

BIOLOGICAL ASPECTS AND LIFE TABLE PARAMETERS OF *Carpoglyphus lactis* (CARPOGLYPHIDAE) WITH DIFFERENT TEMPERATURE.

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ABSTRACT

Study was carried out in the laboratory of zoology department, Faculty of Science for Girls, Al-Azhar University. The biology and control of *C. lactis* L., with three temperature. As temperature increased from 20 °C to 30 °C the average of life cycle decreased from 21.3 to 9.3 days for females and from 18.4 to 8.7 days for males when fed on potato tuber at RH 70 ± 5 %. Average of adult longevity decreased from 21.6 to 18.3 days from females and from 15.2 to 12.0 days for males and 41.2 egg to 79.3 eggs, respectively. Thus 25 °C was most suitable degree for *C. lactis* rearing and reproduction this is supported by life table parameters at 20, 25 and 30 °C, *C. lactis* fed on potato tuber immatures gave the least natural intrinsic rate an increase ($r_m = 0.221$ female / day) at 20 °C, the net reproductive rate (R_0) 31.68 times and the finite rate of increase (λ) 1.23 times / female / day. Although the rate of female survival (L_x) was highest at 20 °C than 25 and 30 °C yet specific rate of fecundity. Stored products are better to be stored than 20 °C.

INTRODUCTION

Carpoglyphus lactis L. is importance in this respect as they inhabit stored food and roots of many important crops. They are well know as grain mites, stored product mites cheese mites, dried food mites, house dust mites, itch mites and mange mites (Curry 1977, Okamoto 1984 and Parkinson *et al.* 1991).

Thus, life table studies are needed to choose one or more of temperature to be used in control against all life stages of *Carpoglyphus lactis* L. in store.

Biology of *Carpoglyphus lactis* L. with different temperatures (20, 25 and 30 °C) on potato tuber determination of minimum temperature for the development and reproduction of *Carpoglyphus lactis* L. with life table parameters at different temperatures 20, 25 and 30°C when fed on potato tuber.

MATERIALS AND METHODS

Mite biology under controlled temperatures:.

In this study the effects of different three temperature, 20, 25 and 30 °C with 70 ± 5 % relative humidity on the developmental period, fertility and longevity of *Carpoglyphus lactis* when fed on stored product.

For preparing pure culture of the mite, plastic cells of 2.5 cm in diameter and 2 cm in depth were filled up with a layer of mixture of plaster of pairs and charcoal (9 :1) on its bottom to depth of 0.5 cm. Drops of water

were added daily to maintain suitable relative humidity (El-Wahab 1992), observations concerning all biological aspects were recorded throughout the mite life span.

Life table parameter:

During developmental period mortalities of different stages and sex ratio of the progeny was determined oviposition by resultant females were recorded daily for each female. Life table parameters (Birch 1948) were estimated using the life 48 computer program (Abu-Setta *et al.*, 1986) parameters were obtained by the formula:

$$\sum X \exp (-r_{mx}) L_x m_x = 1$$

where :X = the female age

m_x = is the expected number of daughters produced per female during the interval "x".

L_x = is the fraction of females alive at age "x".

r_m = is a natural logarithm of intrinsic rate of increase and indicates the number of times of population multiplies in a unit of time.

R_0 = is the rate of multiplication in one generation.

T = is the mean length of generation time usually expressed in days.

Data were statistically analyzed according to Senedcor, (1980).

RESULTS AND DISCUSSION

Stored food products are subjected to infestation with many mite pests which affecting its quantity and probability for man consumption. The most important family carpoglyphidae where their species cause serious economic damages.

Table (1) indicated the effect of temperature (20, 25 and 30 °C) on the biological aspects of *Carpoglyphus lactis* L. when fed on potato tuber at 70 ±5 % R.H. At 20, 25 and 30 °C incubation periods averaged 4.2, 3.3 and 2.4 days respectively, for females and 3.7, 3.0 and 2.5 days respectively for males. The averages of total immature for females were 16.2, 10.4 and 6.3 days, respectively and 14.9, 9.6 and 5.9 days for males, respectively. Life cycle for females averaged 21.3 days at 20 °C, 13.1 days at 25 °C and 9.3 days at 30 °C and averaged 18.4, 11.6 and 8.7 days for males at the previous mentioned temperature, respectively.

As shown in Table (2) the shortest period of duration longevity of *C. lactis* occurred under the highest level of temperature (30 °C) while the longest period took place under the lowest temperature (20 °C) for both males and females. In addition, fecundity of adult females decreased under both high and low temperatures, 41.2 and 58.2 eggs / female as compared with 79.3 eggs / female under 25 °C .

Table (1) : Effect of temperature on life cycle of *Carpoglyphus lactis* L. when fed on potato tuber at 70 ± 5 % R.H.

Temperature	Sex	Average period in days													
		Immature stages													
		Incubation period		Larvae		p.nymph		d.nymph		T.nymph		Total immature stage		Life cycle	
A	Q	A	Q	A	Q	A	Q	A	Q	A	Q	A	Q	A	Q
20 °C	♀	4.2 ± 0.8	1.1 0.9 ± 0.6 ± 0.3	2.1 1.8	3.6 1.8	3.3 1.9	16.2 ± 1.5		21.3 ± 2.9						
	♂	3.7 ± 0.5	1.0 0.5 ± 0.4 ± 0.9	2.0 1.3	3.0 1.5	4.0 1.8	14.9 ± 2.3		18.4 ± 1.6						
25 °C	♀	3.3 ± 0.6	1.0 0.4 ± 0.1 ± 0.04	2.0 0.9	3.0 0.8	2.7 0.9	10.4 ± 0.9		13.1 ± 2.3						
	♂	5.0 ± 0.2	1.0 0.6 ± 0.03 ± 0.02	1.8 0.9	1.8 0.6	2.5 0.7	9.6 ± 1.1		11.6 ± 1.8						
30 °C	♀	2.9 ± 0.7	0.8 0.3 ± 0.06 ± 0.02	1.2 0.4	1.1 0.5	2.1 0.6	6.3 ± 0.89		9.3 ± 2.1						
	♂	2.5 ± 0.9	0.7 0.2 ± 0.3 ± 0.09	1.0 0.3	1.0 0.7	1.9 0.5	5.9 ± 0.93		8.7 ± 1.9						
L.S.D 5 %	♀	0.29	-	-	-	-	1.63		1.87						
	♂	0.25	-	-	-	-	1.92		1.54						

A = Active period Q = quiescence period

Table (2) : Effect of temperature on biological aspects of *Carpoglyphus lactis* L. adult stage when fed on potato tuber at 70 ± 5 % R.H.

Temperature	Sex	Average of biological aspects									
		Adult stage					fecundity				
		Pre - Ovi.,	Ovi.,	P. Ovi.,	Longevity	No. Eggs	D.Rate	Life span	Generation period		
20 °C	♀	2.2 ± 4.9	11.5 ± 1.9	7.5 ± 1.2	21.2 ± 2.7	41.2 ± 5.6	3.5	41.6 ± 3.6	22.1 ± 3.6		
	♂				15.2 ± 3.1			32.4 ± 5.2			
25 °C	♀	1.10 ± 3.7	10.4 ± 1.3	8.1 ± 3.2	23.0 ± 2.9	79.3 ± 8.6	6.7	34.8 ± 4.9	16.3 ± 3.0		
	♂				16.2 ± 2.2			27.5 ± 3.8			
30 °C	♀	1.0 ± 0.51	9.3 ± 1.8	6.3 ± 1.6	18.3 ± 2.3	58.2 ± 5.2	6.2	28.9 ± 5.3	10.1 ± 2.7		
	♂				12.0 ± 1.9			26.8 ± 4.7			
L.S.D 5 %	♀				1.69	5.36		4.29	2.63		
	♂										

Statistical analysis for the obtained results revealed highly significant effect of temperatures in relation to the biological aspects of *Carpoglyphus lactis* L. when fed on potato tuber.

Results these studies indicated that the factor (temperatures) had critical effect on the biology of *C. lactis*. The data are in agreement with those of Apt (1951); Kevan and Sharma, (1963); Okamoto (1984) and Emekci and Toros (2000).

Reproductive potential: Life table parameters

The effect of temperatures on life table parameters was shown in Table (3) the multiplication per generation (R_0) differed according to temperature as this values increased with temperature increase till reaching 25 °C then began to decrease at 30 °C, thus, this values average 31.68, 54.79 and 27.28 times in a generation time (T) of 14.01, 17.01 and 13.26 days; the intrinsic rate of natural increase (rm) was 0.221, 0.235 and 0.223 individual / female / day, and a finite rate of natural increase (exprm) was 1.23, 1.27 and 1.24 times / female / days at 20, 25 and 30 °C, respectively, when *C.lactis* fed on potato tuber. Thus, it could be concluded that according to different life table parameter and fed temperature degree °C gave the highest reproduction rate (rm = 0.235 individual / female / day) for the mite *Carpoglyphus lactis* L. and the least reproduction rate (rm = 0.22 individual / female / day) for this mite. These results agree with Ibrahim (1997).

Table (3) : Effect of temperature on life table parameters of *C.lactis* fed on potato tuber at 70 °C ± 5 %.

Parameter	Temperature (°C)		
	20	25	30
Net reproductive rat (R_0)	31.68	54.79	27.28
Generation time day (T)	14.012	17.01	13.26
Intrinsic rate of increase (rm)	0.221	0.235	0.223
Finite rate of increase (exprm)	1.23	1.27	1.24
Sex rate(Female / total)	0.6	0.8	0.71

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الخصائص البيولوجية وجداول الحياة للأكاروس *Carpoglyphus lactis* على ثلاثة درجات حرارة مختلفة وفاء لببيب فكرى ابراهيم و بسمة ابراهيم أبو النور كلية العلوم - جامعة الأزهر - فرع البنات

تمت الدراسة في معمل قسم الحيوان الزراعى بكلية العلوم جامعة الأزهر بنسات . من المعروف أن لكل أكاروس مدى حرارى يعيش فيه ودرجة حرارة مثلى ، لذلك أجريت التجارب لمعرفة تأثير درجات الحرارة على سرعة نمو وطول فترة حياة النثى وخصوبتها . وكذلك معدل الزيادة الذاتى (rm) و بزيادة درجة الحرارة من ٢٠ - ٣٠ م حيث كان متوسط فترة دورة حياة النثى وفترة حياة النثى البالغة والذكر ومتوسط وضع البيض يتراوح بين (٢١,٣ الى ٩,٣ يوم) ، (١٨,٤ الى ٧,٩ يوم) ، (٢١,٦ الى ١٨,٣ يوم) ، (١٥,٢ الى ١٢,٠ يوم) ، (٧٩,٣ الى ٤١,٢ بيضة) كذلك قل معدل الزيادة الذاتى (rm) من ٠,٢٣ الى ٠,٢٢١ وعلى درجات حرارة ٢٥ م ، ٢٠ م وكان أقل معدل للتكاثر (Ro) ١,٦٨ مرة / أنثى / يوم ومعدل الزيادة النهائية ($exp\ rm$) ١,٢٣ مرة / أنثى / يوم) ولذلك يوصى بأن درجات الحرارة للمخزن يجب أن تكون على درجة ٢٠ م حتى تقلل عدد الأكاروس.