

## Comparative biology of two spotted spider mite, *Tetranychus urticae* Koch (Acariformes: Tetranychidae) on grape and mulberry\*

Grape (*Vitis vinifera* L.) is one of the commercially important fruit crops of the world and is good source of minerals viz., calcium, phosphorous, iron and vitamins particularly B<sub>1</sub> and B<sub>2</sub>. Its juice is mild laxative and acts as stimulant for kidneys. In India, Karnataka occupies second position in cultivation and production of grapes followed by Maharashtra. Karnataka contribute to a total of 14.3 per cent of the Indian grape area (18,100 ha) with the annual production of 3.30 lakh tonnes and productivity of 18.3 tonnes per ha (Anon., 2011). In Karnataka major grape growing districts are Bijapur, Bagalkot, Bangalore, Chikkaballapur, Kolar, Belgaum, Koppal and Gulbarga. In Bijapur district area under grape is 6137 ha with production of 97,592 tons and average productivity is 15 t/ha.

Several factors are responsible for quantity and quality deterioration in grape. Among them the non insect pest red spider mite *T. urticae* is causing enormous damage to grapevine in Andhra Pradesh and Karnataka. Though *T. urticae* is a polyphagous pest infecting many crops, the information pertaining to grapes in Karnataka is lacking.

Biological studies with respect to the mite species are essential to develop suitable management practices. Information regarding the grape mite biology is not much pronounced in publications except a report of Chandra Sekhar *et al.* (2008). Six species viz., *T. urticae*, *T. cinnabarinus*, *T. neocoleonicus*, *Oligonychus mangiferus*, *O. punicae* and *Eutetranychus orientalis* are found causing damage to grapevine in India (Anon., 2008). Among them, the two spotted red spider mite, *T. urticae* causes severe loss in Maharashtra and Andhra Pradesh.

The life history of *T. urticae* was studied under laboratory on grape variety Thompson seedless and mulberry (S-1635) at the College of Agriculture, Bijapur during rabi – summer 2012-13. The ambient temperature was 26±5°C and the relative humidity was 74±5 per cent. Thirty gravid female mites from the mass culture were released on a fresh grape leaf bit maintained in turgid conditions and allowed to lay eggs overnight. The number of eggs laid by these mites was counted and adults were removed from the leaf. The newly emerged hexapod larvae were lifted with moistened zero size camel hair brush and kept on leaf bits (2 x 2 cm) at the rate of one larva per leaf bit per petriplate. Thirty plates were maintained to study the biology. The development of various stages of the mite was observed at 2 h interval under stereobinocular microscope. The leaf bits were replaced regularly to avoid leaf deterioration and consequent poor nutrition. The observations were recorded on the incubation period, larval period, protonymph, deutonymph, quiescent stages, pre-oviposition, oviposition, fecundity and the longevity of adults. The morphometric parameter of egg was recorded with a standardized ocular micrometer fitted to a stereo binocular microscope.

Studies on biology of red spider mite on grapevine revealed that most of the egg laying by mite was confined to the area nearer to mid rib and lateral veins on the under surface of leaf. Freshly laid eggs were spherical, smooth and translucent white

and appeared like tiny water droplets measuring 0.01 mm diameter. They turned brownish progressively towards hatching. The incubation period ranged from 3.67-4.50 days with an average of 4.02 ± 0.2 days on grape. This period varied in laboratory host mulberry i.e., 3.39 ± 0.1 days with a range of 3.08 - 3.75 days (Table 1).

The larva was whitish in colour with prominent red simple eyes and with three pairs of legs. The larval period ranged from 1.83 - 2.25 days with an average of 2.08 ± 0.1 days when reared on grape and that of mulberry host the period ranged from 1.25 - 1.50 days with average of 1.31 ± 0.09 days. The larval stage was followed by a quiescent stage (Quiescent I) which lasted for 0.67- 0.92 days with an average of 0.76 ± 0.07 days in grape. It varied in mulberry with range of 0.75- 1.17 days and with an average of 0.90 ± 0.07 days.

The newly emerged protonymph was amber in colour and the later stage protonymph was brownish in the beginning. Later it turned to dark brown and it was slightly larger than larva and easily distinguishable by the presence of four pairs of legs and this period of grape mite ranged from 1.75- 2.25 days with an average of 1.99 ± 0.15 days. It varied in mulberry host with range of 0.67 - 1.00 days and average of 0.80 ± 0.08 days. The protonymphal stage was followed by quiescent stage (Quiescent II) which ranged from 0.75 - 0.92 days with an average of 0.81± 0.06 and that of mulberry host its ranged from 0.58 - 1.08 days with an average of 0.84±0.08 days. After protonymphal stage the mite passed to deutonymphal stage, which resembled protonymph in all characters except bigger in size and period ranged 1.83 - 2.25 days with average of 2.01 ± 0.12 days on grape leaves. It varied from 0.83 - 1.50 days with an average of 1.04 ± 0.15 days on mulberry host.

After deutonymphal stage, the mite immediately entered into a quiescent stage (Quiescent III) and its period ranged from 0.75 - 1.00 days in grape with a mean of 0.88 ± 0.07 days. The deutonymphal stage varied with mulberry host from 0.58 - 1.50 days with an average of 1.03 ± 0.16 days. The total mean developmental period from egg to adult stage was 12.55 ± 0.82 days. The observations of *T. urticae* reared on grape variety Thompson seedless are in accordance with Chandra Sekhar *et al.* (2008) and Anon. (2008) with respect to biological parameters.

However, slight variations in the individual life stages were evident from the studies. The fecundity observed in present study is comparatively lesser than the observations of Chandra Sekhar *et al.* (2008) and more than the findings of Anon., (2008). However, in the comparative biology the present study revealed low fecundity of 55.5 ± 4.5 per female and the shorter female longevity of 12.8 days on mulberry host. The total developmental period and the ovipositional period were also less for *T. urticae* reared on mulberry compared to grape.

The biological variation for different host is a known phenomenon though each host supports the survival and

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Table. Comparative biology of *T. urticae* on grape (Thomson seedless) and mulberry (S-1635)

| Developmental stages (days) | Grape       |                  | Mulberry     |                  |
|-----------------------------|-------------|------------------|--------------|------------------|
|                             | Range       | Mean $\pm$ S.D   | Range        | Mean $\pm$ S.D   |
| Egg (Incubation period)     | 3.67- 4.50  | 4.02 $\pm$ 0.2   | 3.08 - 3.75  | 3.39 $\pm$ 0.1   |
| Larval                      | 1.83 - 2.25 | 2.08 $\pm$ 0.1   | 1.25 - 1.50  | 1.31 $\pm$ 0.09  |
| Quiescent- I                | 0.67 - 0.92 | 0.76 $\pm$ 0.07  | 0.75 - 1.17  | 0.90 $\pm$ 0.07  |
| Protonymph                  | 1.75 - 2.25 | 1.99 $\pm$ 0.15  | 0.67 - 1.00  | 0.80 $\pm$ 0.08  |
| Quiescent- II               | 0.75 - 0.92 | 0.81 $\pm$ 0.06  | 0.58 -1.08   | 0.84 $\pm$ 0.08  |
| Deutonymph                  | 1.83 - 2.25 | 2.01 $\pm$ 0.12  | 0.83 -1.50   | 1.04 $\pm$ 0.15  |
| Quiescent- III              | 0.75 - 1.00 | 0.88 $\pm$ 0.07  | 0.58 -1.50   | 1.03 $\pm$ 0.16  |
| Total developmental period  | 11.8 - 13.2 | 12.55 $\pm$ 0.82 | 8.67 - 10.17 | 9.31 $\pm$ 0.81  |
| Pre-oviposition period      | 1.75 - 2.25 | 1.99 $\pm$ 0.13  | 1.67 - 2.00  | 1.86 $\pm$ 0.10  |
| Oviposition period          | 10.0 - 11.0 | 10.54 $\pm$ 0.26 | 7.67 - 8.25  | 7.98 $\pm$ 0.16  |
| Post-oviposition period     | 2.25 - 2.83 | 2.57 $\pm$ 0.16  | 2.08 - 2.42  | 2.24 $\pm$ 0.10  |
| Female longevity            | 14.5 - 15.8 | 15.09 $\pm$ 0.56 | 11.58 - 12.1 | 12.08 $\pm$ 0.35 |
| Male longevity              | 8.25 - 9.10 | 8.63 $\pm$ 0.3   | 6.75 -7.4    | 7.12 $\pm$ 3.0   |
| Fecundity (number/female)   | 56-76       | 66.53 $\pm$ 4.93 | 48-64        | 55.50 $\pm$ 4.73 |

perpetuation to considerable extent. The mite, *T. urticae* appeared to be a polyphagous pest and infesting many crops. The biology of *T. urticae* on apple also is in a very close fashion to grapes (Czajkowska *et al.*, 1995). Though, brinjal is a suitable host for *T.*

*urticae* with the biological parameter similar to grapes (except fecundity) the differential response among brinjal cultivars themselves was also evident (Vora, 1994). Hence, grape appeared to be a preferential host for two spotted spider mite.

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