsis* adults reared on Hibiscus plant leaves.

Biological aspects	Temperature degrees			L.S.D 5 %
	Laboratory fluctuated temp. 26.8±3.5°C	Constant temp. 25±1°C	Constant temp. 30±1°C	
Pre- oviposition period	7.6±1.0 a	6.9±1.3 a	5.4±0.9 b	0.9
Oviposition period	9.8±1.2 a	11.3±1.4 b	10.6±2.5 b	1.48
Post- oviposition period	7.0±1.3 a	6.8±1.4 a	6.2±1.1 a	1.06
Female long. (d)	24.3±2.0 a	24.9±2.2 a	22.2±3.2 b	2.12
Male long. (d)	2.3±0.8 a	2.5±1.1 a	2.3±0.9 a	0.76
Generation period	28.2± 3.0	23.9±2.1	20.1±1.2	1.83
Female life span	44.9±3.5 a	41.9±2.1 b	36.8±2.7 c	2.35
Male life span	24.2±2.9 a	21.3±2.0 b	18.2±2.0 c	1.95
Fec./ female (n)	309.8±69.0 a	349.3±85.8 a	382.0±49.9 b	57.96
Sex ratio (♀:♂)	01:00.3	01:00.3	01:00.3	-

Means with the same letter in a rows are not significantly different (P= 0.05; Duncan's Multiple Range Test) Duncan, 1955

From the obtained results the adult longevity duration of the CMB was significantly affected by the tested temperatures. The pre-oviposition period for the insects reared on the Hibiscus plant leaves under the constant temperatures of 25±1°C and 30±1°C required 6.9±1.3 and 5.4±0.9 days, while 7.6±1.0 days was required for the insects reared at the laboratory fluctuated temperatures of 26.8±3.5°C, The same trend of data shown in the pre-oviposition period was observed in the oviposition period; the oviposition periods were 11.3±1.4, 10.6±2.5 and 9.8±1.2

days for the adults reared at 25±1°C, 30±1°C and 26.8±3.5°C, respectively Table (2). The fecundity of the cotton mealybug through the oviposition period were 349.3±85.8, 382.0±49.9 and 309.8±69.0 Eggs/female in average for the adults reared at 25±1°C, 30±1°C and 26.8±3.5°C, respectively. The post-oviposition period also takes the same trend, 6.8±1.4, 6.2±1.1 and 7.0±1.3 days were required for the CMB adults reared at 25±1°C, 30±1°C and 26.8±3.5°C, respectively.

The obtained results are agreement with Kamariya (2009), who found that the average of pre-oviposition, oviposition and post-oviposition periods were, recorded as 4.32 ± 0.8, 8.0 ± 0.82 and 2.72 ± 0.79 days, respectively. The average egg laying capacity of the female was 427.68 ± 86.69 eggs. The average longevity of female adults was 13 to 18 days with an average of 15.52 ± 1.42 days. Also, Anonymous, (2008), recorded that the fecundity of mealybug was observed as 310-625 eggs/ female with average of 470 eggs/ female. 98-239 nymphs were observed in an ovisac. In the present study majority of observations are match with the biological features about 150-600 eggs were found in an ovisac.of *P. solenopsis* on *Hibiscus rosa-sinenesisas* explained by Akintola and Ande (2008) from Nigeria and with the observations of Vennila *et al.* (2010) in cotton plants in India. Shoe flower and cotton and some of the other preferred hosts which are agricultural crops are of Family Malvaceae. Therefore the results would be comparable to other crops and weeds act as host of *P. solenopsis*. According to Ali *et al.*, (2012), the fecundity was reduced with increase in temperature and at 40°C no egg was produced due to high temperature.

From the previous results males of CMB lived shorter than females, female lived 24.9±2.2, 22.2±3.2 and 24.3±2.0 days at 25±1°C, 30±1°C and 26.8±3.5°C, respectively. Whereas males lived 2.5±1.1, 2.3±0.9 and 2.3±0.8 days at 25±1°C, 30±1°C and 26.8±3.5°C, respectively, Table (2).

The results are in agreement with Anonymous, (2008) who recorded those males of CMB lived for 3 to 5 days because they haven't functional mouthparts. While, female adult survived for 30 to 48 days (Average 40.7 days). Also, Ali *et al.*, (2012), found that the adult female's duration differed at different temperatures and relative humidity. It was 60.57 days at 20°C; which continued to decrease with rise in temperature and reached to 7.0 days at 40°C. The duration of adult male was 1.92 days at 20°C, 1.85 days at 25°C and it gradually decreased to 0.78 days at 35°C. It did not emerge from pupae at 40°C. Further, adult male taken from field population, was paired at this temperature. The adult died without successful mating to female specimen. Aheer *et al*. (2009) also reported that adult male survived 1-2 days at 25°C with 75% RH.

The effect of different constant and laboratory fluctuated temperatures on CMB appeared clearly in the total life span for males and females (it was calculated from the egg laying to death of the adult stage). The short life span of *P. solenopsis* was recorded at 30±1°C it was 36.8±2.7 and 18.2±2.0 days for females and males respectively, whereas the long life span was recorded at laboratory fluctuated fluctuated temperatures of 26.8±3.5°C it was 44.9±3.5 and 24.2±2.9 days for females and males respectively. While the moderate duration for life span was recorded at 25±1°C it was 41.9±2.1 and 21.3±2.0 days for females and males respectively, Table (2).

These findings are in conformity with those of Ali *et al.*, (2012) they reported thus lower temperatures prolonged life span of the pest as compared to the higher temperatures.

Sex ratio between females and males of *P. solenopsis* reared on Hibiscus plant leaves not affected by the tested temperatures of 25±1°C, 30±1°C and 26.8±3.5°C, it gives similar percentage of sex ratio. Culture revealed that out of 100 third instar nymphs for different temperatures of 25±1°C, 30±1°C and 26.8±3.5°C, 80, 78 and 79 were females and 20, 22 and 21 were males respectively. Thus female to male ratio was 1: 0.25, 1: 0.28 and 1: 0.27 (♀:♂) Table (2).

The similar findings were obtained by Prishanthini and Vinobaba (2009), they showed that sex ratio of *P. solenopsis* females to males was 1: 0.21 (♀:♂).

Although, the average of laboratory fluctuated temperature 26.8±3.5°C is higher than the constant temperature of 25±1°C, the duration of immature developmental period and the total life span was longer at the laboratory fluctuated temperature these findings may be due to the differences between the maximum temperature at light and the minimum of temperature at night, (the daily range of temperature) Tables (1 and 2).

In general, statistical analysis indicated that the immature developmental period and total life span of both sexes of the cotton mealybug, were significantly affected by the tested temperatures and it was faster at warm temperatures. Thus, the obtained results are of most importance in the integrated management programs to avoid the spread and potential risk of this insect.

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تأثير درجات الحرارة على الخصائص البيولوجية لبق القطن الدقيقى ,*Phenacoccus solenopsis* Tinsley على نباتات الهبسكس

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تهدف هذة الدراسة الى تسليط الضوء على تأثير إثنتين من درجات الحراره الثابتة 25±1°م و30±1°م ودرجة حرارة المعمل المتغيره بمدى 21.9±3.19°م إلى 31.7±3.91°م بمتوسط 26.8±3.5°م على بعض خصائص بق القطن الدقيقى البيولوجية. حيث أوضحت النتائج أن إجمالى دورة حياة حشرة بق القطن الدقيقى بالنسبة للأناث كانت اقصر عند مقارنتها بالذكور، وكان لدرجات الحرارة تأثيراً معنوياً على دورة حياة الحشرة، وكانت الإناث قد إستغرقت 17.0±1.8، 14.7±1.5 و 20.6±2.4 يوماً على درجات حرارة 25±1°م، 30±1°م و26.8±3.5°م على التوالى. بينما إستغرقت دورة حياة الذكور 18.8±1.5، 15.9±2.1 و21.9±2.9 يوماً على درجات حرارة 25±1°م، 30±1°م و26.8±3.5°م على التوالى وذلك على أوراق نبات الهبسكس (الورد الصينى). وكانت فترة الجيل قد تأثرت معنوياً بدرجات الحرارة المختبرة وكانت فترة الجيل 28.2±3.0، 23.9±2.1 و20.1±1.2 يوماً على درجات حرارة 25±1°م، 30±1°م و26.8±3.5°م على التوالى. وقد لوحظ أن الذكور البالغة عاشت فترة أقصر مقارنةً بالإناث ، حيث عاشت الإناث البالغة 24.9±2.2، 22.2±3.2 و24.3±2.0 يوماً على درجات حرارة 25±1°م، 30±1°م و26.8±3.5°م على التوالى، بينما وجد أن الذكور البالغة عاشت 2.5±1.1، 2.3±0.9 و2.3±0.8 يوم على درجات حرارة 25±1°م، 30±1°م و26.8±3.5°م على التوالى. كما اتضح أن الخصوبة لإناث بق القطن الدقيقى أيضاً قد تأثرت ولكن تأثيراً غير معنوياً بإختلاف درجات الحرارة ، فوجد أن الإناث وضعت 349.3±85.8 ،382.0±49.9 و309.8±69.0 بيضة/الأنثى على درجات حرارة 25±1°م، 30±1°م و26.8±3.5°م على التوالى. وإتضح أن النسبة الجنسية بين إناث وذكور حشرات بق القطن الدقيقى لم تتأثر بإختلاف درجات الحرارة. و يمكن أن نستخلص من تلك النتائج السابقة أن حشرات بق القطن الدقيقى إستغرقت وقت أقصر لتطورها على درجة الحرارة 30±1°م مقارنة مع 25±1°م و 26.8±3.5°م.