Some Biological Aspects of Two-Spotted Spider Mite, *Tetranychus Urticae* Koch (Acari: Tetranychidae) Infesting *Benincasa Hispida*

G. C. Biswas[1*], W. Islam[2], R. K. Saha[3] and S. R. Saha[4]

Abstract: The duration of different developmental stages, fecundity and longevity of *Tetranychus urticae* infesting *Benincasa hispida* were studied in different seasons under laboratory condition. Except fecundity the highest values of these parameters were obtained during the winter. The negative effects of temperature was observed on hatching, larval, protonymphal, deutonymphal and reproductive periods whereas temperature directly affected the fecundity of *T. urticae*. The relative humidity was found to have no significant effect on the any of the parameters studied.

Key words: Developmental period, reproductive period, fecundity, longevity, *Tetranychus urticae.*

Introduction

Benincasa hispida (Thumb) Cogn. (Wax gourd) is a popular vegetable and is cultivated more or less throughout India, all over Bangladesh and many other warm countries [10]. The two-spotted spider mite has been identified as a detrimental pest of numerous vegetable crops like lady's finger, brinjal, cucurbits, cucumber, cowpea, melons, wax gourd etc. in Bangladesh. This mite pest in found very injurious throughout tropical and subtropical parts of the world [6,8]. This pest attacks mainly the lower surface of the leaves of wax gourd. The spider mite causes direct damage like loss of chlorophyll, defoliation, stunting of growth, appearance of various types of plant deformities etc. and all these severely affect the growers. Not only that, this mite inject toxic substances into the hosts, which cause increased localized growth and disruption of tissue [6]. Keeping this in mind, the present work was taken to study the duration of the developmental stages, reproductive period, fecundity and longevity of *T. urticae* infesting wax gourd leaves, because detailed research on this in still wanting.

Materials and Methods

T. urticae infested papaya leaves were collected in April, 2003, from the university campus of Rajshahi and examined under a stereo binocular microscope to observe the mites. One female mite was reared on a single host leaf disc (ca. 4 cm^2) kept in a glass petridish with a pad of water saturated cotton wool beneath the leaf disc. After laying one egg on each leaf disc, the female was removed and thus 30 sets of egg were reared to observe

* Corresponding Author
[1] Department of Zoology, Government Fazlul Haque College, Chakhar, Barisal
[2] Institute of Biological Sciences, University of Rajshahi
[3] Yousufpur College, Charghat, Rajshahi
[4] Institute of Biological Sciences, University of Rajshahi

the development and fecundity of this mite. The old discs were replaced with fresh ones every two days and observations were made regularly. The laboratory was well ventilated round the clock and the average room temperature and relative humidity were recorded. The experiment was conducted for three seasons viz., autumn, winter and summer. The fecundity was recorded with removal of all the eggs from the rearing leaf discs. The reproductive period of *T. urticae* was considered as the time between the adult emergence and last egg laid.

Results

The results of different biological aspects of *T. urticae* in various seasons are presented in Table 1. All the periods, longevity and fecundity during different seasons varied significantly ($P<0.05$, Table 1).

Temperatures (21-31^{o}C) significantly influenced the developmental periods of the experimental mites (Table 2). The increase in temperatures reduced the developmental and reproductive periods and the longevity of *T. urticae* (Fig. 1 and Fig. 2). But, the fecundity was increased with the increase of temperature. The relative humidity produced no significant effects on any of the parameters studied.

Table 1: *Duration of different developmental stages, longevity of adults and fecundity of Tetranychus urticae infesting B. hispida during different seasons at room temperature of 21-31^{o}C and at R.H. of 60-90%.*

Seasons	Hatching period (days)	Larval period (days)	Deutonymph period (days)	Reproductive period (days)	Longevity (days)	Fecundity
Autumn	3.87±0.13 b	2.73±0.13 b	2.27±0.08 b	16.83±0.21 b	25.47±0.26 b	46.17±0.63 b
Winter	4.60±0.09 c	3.57±0.09 c	3.00±0.14 c	19.33±0.24 c	29.77±0.16 c	25.47±0.46 a
Summer	3.13±0.10 a	1.17±0.07 a	1.63±0.09 a	14.83±0.15 a	19.90±0.15 a	53.83±0.58 c
F value	138.97	544.69	65.08	146.39	1862.80	1043.36

Table 2: *The effects of temperature and relative humidity on different biological aspects of T. urticae.*

Physical factors	Temperature		Ralative Humidity	
Variables	'r' values	Equation	'r' values	Equation
Hatching period	0.999***	y = 7.6887-0.147x	0.117	-
Larval period	0.985*	y = 8.73+-0.24x	0.125	-
Deutonymphal period	0.999***	y = 5.862-0.137x	0.146	-
Reproductive period	0.998**	y = 28.697-0.45x	0.282	-
Longevity	0.997**	y = 50.709-0.987x	0.283	-
Fecundity	0.967*	y = 31.913+2.836x	0.046	-

*=P<0.05; **=P<0.01; ***=P<0.001

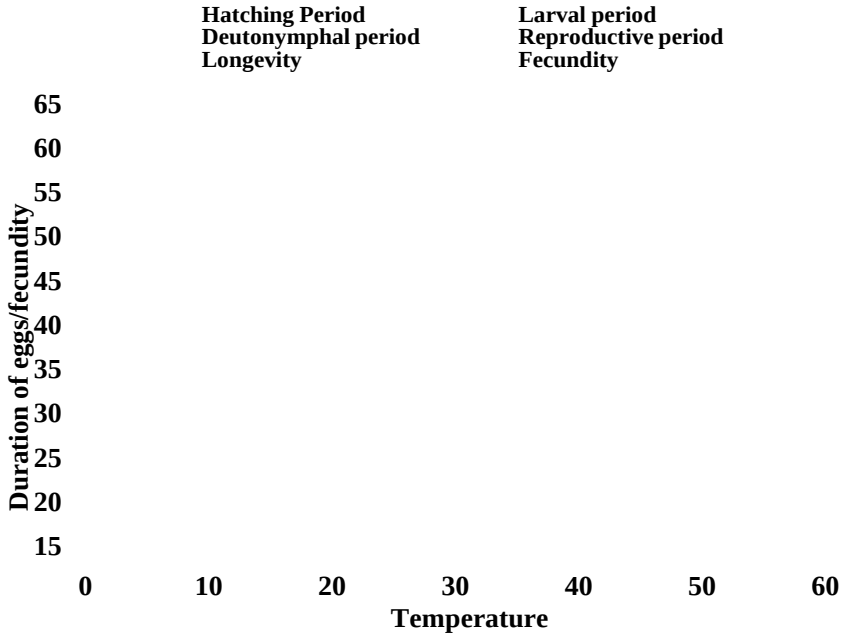

Fig.1: *Relationship between temperature with Hatching period, Larval period, Deutonymphal period, Reproductive period, Longevity and Fecundity in different seasons of T. urticae.*

Discussion

Study [11] on the biology of *T. cinnabarinus* infesting *Carica papaya* describes that the duration of hatching period, developmental periods and adult longevity were highest in winter than in the summer and autumn, whereas the fecundity was higher in summer (45.33 eggs/mites) and lower in winter (23.33 eggs/mite).

Similar investigation [2] of biological aspects of *T. cinhnabarinus* infesting *Solanum melongena* showed that the duration of hatching of eggs, development of nymphs, reproductive periods and longevity of the adults were highest in winter than in the summer whereas, the fecundity was higher in summer (44.57 eggs/mite) and lower in winter (24.27 eggs/mite).

In desert spider mite, *Tetranychus desertorum* Banks, the incubation (hatching) periods in winter and summer were 5 and 2 days. respectively [6]. In *T. evansi* Baker and Pritchard, the incubation period at 23^{o}C lasts for 3 days. The incubation period of *T. urticae* under a diurnal temperature cycle of 15 to 28.3^{o}C was 6.6 days [7]. The present experiment showed the similar relationship with temperature, but relative humidity has no significant effect on any stage of life cycle of the studied mite.

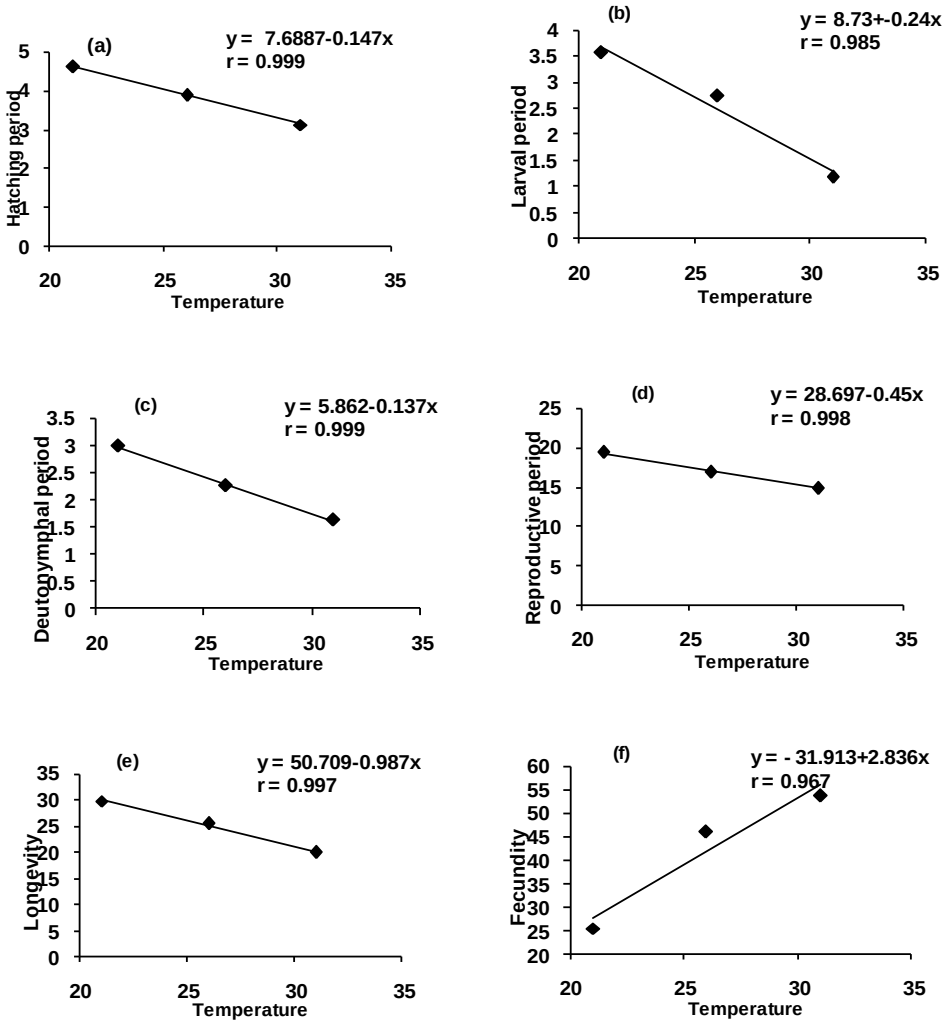

Fig. 2: *Relationship between temperature and (a) Hatching period, (b) Larval period, (c) Deutonymphal period, (d) Reproductive period, (e) Longevity and (f) Fecundity in different seasons of T. urticae.*

In *T. urticae* the duration of protonymph and deutonymph stages were 3.0 and 3.5 days, respectively [7]. The developmental time from egg to adult of *T. truncatus* Ehara varied from 6.30 to 14.89 days at 20 to 33°C [9]. [3] reported the development time of *T. evansi* was 6.3 to 13.6 at 21 to 36°C [3] which indicates that the decrease in developmental periods occur with the increase of temperature.

In case of adults, the duration of preoviposition, oviposition and postoviposition periods and the adult longevity decrease with the rising temperature (25-30°C) and the fecundity with the ascending temperature [1]. The highest number of eggs (35.8 eggs/female) laid

at 28°C and the lowest at 16°C (17.9 eggs/female); and the female longevity was the longest (34.5 days) at 20°C and the shortest (8.2 days) at 36°C [4]. The total longevity of *T. evansi* was 31.4, 21.8 and 17.7 days at 21, 26 and 31°C, respectively [3]. The reproductive period was 21.3, 14.6 and 10.7 days, fecundity per female per day was recorded as 5.4, 8.2 and 13.4 eggs at 21, 26 and 31°C, respectively of this mite.

Also decrease in longevity and fecundity occurred with increase of relative humidity [5]. The results of the present investigation showed that temperature played negative effect on developmental stages, reproductive period and longevity and on the other hand it played positive effect on fecundity which in almost similar to the above mentioned findings, But, the relative humidity had no effect on the life history of this mite.

Acknowledgements

The authors are grateful to Professor Mahboob Hasan, Gautam Lahiry for their help and kind cooperation and the Director, Institute of Biological Sciences, Rajshahi University for financial support and laboratory facilities.

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