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A PRELIMINARY STUDY ON THE DURATION OF DIFFERENT LIFE STAGES OF *Tetranychus macfarlanei* BAKER AND PRITCHARD INFESTING CHRYSANTHEMUM (Chrysanthemum sp.) AT 25°C AND 27°C UNDER LABORATORY CONDITIONS IN KOLKATA

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ABSTRACT

The life cycle of *Tetranychus macfarlanei* was studied on Chrysanthemum at two temperatures viz 25°C and 27°C in Kolkata, West Bengal and the duration of different life stages were recorded. The incubation period was 1.08±0.30 days at 25°C and the corresponding figure for 27°C was 1.10±0.30 days. The larval period was 2.02±0.73 days at 25°C and 2.00±0.55 days at 27°C respectively. Protonymphal period lasted for 1.80±0.50 at 25°C and the corresponding figure for 27°C was 1.45±0.30 days. Deutonymphal period was2.40±0.35 days at 25°C and the corresponding figure for 27°C was 2.30±0.80 . Egg to adult period was 5.80±0.80 days at 25°C and the corresponding figure for 27°C was 5.50±0.18 days. Pre -oviposition period lasted for 1.50±0.18 days at 25°C and the corresponding figure for 27°C was 1.40 ±0.16. Oviposition Period was of 10.80±0.20 days at 25°C and in case of 27°C, the corresponding figure was14.30±0.10 days. Post – oviposition period was of 1.10±0.20 days in at 25°C and 2.00±0.35 at 27°C . The fecundity of mated female was 150.60±0.20 on chrysanthemum at 25°C and 148.00±0.10 days in case of unmated female. At 27°C, the corresponding figures were 166.80±0.22 days and 160.30±0.15 days respectively. The longevity of female was 18.20±0.75 days and 14.70±0.70 days in case of male at 25°C on chrysanthemum and 22.10±0.85 days and 13.50±0.80 days respectively at 27°C. The sex ratio was studied at 27°C and was found to be 3F: 1M .

KEYWORDS: *Tetranychus macfarlanei, chrysanthemum*, life cycle, sex ratio.

Chrysanthemums, sometimes called mums called mums or chrysanths, are flowering plants of the genus *Chrysanthemum* in the family Asteraceae.

They are native to Asia and northeastern Europe. Most species originate from East Asia and the center of diversity is in China. Countless horticultural varieties and cultivars exist.

Chrysanthemum is among the more popular flowers grown in our country for its diversified beauty of colors, shapes, shades and keeping quality. It is highly suitable for beds, pots and for floral arrangement. Its bloom last over a short period of 1 to 2 months. Hence, they command remunerative price in the market. On account of its good, keeping quality flowers can be transported to a distant market easily.

On account of its origin and commercial production in Asia it is called as, 'Queen of East' OR **'**Glory of East**'** and sometimes 'Winter Queen' as the flowers are available during winter.

Pyrethrum (*Chrysanthemum* [or *Tanacetum*] *cine rariaefolium*) is economically important as a natural source of insecticide (Pottorff2010, Fisher2013).. The flowers are pulverized, and the active components, called pyrethrins, which occur in the achenes, are extracted and sold in the form of an oleoresin. This is applied as a suspension in water or oil, or as a powder. Pyrethrins attack the nervous systems of all insects, and inhibit female mosquitoes from biting. In sublethal doses, they have an insect-repellent effect. They are harmful to fish, but are far less toxic to mammals and birds than

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many synthetic insecticides. They are not persistent, being biodegradable, and also decompose easily on exposure to light. Pyrethroids such as permethrinare synthetic insecticides based on natural pyrethrum.

Chrysanthemum plants have been shown to reduce indoor air pollution by the NASA Clean Air Study (Wolverton*et.al*. 2013)

But this plants is being attacked by a number of pests including mites (Corpuz-Raros 2001, Gupta 2012, Karmakar *et. al*. 2010, 2016) and one of the serious pest mite is *Tetranychus macfarlanei* . So it was thought to undertake a study on its life cycle at varying temperatures.

The objective of this study was to study life cycle of *Tetranychus macfarlanei*whichis a serious pest of Chrysanthemum ,with regard to duration of different developmental stages, sex ratio, fecundity, longevity, extent of mortality etc.

MATERIALS AND METHODS

For studying the life cycle of *Tetranychus macfarlanei* infesting Chrysanthemum (*Chrysanthemum* sp.) pure culture was maintained in plotted plants surrounding all around with mosquito net to prevent entry of outside agents on the plants. The plotted plants were regularly watered to maintain them in good condition.

The technique which was followed for studying life cycle of phytophagous mite was leaf-disc technique of Helle and Sabelis (1985).

The excised leaves were kept on wet cotton pad kept in Petridis and the cotton was kept supersaturated with water so that a film of water is maintained at margins of leaves to prevent escape of mites. 5-10 gravid females were released on an excised leaf for allowing them to lay eggs. On the following day, the excised leaf was examined to find out if 10-15 such eggs have been obtained on the excised leaves. The females were either killed or removed leaving behind the eggs only. All such eggs were encircled with a pen to facilitate locating the eggs for taking observations towards further development.

Thereafter, observations were recorded twice daily from the following days to find out whether the eggs have hatched and necessary records were maintained in the diary. Once the eggs have hatched, the newly emerged larva was picked up with a fine brush and kept in fresh excised leaves put on a super-saturated cotton pad. Thereafter, observations were recorded towards further development of the larva and duration of each of the stages like incubation, larva, protonymph, deutonymph, egg-adult, preoviposition, oviposition, postoviposition, fecundity, longevity, percentage of hatching and percentage of larva reaching adulthood were recorded. Whenever it was found necessary, the dried excised leaves were replaced by the fresh ones and transferring the concerned developmental stage of the mite carefully and gently to inflict minimum injury to the mite.

The duration of each stage was tabulated and subjected to statistical analysis for interpretation.

RESULTS

Table: The duration of of different life stages of the mite has been tabulated and analyzed statistically

Temperature	Incubation Period	Larval Period	Protonymphal Period	Deutonymphal	Egg-Adult Period	Pre-Oviposition	Oviposition Period	Post Oviposition	Fecundity	Longevity

				Period		Period		Period	Mated	Unmated	Female	Male
25°C	1.08±0.30	2.02±0.73	1.80±0.50	2.40±0.35	5.80±0.80	1.50±0.18	10.80±0.20	1.10±0.20	150.60±0.20	148.00±0.10	18.20±0.75	14.70±0.70
27°C	1.10±0.30	2.00±0.55	1.45±0.30	2.30±0.80	5.50±0.18	1.40±0.16	14.30±0.10	2.00±0.35	166.80±0.22	160.30±0.15	22.10±0.85	13.50±0.80

DISCUSSIONS

Copulation

Both male and female attain sexual maturity immediately after emergence and as the male emerged earlier than the female, it awaits near the female quiescent deutonymphs so that it can mate her as soon as the female emerged. Usually a single female mated with a single male.

Eggs

Freshly laid eggs are generally round in shape and transparent but with the progress in time, it became slightly darker and a reddish tinge appeared.

Incubation

The incubation period was 1.08±0.30 days at 25°C and the corresponding figure for 27°C was 1.10±0.30 days.

Larval period

The larva hatched by making a small hole in the egg capsule and it can be identified by its 3 pairs of legs. The larval period was 2.02±0.73 days at 25°C and 2.00±0.55 days at 27°C respectively. The larval period was reported to be 1.8 days at 29°C in case of *Tetranychus ludeni* on French by Mallik and Channabasavanna (1983). And around 1.53-2.05 days in case of *Tetranychus ludeni* on a variety of hosts at temperatures ranging from 27.4°C- 30.3°C (Puttaswamy and Channabasavanna, 1982). The larva entered into quiescent stage for a short time before entering into protonymphal stage.

Protonymphal Period

The protonymphs are more or less equal in size with the protonymph but can be easily identified as these have 4 pairs of legs. Besides these have a bit of reddish color also which darkened with time. This period lasted for 1.80±0.50 at 25°C and the corresponding figure for 27°C was 1.45±0.30 days. It was observed that the duration of this period decreased as the temperature increased, irrespective of hosts. The present observations are in conformity with those of Puttaswamy and Channabasavanna (1981) who reported the protonymphal period to be around 1.46 days- 2.27 days in case in case of *T. ludeni* and 1.47-2.22 days in case of *T. neocaledonicus*

The male protonymph directly moulted into adult after passing through a quiescent stage while the female protonymphmoulted into deutonymph.

Deutonymphal period

The deutonymphs are larger in size resembling the adult and became reddish orange in color. This period was 2.40±0.35 days at 25°C and the corresponding

figurefor 27°C was 2.30±0.80 days Mallik and Channabasavanna (1983) reported the deutonymphal period in case of *T. ludeni* to be around 2 days.

Egg – Adult period

Egg to adult period was 5.80±0.80 days at 25°C and the corresponding figure for 27°C was 5.50±0.18 days This period was shorter at 27°C than at 25°C . Mallik and Channabasavanna (1983) reported this period to be 222 hours for females and 200 hours for male in case of *T. ludeni* on French bean.

Pre – oviposition period

Pre – oviposition period lasted for 1.50±0.18 days at 25°C and the corresponding figure for 27°C was 1.40 ±0.16. Manjunatha and puttaswamy (1989) reported this period to be of 1.27±0.20 days to 1.83±0.19 days in case of *T. neocaledonicus*.

Oviposition Period

This period was of 10.80±0.20 days at 25°C and in case of 27°C, the corresponding figure was 14.30±0.10 days. From the data, it was very clear that the duration of this period was shortest on chrysanthemum at 25°C .Puttaswamy and Channabasavanna (1981) reported this period to be of 10.85 days on brinjal and 22.72 days on South American cucurbits in case of *T. ludeni*.

Post – Oviposition Period

Post – oviposition period was of 1.10±0.20 days in at 25°C and 2.00±0.35 at27°C .Manjunatha and puttaswamy (1989) reported this period to be 1.88±0.47 days in case of *T. neocaledonicus.*

The fecundity of mated female was 150.60±0.20 on chrysanthemum at 25°C and 148.00±0.10 days in case of unmated female. At 27°C, the corresponding figures were 166.80±0.22 days and 160.30±0.15 days respectively.

Puttaswamy and Channabasavanna (1981) reported the highest fecundity on okra (149.40 eggs). Manjunatha and puttaswamy (1989) reported the fecundity of mated females to be 75.38±22.40 eggs and 51.60±21.30 eggs in case of unmated females while describing the life cycle stages of *T. neocaledonicus*. However, the data obtained in the present study is seemed to be a higher than the other tetranychid species.

Longevity

The longevity of female was 18.20±0.75 days and 14.70±0.70 days in case of male at 25°C on chrysanthemum and 22.10±0.85 days and 13.50±0.80 days respectively at 27°C.

From the data above, it is very clear that the females had higher longevity than males irrespective of temperature .Puttaswamy and Channabasavanna (1981) reported longevity of *T. ludeni* to be 21.08 days on French bean and 14.31 days on brinjal. Manjunatha and Puttaswamy (1989) reported longevity of females and males to be 22.80±0.47 days and 8.81±1.25 days respectively in case of T. neocaledonicus. The present observation is more or less similar with the said observations.

Sex Ratio

The sex ratio was studied at 27°C and was found to be 3F: 1M

CONCLUSIONS

So, from the above results it can be concluded that 27°C was the most suitable temperature for this mite with shorter egg- adult period, longer oviposition period and higher fecundity and higher longevity.

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