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Biology Of Two Spotted Red Spider Mite, *Tetranychus urticae* (Koch).

Thirupam Reddy B.* and Bontha Rajasekar
Department of Agril. Entomology, University of Agricultural Sciences, Dharwad, India.
*Corresponding author–thirupam91@gmail.com

ABSTRACT
Bionomics of two spotted red spider mite, Tetranychus urticae (Koch) was studied under laboratory conditions (27±1°C and 75±5% RH) at Department of Agricultural Entomology, College of Agriculture, Dharwad, during 2016. The incubation period varied from 3.92 ± 0.41 days, The female larval occupied 2.72 ± 0.18, while male larva occupied 2.62 ± 0.37 The duration of 0.42 ± 0.06 days in female occupied 0.28 ± 0.05 days in males. The protonymphal period for for female was 2.16 ± 0.13 days and for male, it was 2.53 ± 0.05. The duetonymph lasted for 1.75 ± 0.37days for female, while in male it lasted for 1.05 ± 0.11, adult male lasted for 10.23 ± 0.44 days, pre-ovipositional period lasted for 1.61 ± 0.25, Oviposition period lasted for 14.31 ± 1.26, Post oviposition period lasted for 2.97 ± 0.36.
Key words : *Bio-ecology, two spotted red spider mite, Tetranychus urticae.*

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INTRODUCTION

Two spotted red spider mite, *Tetranychus urticae* is extremely polyphagous; it can feed on hundreds of plants. These including peppers, tomatoes, potatoes, beans, maize and strawberries and ornamental plants such as roses. It is the most prevalent pest of *Withania somnifera* in India. It lays its eggs on the leaves, and it poses a threat to host plants by sucking cell contents from the leaves cell by cell, leaving tiny pale spots or scars where the green epidermal cells have been destroyed. Although the individual lesions are very small, attack by hundreds or thousands of spider mites can cause thousands of lesions and thus can significantly reduce the photosynthetic capability of plants and its management has usually been by acaricides. The development of acaricide resistance has led to intensive studies of the mite's biology and alternate control methods, principally by predaceous mites species [1].

MATERIALS AND METHODS

The biology of *T. urticae* was studied under laboratory conditions on mulberry leaf at temperature 27^0c with 75 per cent relative humidity in growth chamber of Biocontrol laboratory. Thirty gravid female mites from the mass culture were released on a fresh leaf arena maintained in turgid condition and allowed to lay eggs overnight. Next day morning the number of eggs laid by these mites were counted and were removed from the leaf. After egg hatching, the newly emerged hexapod larvae were lifted carefully with the help of a moistened zero size camel hair brush and kept on leaf arena of 2 cm diameter. In each petri plate, 10 leaf arenas were kept and in each arena, one larva was maintained. The development of various stages of the mite was observed at 12 h interval with the help of stereo binocular microscope. The leaf arenas were replaced regularly to avoid leaf deterioration and consequent poor nutrition. To record the morphology of different stages of mites, each stage of mites were mounted on a glass slide. After permanent mountage of each stage, the slides were observed in a phase contrast microscope and measurements were made with inbuilt software.

The observation on biology included incubation period, duration of larva, quiescent stage, pre-oviposition, oviposition and post-oviposition periods, fecundity and longevity of adults were recorded. The data obtained on duration of life stages were analysed to work out standard deviation. Thirty gravid female mites from the mass culture were released on a fresh leaf arena (2 cm diameter) maintained in turgid condition and allowed to lay eggs overnight. Emergence of larva in individual leaf arena was recorded at 12 h interval and incubation period was worked out at 27°C with 75 per cent relative

humidity. After incubation period, the 30 freshly emerged larvae were kept in each leaf arena and observed for further stages at 12 h interval. To record pre-oviposition period, male and females emerged were separated and allowed for mating, after that the adults were lifted carefully with the help of a moistened zero size camel hair brush and kept on leaf arena and observed for egg laying at an interval of 12 h. The oviposition period was recorded from each leaf arena containing a gravid female and observations were recorded from first egg laid by the female to last egg and total number of eggs was recorded. The observation on post-oviposition period was also made at 12 h interval. Observation on the daily fecundity was made on 30 adult females released in 30 leaf arena. Number of eggs laid in each rearing arena was recorded daily and expressed in terms of number of eggs laid per female per day of female life span. Total life span of both female and male was worked out by combining developmental period and adult longevity.

RESULTS AND DISCUSSION

Freshly laid eggs were smooth, spherical in shape, translucent white and appeared like a tiny drop of water. The incubation period varied from 3.92 ± 0.41 days (Table 1) in case of female, The morphometric observation indicated that the mean diameter of egg was 130.50± 0.70 µ with a range of 130 - 132 µ (Table 2). As the time progressed, egg gradually turned more brownish and then to a creamy pinkish prior to hatching. The larvae emerged out of the egg by making a vertical slit on one side of the cohesion. The newly emerged hexapod larva was almost spherical or slightly oval in shape with two prominent red spots (simple eyes) on the dorsal propodosomal region. Initially the larva crawled around for some time and settled at a place to feed on the cell sap. The larva was creamy white in colour and turned green upon initiation of feeding and finally to dark green with dark specks appearing dorso-laterally. The female larval period occupied 2.72 ± 0.18, while male larva occupied 2.62 ± 0.37 (Table 1). The larva measured 180.02± 2.31 µ in length and 132.54± 2.05µ in width (Table 2). The matured larva ceased to feed and entered a quiescent stage by anchoring itself to a leaf surface and assumed a characteristic pose. During this quiescent stage, the anterior two pairs of legs were extending straight forward and kept close to each other and posterior legs were extended backwards and held close to the sides of opisthosoma. The duration of 0.42 ± 0.06 days in female occupied 0.28 ± 0.05 days in males (Table 1).

Table 1. Biology of two spotted red spider mite, *Tetranychus urticae* under laboratory conditions

Stage*	Sex	Range (days)	Mean± S.D (days)
Egg	Male	3.00-4.20	3.55 ± 0.42
	Female	3.20- 4.50	3.92 ± 0.41
Larva	Male	2.00-3.10	2.62 ± 0.37
	Female	2.50-3.00	2.72 ± 0.18
Nymphochrysalis	Male	0.20-0.36	0.28 ± 0.05
	Female	0.35-0.52	0.42 ± 0.06
Prtonymph	Male	1.00-2.00	1.58 ± 0.37
	Female	1.40-2.70	2.04 ± 0.45
Prtochysalis	Male	0.28-0.40	0.33 ± 0.04
	Female	0.33-0.50	0.47 ± 0.03
Duetonymph	Male	1.00-1.56	1.30 ± 0.14
	Female	1.13-2.20	1.75 ± 0.37
Teliochrysalis	Male	0.27-0.35	0.30 ± 0.02
	Female	0.40-0.52	0.46 ± 0.04
Total developmental pediod	Male	9.52-10.60	10.23 ± 0.44
	Female	10.32-12.98	12.23 ± 0.65

* Mean of 15 observations

The newly emerged protonymph was oval shaped and amber coloured. It was slightly bigger in size than the larva and was easily by the presence of four pairs of legs. Feeding protonymph was greenish in the beginning and turned to dark green. The dark specks on the dorsum increased in size as the time passed. The protonymphal period for for female was 2.16 ± 0.13 days and for male, it was 2.53 ± 0.05 (Table 1). The morphometric observation indicated the protonymph measured 40.72± 5.87µ in length and 154.21± 4.36µ in width (Table 2).

Table 2. Morphometry of different stages of two spotted red spider mite, *T.urticae*

Stage*	Mean±S.D	
	Length	Breadth
Egg	130.50± 0.70	
Larva	180.02± 2.31	132.54± 2.05
Protonymph	240.72± 5.87	154.21± 4.36
Duetonymph	381.56 ±4.00	235.12± 4.66
Male	368.66± 10.65	173.40± 9.25
Female	465.35± 12.67	281.04± 14.51

* Mean of 15 observations

At maturity, the protonymph entered into a brief quiescent stage known as deutochrysalis. At this stage the mite suspended all activities of feeding and remained anchored to the leaf surface. This stage lasted for 1.75 ± 0.37 days for females, while it occupied 1.30 ± 0.14 days for males (Table 1). The newly emerged duetonymph was red in colour and the size of the body was little enlarged than that of protonymph. The duetonymph lasted for 1.75 ± 0.37days for female, while in male it lasted for 1.05 ± 0.11 (Table 1). The protonymph measured 240.72± 5.87 µ in length and 154.21± 4.36 µ in width (Table 2). The mature deutonymph entered into a quiescent stage known as the teleiochrysalis. At this stage the body was shrunk and decreased in size. Female lasted for 0.46 ± 0.04 days and 0.27-0.35 days for male (Table 1). The adults emerged splitting dorsally the skin of teleiochrysalis and started their activities immediately. Pronounced sexual dimorphism was apparent at this stage. The adult male lasted for 10.23 ± 0.44 days (Table 1). The adult male measured on an average 368.66± 10.65 µ in length and 173.40± 9.25 µ in width (Table 2). The females soon after emergence were bright red in colour and it lasted for 12.23 ± 0.65 days and measured 465.35± 12.67 µ in length and 281.04± 14.51 µ width. After a period of feeding, the colour changed to caramine/brick red. The simple eyes were seen as two red spots on the sides of dorsal propodosomal region. The female was found bigger with a rounded and oval shaped abdomen. The present findings are similar with Cagle [2], Dosse [3] studied life cycle of *T. urticae* consists of egg, larva, protonymph, deutonymph and adult. The female laid eggs only after a lapse of certain period and this period lasted for 1.61 ± 0.25 days, Oviposition period lasted for 14.31 ± 1.26, Post oviposition period lasted for 2.97 ± 0.36 days. Laing [4] in his study of *T. urticae* reared on strawberry leaves at found the preoviposition period to be 2.1 days.

CONCLUSION

Tetranychus urticae (Koch) incubation period varied from 3.92 ± 0.41 days, The female larval occupied 2.72 ± 0.18, while male larva occupied 2.62 ± 0.37 The duration of 0.42 ± 0.06 days in female occupied 0.28 ± 0.05 days in males. The protonymphal period for for female was 2.16 ± 0.13 days and for male, it was 2.53 ± 0.05. The duetonymph lasted for 1.75 ± 0.37days for female, while in male it lasted for 1.05 ± 0.11, adult male lasted for 10.23 ± 0.44 days, pre-ovipositional period lasted for 1.61 ± 0.25, Oviposition period lasted for 14.31 ± 1.26, Post oviposition period lasted for 2.97 ± 0.36.

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