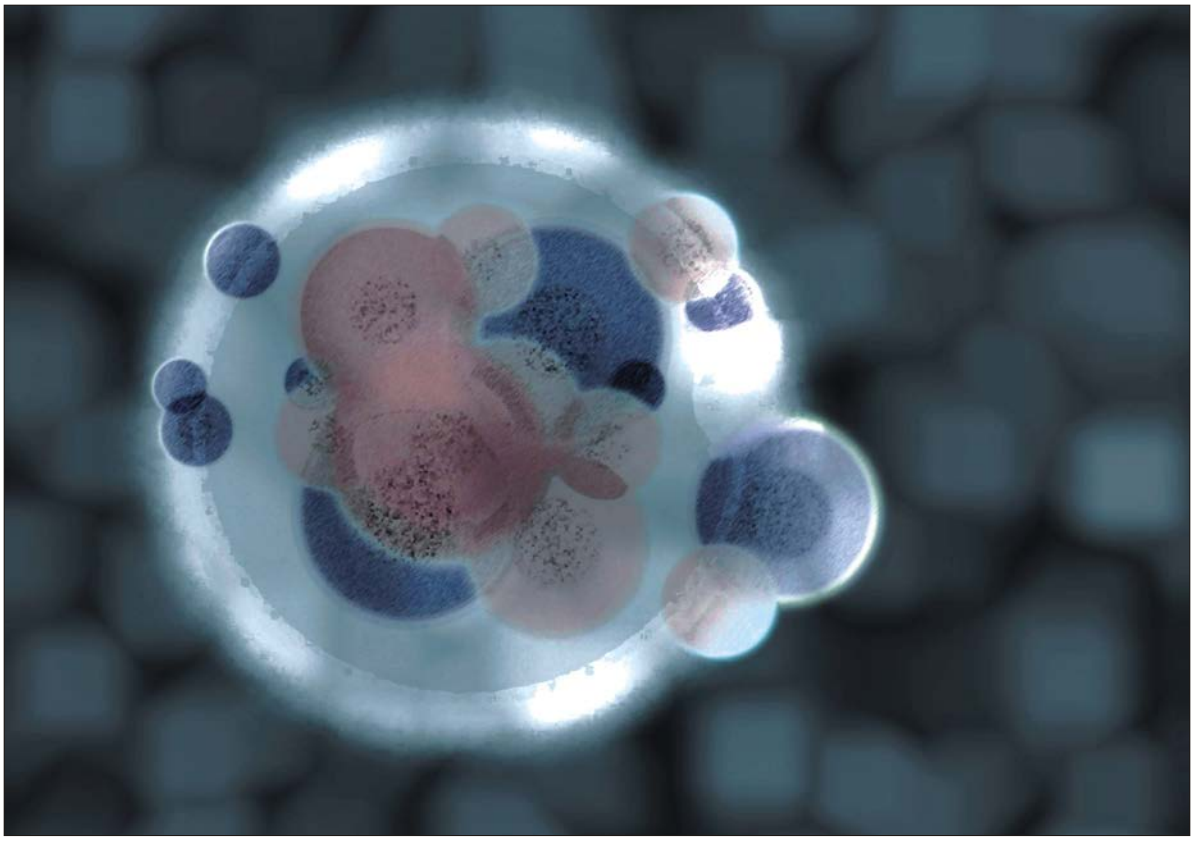

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Some Biological Aspects of Carmine Spider Mite, *Tetranychus cinnabarinus* Boisd. (Acari:Tetranychidae) Infesting Egg-plant from Rajshahi

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Abstract: The hatching, larval, protonymphal, deutonymphal and reproductive periods, fecundity and longevity of *Tetranychus cinnabarinus* infesting *Solanum melongena* were studied in different seasons under laboratory condition. Except fecundity the highest values of these parameters were obtained during winter. Negative impact of temperature was observed on hatching, larval, protonymphal, deutonymphal and reproductive period whereas temperature affected directly the fecundity of *T. cinnabarinus*. Relative humidity was found to have no significant effect on development stages well as any aspect.

Key words: Developmental period, reproductive period, fecundity, longevity, *Tetranychus cinnabarinus*

INTRODUCTION

The carmine spider mite, *Tetranychus cinnaberinus* Boisd. is found to infest more than 120 host plants of economic value including crops, cotton, strawberries, ornamental plants, deciduous fruits, tomatoes and other vegetables and is widely distributed in different parts of the world[1,2]. The egg-plant, *Solanum melongena* L. is a favourable host of this serious spider mite[3,4]. This phytophagous mite attacks mainly the mature and old leaves of the host plant and sucking cell sap and chlorophyll causes a great deal of yield loss every year to this favourite vegetable.

No work has yet been done on the biology and any aspect of this pest. Considering this, an attempt was made to find out the duration of developmental stages, fecundity, reproductive period and longevity of *T. cinnabarinus*.

MATERIALS AND METHODS

T. cinnaberinus infested egg-plant leaves were collected in April, 2002, from the university campus of Rajshahi and examined under a stereo binocular microscope to get the mites. One female mite was reared on a single host leaf disc (ca. 4 cm^2) kept in a glass petridish with pad of water saturated cotton wool beneath the leaf disc. After having one egg on each leafdisc the female was removed and thus 30 sets of egg were reared to observe the development and fecundity of this mite. Old discs were replaced with fresh ones every two days and observations were made regularly. The laboratory was well ventilated round the clock and 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. cinnabarinus* was considered as the time between the adult emergence and last egg laid.

RESULTS AND DISCUSSION

The hatching, larval, protonymphal, deutonymphal and reproductive periods, longevity and fecundity of *T. cinmabarinus* in various seasons varied significantly ($p<0.05$) (Table 1).

Highest temperature (21-31°C) was found to influence significantly the development periods ($p<0.001$ for hatching period, $p<0.01$ for larval period , $p<0.001$ for protonympal period and $p<0.05$ for deutonymphal period) reproductive period ($p<0.05$), longevity ($p<0.01$) and fecundity ($p<0.01$) of the experimental mites (Table 2). In order to describe the nature of their relationships regression lines were drawn (Fig. 1a-g). The negative slope of the lines (Fig. 1a-f) indicates that temperature

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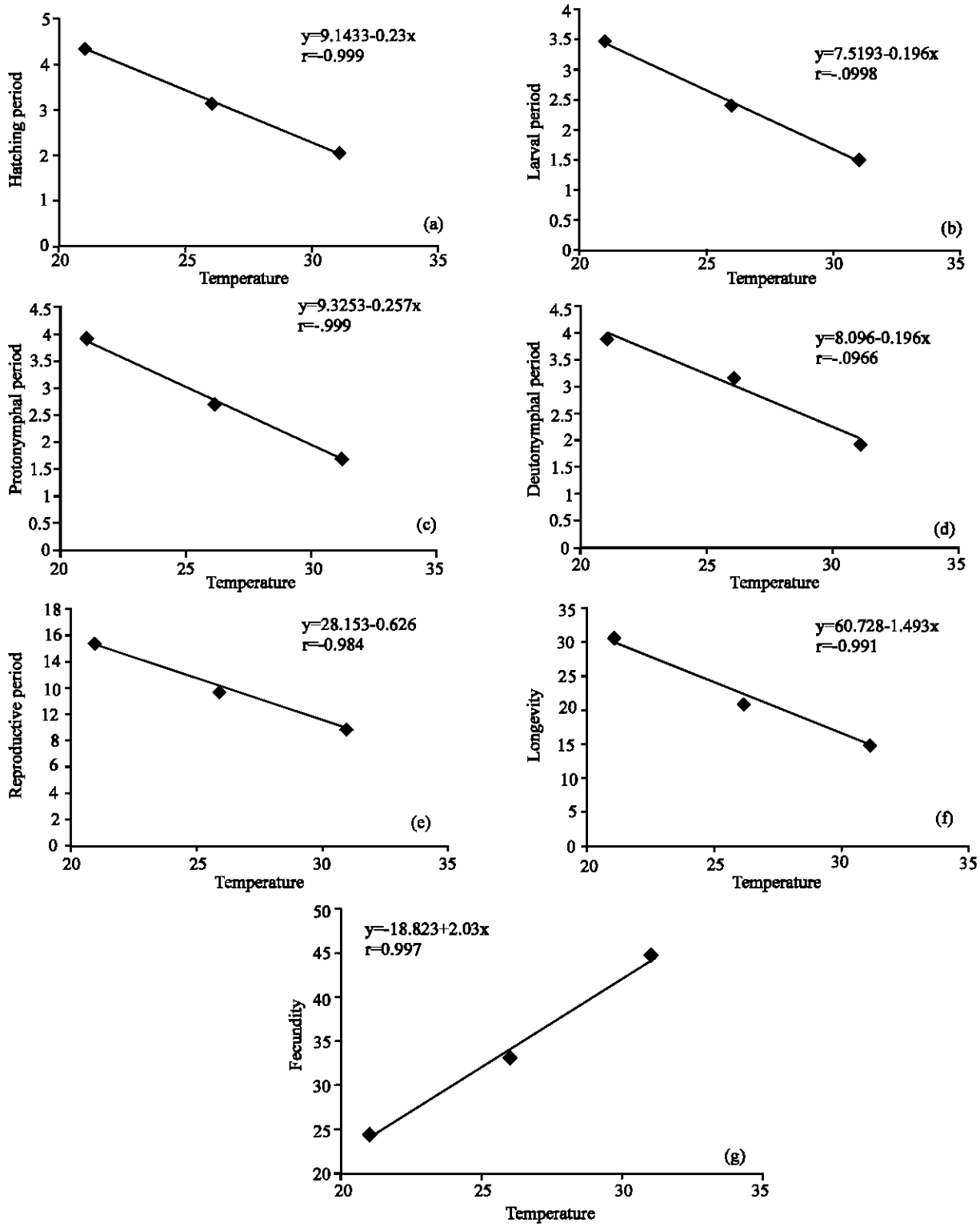

Fig. 1: Relationship between temperature and (a) Hatching period, (b) Larval period, © Protonymphal period, (d) Deutonymphal period, (e) Reproductive period, (f) Longevity and (g) Fecundity in different seasons of *T. cinnabarinus*

Table 1: Different biological aspects of *Tetranychus cinnabarinus* infesting *S. melongena* during different seasons

Seasons	Hatching period (days)	Larval period (days)	Protonymph period (days)	Deutonymph period (days)	Reproductive period (days)	Longevity (days)	Fecundity
Autumn	3.13±0.06a	2.37±0.12a	2.70±0.09a	3.30±0.10a	11.23±0.18b	20.80±0.29a	33.03±0.53a
Winter	4.33±0.12a	3.43±0.09a	3.90±0.14a	3.83±0.13a	15.33±0.18a	29.93±0.30b	24.27±0.58b
Summer	2.03±0.11b	1.47±0.09b	1.33±0.09b	1.87±0.11a	9.07±0.14b	15.00±0.22c	44.57±0.67b
F value	174.99	177.41	245.28	124.78	634.27	1942.73	453.65
D.F.	29, 2	29, 2	29, 2	29, 2	29, 2	29, 2	29, 2
LSD	1.99	1.69	1.88	2.02	2.85	3.88	10.91
HSD	1.77	1.50	1.66	1.79	2.53	3.44	9.68

Means marked by same letter are significantly different as DMRT. D.F = Degree of freedom

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

Physical factors variables	Temperature 'r' values	Equation
Hatching period	0.999***	y=9.1433-0.23x
Larval period	0.998**	y=7.5193-0.196x
Protonymphal period	0.999***	y=9.2353-0.257x
Deutonymphal period	0.966*	y=8.096-0.196x
Reproductive period	0.984*	y=28.153-0.626x
Longevity	0.991**	y=60.728-1.493x
Fecundity	0.997**	y=-18.823+2.03x

*= p<0.05; **=p<0.01; *** = p<0.001

reduced the developmental, reproductive period and longevity of *T. cinnabarinus*. But fecundity of *T. cinnabarinus* increases with the increase of temperature. The relative humidity played no significant effect on any of the stages and fecundity. According to Jeppson *et al.*[1], from the life history of desert spider mite, *Tetranychus desertorum* Banks, it is revealed that the incubation (hatching) periods in winter and summer were 5 and 2 days, respectively and on the other hand, in case of *T. evansi* Baker and Pritchard the incubation period at 23°C and 50% relative humidity lasts 3 days. Laing[5] showed that the duration of incubation period of *T. urticae* under a diurnal temperature cycle of 15 to 28.3°C was 6.6 days. The present experiment shows the similar relationship with temperature, but relative humidity has no significant effect on any stage of life cycle of the studied mite.

The duration of protonymph and deutonymph stages of *T. urticae* were 3.0 and 3.5 days, respectively[5]. Sakunwarin *et al.*[6] reported that the developmental time from egg to adult of *T. truncatus* Ehara varied from 6.30 to 14.89 days at 20, 24, 28, 31 and 35°C. Bonato[7] reported that development time of *T. evansi* was 13.6, 9.8, 7.8 and 6.3 days at 21, 26, 31 and 36°C, respectively which indicates the decreasing developmental period with the increase of temperature.

As regards the adult stages, the duration of preoviposition, oviposition and postoviposition periods as well as adult longevity, decreased with the rising temperature in the range of 25-30°C and mean total fecundity also declined with ascending temperature[8].

Fu *et al.*[9] showed that the developmental time varied from 7 days at 32°C to 33.1 days at 16°C; the highest number of eggs (35.8 eggs/female) was recoded at 28°C and the lowest at 16°C (17.9 eggs/female) and female longevity was the longest (34.5 days) at 20°C and the shortest (8.2 days) at 36°C. According to Bonato[7], the total longevity of *T. evansi* was 31.4, 21.8 and 17.7 days at 21, 26 and 31°C, respectively. 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.

Harison and Smith[10] observed decreasing trend in longevity and fecundity with the increase of relative humidity. 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 is almost similar to the above mentioned findings but relative humidity had no effect on the life history of this mite.

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