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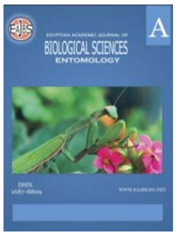

Some Biological Aspects of the Two-Spotted Spider Mite, *Tetranychus urticae* Koch, (Acari: Tetranychidae) at Constant Temperatures

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ABSTRACT

Biology of the two spotted spider mite, *Tetranychus urticae* Koch was studied at constant temperatures of 26º and 30ºC. A temperature of 30º was found to be the most favorable temperatures for the development and multiplication of this pest. Threshold temperatures (t_0) of 12.87º, 12.92º, 9.45º, and 13.94 ºC were calculated for the egg, larvae, protonymph and deutonymphal stages, respectively. Based on these thresholds the stages respectively needed about 63.35, 26.81, 30.95, and 26.17 day-degrees to complete their development. Thermal units required to develop one generation of this pest was about 146.48 day-degrees using 12.50ºC as a base temperature.

INTRODUCTION

The two-spotted spider mite, *Tetranychus urticae* Koch, (Acari: Tetranychidae) is an important pest of a variety of agricultural crops (Jeppson, 1975 and Saeidi *et al*., 2010). Adults and immatures feed primarily on leaves producing tiny gray or silvery spots known as stippling damage. Damage to the leaves inhibits photosynthesis, and severe infestations can result in premature leaf fall, shoot dieback, and decreased plant vigor (Zhang, 2003). High infestation can also result in feeding and damage. This mite has been reported to attack about 1200 species of plants, of which more than 150 are economically significant (Zhang, 2003), currently, the cost of their use to counter spider mite damage exceeds U S D $ 1 billion per year in the European Union due to the excessive use of pesticides and the associated problems of resistance and environmental pollution.

Temperature is usually the environmental factor with the greatest effect on developmental rate of immature mites. To quantify the effect of temperature on mite development, life stages of a species may be held at constant temperatures and the resultant development times can be used to estimate developmental rate curves (Southwood, 1978). From these developmental rate curves, models can be formulated to predict development time as a function of temperature. These models are useful in making pest management decisions, or to be used as components of more comprehensive models for the investigation of population dynamics. Several studies have investigated the effects of temperature on development and reproduction of tetranychid mites on different host plants, such as *T. urticae* on cotton (Carey and Bradley, 1982), *Tetranychus piercei* McGregor on banana (Yueguan *et al*., 2002), *Tetranychus truncates* Ehara on mulberry (Sakunwarin *et al*., 2003), Thus, the objective of this study was to determine some biological aspects of the read spider mite at constant temperatures under laboratory conditions.

MATERIALS AND METHODS

The present investigation was carried out to determine the effect of constant temperatures of 26º and 30ºC on the development of the immature stages of the read spider mite, *T. urtucae* as well as on the adult fecundity and longevity.

Rearing technique

The experimental mites were obtained from caster leaves *Ricinus communis* L. from the farm of Agricultural Cairo University. *T. urticae* were reared in the laboratory on fresh leaves of Acalypha, *Acalypha marginates* for one generation under laboratory condition before the experiments to establishment the mite.

Simply, by collecting severely infested caster leaves *Ricinus communis* L. by egg and larvae of this pest. Individuals of 20 eggs *T. urticae* were transferred to Acalypha, leaf discs (2×5cm diameter) placed on cotton bed in Phil dishes (20×15 cm). The cotton bed was kept wet by soaking with water twice daily So that the discs remained fresh.

Effect of temperature on preimaginal development

Egg stage

Eggs were deposited singly inside the tissue of leaves and the eggs transferred individuals to the disc (2×2 cm), and kept under two temperatures degrees 26ºC and 30ºC and 65±5% R.H. The rearing discs were checked twice daily.

A number of 100 eggs in four replicates were exposed to each temperatures mentioned above. Incubation period and hatchability were recorded.

Larval stage

Larvae (< 24 hrs old) were distributed individually in Pitri-dishes provided with plant leaves. At least 100 larvae in ten replicates individually were exposed to each temperatures regime. Leaves were checked and changed daily up to deutonymphal stage. The time required for the development was recorded.

Protonymphal stage

Protonymph (< 24 hrs old) were distributed individually in Pitri-dishes provided with plant leaves. At least 100 larvae in four replicates were exposed to each temperatures regimes. Leaves were checked and changed daily up to deutonymphal stage. The time required for the development was recorded.

Deutonymphal stage

In the case of deutonymphal stage, exactly 100 of protonymphal stage (less than 12 hrs. old) in four replicates were exposed to above mentioned temperatures regimes. Each 25 individuals were placed in disk mentioned above. The observation was made daily until the adults emerged.

Adult stage

Newly emerged adults mites (less than 12 hrs. old) were paired in cages. The cages were provided with castor plants as oviposition site. Fifty pairs of adults were reared at each temperature. The cages were inspected daily to observe the oviposition periods. The number of eggs laid and the longevity of adults were also recorded.

Statistical analysis

Time required for the development and survival of each stage were recorded. Data were subjected to statistical analysis using t-test and means were compared according to Duncan's multiple range test of significances at 0.05 level of probability.

Developmental thresholds (t_o) and thermal units (Day- degrees) required for the development of immature stages of the pest were calculated according to Mangat (1977). Briefly, the day-degrees corresponding to various base lines are plotted graphically. The point of intersection represents the best estimate of thermal threshold and thermal units necessary for development.

RESULTS AND DISCUSSION

The present investigations were oriented to study the effect of constant temperature regimes of 26º and 30ºC on the development of the immature stages of *T. urticae* to determine the developmental threshold (t_0) and thermal units (day-degrees) needed for the development of the immature stages as well as the adult reproductive potential (longevity and fecundity) of red spider mite, *T. urticae*.

The results indicate that the pest developed successfully from egg to adult emergence over the temperatures ranged from 26º to 30ºC. The duration of the immature stages under different constant temperatures are given in Table 1. Using these data Table 2 was constructed showing the number of day-degrees which must accrue at different temperature thresholds for comparable development.

Egg stage

As shown in Table 1, the time required for completion of embryogensis decreased gradually as temperature increased from 26º to 30ºC. The incubation period of the pest lasted 4.76±0.55 and 3.66±0.29 days at the constant temperatures of 26º and 30ºC, respectively. Apparently, there were significant differences in the incubation periods at the tested temperatures. The longest incubation period was recorded at 26º but the shortest one was revealed at 30ºC.

Data in Table 1 were used to calculate the developmental threshold (t_0) and the thermal units (DD) necessary for the development of egg stage of the pest. A temperature developmental threshold for egg stage was found to be 12.87ºC. Consequently the thermal units needed to complete its development were about 63.35 day-degrees (Table3).

Larval stage

The larval durations tended to be shortened with the corresponding of temperature. The results in Table 1 show the average duration of larval stage of *T. urticae*. Means of 2.05±0.22 and 1.57±0.15 days were recorded at temperatures of 26º and 30ºC, respectively. Statistical analysis of the data showed that significant differences between values of mean durations at the tested temperatures.

Table 1: Mean number of days (±SE) required for the immature development of *T. urticae* reared at constant temperatures of 26 and 30ºC.

Temp. (ºC)	Duration (in days) ±SE				
	Egg	Larvae	Protonymph	Deutonymph	Total
26	4.76±0.55a	2.05±0.22a	1.87±0.27a	2.17±0.19a	10.85±0.65a
30	3.66±0.29b	1.57±0.15b	1.51±0.23b	1.63±0.16b	8.37±0.61b

Means followed by the same letters vertically are not significantly different at 0.05 level of probability.

The calculated temperature threshold (t_0) for the larval stage was 12.92ºC, consequently, this stage required about 26.81 day-degrees to complete its development (Table 2).

Protonymphal stage

The duration of the protonymphal stage is shown in Table 1. Results show that the protonymphal stage lasted 1.87±0.27 and days at 26º and 30ºC, respectively. The longest period was recorded at 26ºC, while the shortest was observed at 30ºC. This results seems to be logic, since the duration of any developmental stages or/and physiological process are negatively correlated with the corresponding temperature within the tolerant zone of temperatures. Statistical analysis of the data showed significant differences between the duration of the protonymphal stage at all tested temperatures.

Table 2: Number of day degrees (DD) required for the development of egg, larvae, protonymph, deutonymph and total immature stage of *T. urticae* using hypothetical temperature thresholds below under rearing temperatures of 26 and 30ºC.

Temperature thresholds (to)	Day degrees (DD)									
	Egg		Larvae		Protonymph		Deutonymph		Total	
	26º (4.76)	30º (3.66)	26º (2.05)	30º (1.57)	26º (1.87)	30º (1.51)	26º (2.17)	30º (1.63)	26º (10.85)	30º (8.37)
5	99.96	91.50	43.05	39.25	39.27	37.75	45.57	40.75	227.85	209.25
6	95.20	87.84	41.00	37.68	37.40	36.24	43.40	39.12	217.00	200.88
7	90.44	84.18	38.95	36.11	35.53	34.73	41.23	37.49	206.15	192.51
8	85.68	80.52	36.90	34.54	33.66	33.22	39.06	35.86	195.30	184.14
9	80.92	76.86	34.85	32.97	31.79	31.71	36.89	34.23	184.45	175.77
10	76.16	73.20	32.80	31.40	29.92	30.20	34.72	32.60	173.60	167.40
11	71.40	69.54	30.75	29.83	28.05	28.69	32.55	30.97	162.75	159.03
12	66.64	65.88	28.70	28.26	26.18	27.18	30.38	29.34	151.90	150.66
13	61.88	62.22	26.65	26.69	24.31	25.67	28.21	27.71	141.05	142.29
14	57.12	58.56	24.60	25.12	22.44	24.16	26.04	26.08	130.20	133.92
15	52.36	54.90	22.55	23.55	20.57	22.65	23.87	24.45	119.35	125.55
16	47.60	51.24	20.50	21.98	18.70	21.14	21.70	22.82	108.50	117.18
17	42.84	47.58	18.45	20.41	16.83	19.63	19.53	21.19	97.65	108.81
18	38.08	43.92	16.40	18.84	14.96	18.12	17.36	19.56	86.80	100.44
19	33.32	40.26	14.35	17.27	13.09	16.61	15.19	17.93	75.95	92.07
20	28.56	36.60	12.30	15.70	11.22	15.10	13.02	16.30	65.10	83.70

Table 3 shows the estimated temperature threshold of protonymphal stage development as 9.45ºC. The thermal unit required for the protonymphal stage to complete its development was 30.95 day-degrees.

Deutonymphal stage

The duration of the deutonymphal stage is shown in Table 1. Results show that the deutonymphal stage lasted 2.17±0.19 and 1.63±0.16 days at 26º and 30ºC, respectively. The longest period was recorded at 26ºC, while the shortest was observed at 30ºC. Statistical analysis of the data showed significant differences between the duration of the deutonymphal stage at all tested temperatures.

Table 3 shows the estimated temperature threshold of deutonymphal stage development as 13.94ºC.

Table 3: Regression equations expressing developmental thresholds and thermal units needed for the development of different immature stages of *T. urticae* reared at constant temperatures of 26 and 30ºC.

Stage	Temperature	Regression equations	(t_o)	(DD)
Egg	26	123.76+(-4.76)x	12.87	63.35
	30	109.80+(-3.66)x		
Larvae	26	53.30+(-2.05)x	12.92	26.81
	30	47.10+(-1.57)x		
Protonymph	26	48.62+(-1.87)x	9.45	30.95
	30	45.50+(-1.54)x		
Deutonymph	26	56.42+(-2.17)x	13.94	26.17
	30	48.89+(-1.63)x		
Total	26	282.10+(-10.85)x	12.50	146.48
	30	251.10+(-8.37)x		

The thermal unit required for the protonymphal stage to complete its development was 26.17 day-degrees.

From Egg to Adult emergence

As shown in Table 1, the total developmental period from egg to adult emergence was correlated significantly with the corresponding temperatures. When the analysis of variance was carried out, it yielded a significant indicating differences between the duration from egg to adult and corresponding tested temperature were highly significant. The longest time required for the insect to complete its life cycle (10.85±0.65 days) achieved at 26ºC and decreased as temperature increased to reach 8.37±0.61 days at 30ºC. It is clear that increase of temperature by 4ºC decreased developmental time by about 1.3 fold.

In general, from the obtained results it could be concluded that immature development time of *T. urticae* at 26º and 30ºC were 10.85 and 8.37 days, respectively. Our findings are close to those found by Ahmadi *et al*., 2007. The calculated developmental threshold is about 12.50ºC. On the base of this value, an average of 146.48 day-degrees is needed for the development of one generation of the red spider mite, *T. urticae*.

The developmental time reported by Sedaratian *et al*. (2009) on different soybean genotypes varied from 7.6 to 8.8 days for female and from 7.1 to 8.4 days for male, which close obtained in the present study. At 30°C, our findings are also similar to those which found in other studies (Inglinski and Rainwater, 1954; Kasap, 2004; Parslika and Huszar, 2004; Forghani *et al*., 2006). Host plants, experimental conditions, as well as, mite strain may provide an explanation for longer or lower developmental times. The lower temperature threshold of 12.1°C for males, computed by linear regression, is similar to the 12.8°C reported by Ju *et al*. (2008), but the value for that of females (13.8°C) is quite different from the 8.4°C reported by Kasap (2004) on apple and 12.5°C by Ju *et al*. (2008) on eggplant, suggesting different temperature adaptations among various populations. The mean number of degree-days required by *T. urticae* to complete its development was 160.2DD for females and 174.8 DD for males, which were higher than those estimated by Ju *et al*. (2008) on eggplant (80.5 and 74.7 DD for females and males, respectively); but lower than that reported by Kasap (2004) for female *T. urticae* (172.4 DD) on apple. These differences may be explained by the existence of three genetically distinct host races of *T. urticae* on peach, eggplant, and apple.

Adult stage

Longevity

Data in Table 4 show the longevity of the studied mite pest as affected by constant temperatures. Females of start to lay eggs after being mated, shortly after adult emergence. The pre-oviposition period seems to be least affected by prevailing temperatures. At the tested temperatures of 26º and 30ºC means of 1.51±0.31 and 0.91±0.19 days for the pre-oviposition period, respectively. Temperature had insignificant effect on the pre-oviposition period. Oviposition periods varied greatly according to the prevailing temperature. The shortest oviposition period (11.24±0.36 days) was recorded at 30ºC whereas, the longest one was recorded at 26ºC (14.25±0.45 days). The oviposition period decrease with the increase of temperature. The post-oviposition period ranged from 1.81±0.19 days at 26º to 1.34±0.11 days at 30ºC. This period was increase with the increase of temperature from 26º up to 30ºC (Table 4). Regardless of temperature, the pre-oviposition period needed the shortest time from the whole longevity of the adult stage (13.36%) and the oviposition period needed the longest time (62.73%), whereas the post-oviposition period needed

23.91% of the total adult lifespan.

According to the longevity (male and females), as shown in Table 4, adult longevity decreased with the increase of temperature. The longest duration period was 14.83±0.86 days for males and 17.61±0.49 days for females at 26ºC, while the shortest period was 10.43±0.60 days for males and 12.71±1.02 days for females at 30ºC. The data show also that the adult females tended to live longer than males under all tested temperatures. When the data were statistically analyzed; a significant differences was obtained.

Table 4: Longevity (in days±) and reproductive potential of *T.urticae* reared at constant temperatures of 26 and 30ºC.

Temp. (Cº)	Longevity (in days) and fecundity ± SE					
	Male	Female				
		Pre-	Oviposition	Post-	Longevity	No. egg / ♀ (fecundity)
26	14.83±0.86a	1.51±0.31a	14.25±0.45a	1.81±0.19a	17.61±0.49a	109.28±10.29b
30	10.43±0.60	0.91±0.19b	11.24±0.36b	1.34±0.11b	12.71±1.02b	140.54±15.89a

Means followed by the same letters vertically are not significantly different at 0.05 level of probability.

Egg laying capacity (fecundity)

As shown in Table 4, the total number of deposited eggs per female during its life increased as temperature increased. The maximum number of eggs (109.28±10.29 eggs / female) was recorded at 26C. However, females reared at 30ºC laid significantly higher eggs than those exposed to other temperatures. In general, it could be concluded however, that the temperature of 30ºC my be considered as the optimum zone for eggs laying activity.

Longevity of the adult *T. urticae* determined in the present study agreement to those reported in other studies conducted at similar constant temperatures. Carey and Bradley (1982) found the mean longevity of females to be 14.71 and 9.71 days at 23.8 and 29.4°C respectively. Kasap (2004) reported the longevity of females to be 29.9, 25.9, 16.8 and 4.7 days at 20, 25, 30 and 35°C, respectively. Rajakumar *et al.* (2005) estimated that at 25°C female and male *T. urticea* lived for 18.7 and 12.1 days, respectively. Forghani *et al.* (2006) found that females and males lived for 20.8 and 19.2 days, respectively at 28°C. The scatter in development values among studies can be attributed to the effects of multiple factors, including: disparities in host plant suitability, the source of *T. urticae* stock colony, discrepancy in humidity and photoperiod conditions, in addition to the frequently of checking. At 25°C, the mean total number of eggs laid by *T. urticae* in the present study was substantially lower than egg numbers recorded on different crops in several previous studies (Shih *et al.*, 1976; Parslika and Huszar, 2004; Rajakumar *et al*., 2005; Karimi *et al*., 2006; Ju *et al*., 2008; Razmjou *et al*., 2009; Sedaratian *et al*., 2009; Saeidi, 2011).

Overall, the differences between our results and the findings in other studies can probably be attributed to the following three reasons: (i) the nutritional suitability of peach, (ii) the geographic origin and adaptation of the *T. urticae* population, and finally (iii) different laboratory conditions such as photoperiod and humidity. According to our results, and independent of the tested temperatures, most of the eggs gave rise to male progeny in the first 3-4 days of oviposition period and thereafter to female progeny. The same trend has been observed in other tetranychid species such as *T. turkestani* (Karami, 2011). According to Sabelis (1985), the male-biased progeny production at the beginning of the oviposition period could contribute to the early insemination of females that would afterwards start to disperse in search of a suitable host plant.

The present study indicates that temperature is a substantial factor that can affect the reproduction and survival of *T. urticae*. Our results have several advantages: First, they can be used in mass-rearing projects. Thus, the optimum rearing temperature for development, survival, and fecundity can be chosen from our data. Furthermore, for pest management purposes, our data can be used in the construction of computer simulation models to predict *T. urticae* development and population dynamics. Finally, they can be utilized in order to develop biological control programs against *T. urticae* utilizing its predators, because to achieve this goal, creditable information on the developmental time and population growth parameters of *T. urticae* is necessary. To obtain practical information for controlling this mite, however, field studies should be undertaken to complement laboratory studies.

REFERENCES

Carey, J. R. and Bradley, J. W. (1982). Developmetal Rates, Vital Schedules, Sex Ratios, and Life Tables for *Teranychus urticae*, *Tetranychus turkestani* and *Tetranychu pacificus* (Acarina: Tetranychidae) on Cotton. *Acarologia*, 23(4): 333-345.

Forghani, S. H.; Arbabi, M.; Ostovan, H.and Kamali, K. (2006). Biology of Two spotted Spider Mite *Tetranychus urticae* (Acari: Tetranychidae) on Cotton in Laboratory and Field Condition in Golestan Province. *17th Iran. Plant. Prot. Cong.*, Karaj, Iran, 199 PP.

Inglinski, W. and Rainwater, C. F. (1954). Life History and Habits of *Tetranychus desertorium* and *Bimaculatus* on Cotton. *J. Econo. Entomol.*, 47: 1084-1086.

Jeppson, L. R.; Baker, E. W. and Keifer, H. H. (1975). Mites Injurious to Economic Plants. University of California Press, Berkely, 614 PP.

Ju, K.; Sangkoo, L.; JeongMan, K.; YoungRip, K.; TaeHeung, K. and Jisoo, K. (2008). Effect of Temperature on Development and Life Table Parameters of *Tetranychus urticae* Koch (Acari: Tetranychide) Reared on Eggplants. *Kor. J. Appl. Entomol.*, 47(2): 163-168.

Karami-Jamour, T. (2011). Biology of Two Spotted Spider Mite, *Tetranychus turkestani* Ugarov and Nikolski and Its Predator, *Stethorus gilvifrons* Mulsant under Laboratory Conditions. MSc. Thesis, University of Shahid Chamran, Ahvaz, Iran, 138 PP.

Karimi, A.; Ashouri, A. and Noii, S. (2006). Life Table of *Tetranychus urticae* on Sweet Pepper and Green Bean. *17th Iran. Plant Prot. Cong.* Karaj, Iran, 204 PP.

Kasap, I. (2004). Effect of Apple Cultivar and of Temperature on the Biology and Life Table Parameters of The Two-spotted Spider Mite *Tetranychus urticae*. *Phytoparasitica,* 32(1): 73-82.

Mangat, B. S. (1977). Thermal thresholds and temperature accumulation for the cotton bollworm. J. Tennessee Academy of Science, 55:15-16.

Parslika, J. and Huszar, J. (2004). Influence of Temperature and Host Plants on the Developmental and Fecundity of the Spider Mite (*Tetranychus urticae*). *Plant Prot. Sci.*, 40(4): 141-144.

Rajakumar, E.; Hugar, P. S. and Patil, B. V. (2005). Biology of Red Spider Mite, *Tetranychus urticae* Koch (Acari: Tetranychidae) on Jasmine. *J. Agric. Sci.*, 18(1): 147-149.

Razmjou, J.; Tavakkoli, H. and Nemati, M. (2009). Life History Traits of *Tetranychus urticae* on Three Legumes (Acari: Tetanychidae). *Munis Entomol. Zool.*, 4(1): 204-211.

Sabelis, M. W. (1985). Reproduction Strategies. In: "*Spider Mites, Their Biology, Natural Enemies and Control*". (Eds): Helle, W. and Sabelis, M. W.. Elsevier, Amsterdam, PP. 237-278.

Saeidi, Z. (2011). Study on Resistance of Almond Cultivars to Spider Mites. No. 86004, Chaharmahal and Bakhtiari Agricultural and Natural Resources Research Center, Iran, 15 PP.

Saeidi, Z.; Nourbakhsh, S. H.; Nemati, A. R. and Ueckerman, E. A. (2010). First Report of *Schizotetranychus smirnivi* Wain. in Iran. *19th Iran. Plant. Prot. Cong.*, Tehran, Iran, 373 PP.

Sakunwarin, S.; Chandrapatya, A. and Backer, G. (2003). Biology and Life Table of The Cassava Mite, *Tetranychus truncates* Ehara (Acari: Tetranychidae). *Sys. Appl. Acarol.*, **8**: 13-24.

Sedaratian, A.; Fathipour, Y. and Moharramipour, S. (2009). Evaluation of Resistance in 14 Soybean Genotypes to *Tetranychus urticae* (Acari: Tetranychidae). *J. Pest Sci.*, 82(2): 163-170.

Shih, C. I. T.; Poe, S. L. and Cromroy, H. L. (1976). Biology, Life Table and Intrinsic Rate of Increase of *Tetranychus urticae*. *An. Entomol. Soc. Am.*, 69: 362-364.

Southwood, T. R. E. (1978). Ecological Methods. Chapman and Hall, London, UK, 232 PP.

Yueguan, F.; Faugping, Z.; Zhengqiang, P.; Kui, L. and Qian, J. (2002). The Effects of Temperature on the Development and Reproduction of *Tetranychus piercei* McGregor (Acari: Tetranychidae) in Banana. *Sys. Appl. Acarol.*, **7**: 69-76.

Zhang, Z. Q. (2003). Mites of Greenhouses: Identification, Biology and Control. CABI Publishing, Cambridge, UK. 244 PP.

ARABIC SUMMERY

بعض المقاييس البيولوجية لاكاروس العنكبوت الأحمر تحت درجات حرارة ثابتة

سلوى محمود السعيد شعلة
معهد بحوث وقاية النباتات – مركز البحوث الزراعية

أجريت دراسات بيولوجية لاكاروس العنكبوت الأحمر ذو البقعتين تحت ظروف ثابتة من الحرارة ٢٦، ٣٠°م. وجد من خلال الدراسة أن درجة الحرارة الثابتة ٣٠°م هي درجة حرارة مناسبة لنمو وتضاعف هذه الآفة. تم تحديد الحد الحرج (صفر النمو) لكل من أطوار البيض، واليرقة، الحورية الأولى، الحورية الثانية لهذه الآفة ووجد انه ١٢.٨٧°، ١٢.٩٢°، ٩.٤٥°، ١٣.٩٤°م، على التوالي. كما وجد أن الحد الحرج اللازم لنمو الأطوار الغير كاملة (من مرحلة البيضة حتى الحيوان الكامل) هو ١٢.٥٠°. باستخدام الحدود الحرجة للنمو السابقة تم حساب الوحدات الحرارية اللازمة لنمو الأطوار المختلفة ووجد إنها ٦٣.٣٥، ٢٦.٨١، ٣٠.٩٥، ٢٦.١٧ وحدة حرارية يومية لكل من مرحل البيض، واليرقات، والحورية الأولى ، الحورية الثانية لاكاروس العنكبوت الأحمر ذو البقعتين. وأيضا وجد أن جيل كامل لهذه الآفة يحتاج ١٤٦.٤٨ وحدة حرارية يومية اعتمادا على الحد الحرج للنمو وهو ١٢.٥٠°م.