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Feeding potential of *Euseius ovalis* (Evans) (Acaridae: Phytoseiidae) on *Tetranychus macfarlanei* Baker and Pritchard (Acaridae: Tetranychidae) infesting okra

C.K.Mohamed Liyaudheen*, P.K. Rekha, K. Anitha, and N. Ramani

ABSTRACT

Predatory mites of the family Phytoseiidae have been successfully used in the biological control of numerous agricultural pests worldwide. The present study deals with the feeding efficacy of *Euseius ovalis* on *Tetranychus macfarlanei*, a major spider mite pest with wide host range, inducing considerable damage and yield loss to the vegetable crop, *Abelmoschus esculentus*, the commonly called okra. Feeding potential of *E. ovalis* was studied by rearing the prey and predator in an incubator, at 30 ± 2^0 C and 64 ± 2% RH, by adopting the leaf flotation technique, on the leaf discs of okra plant . Known numbers of different life stages of *T. macfarlanei* were offered to different life stages of the predator and data were recorded on the feeding activity and feeding rate of the predatory mite. The predatory mite it pierced the body of the prey with its chelicerae and gradually sucked out the internal contents. Maximum feeding preference could be observed on the eggs of the pest mite, followed by the larva and protonymph. Lower feeding preference was observed on the adult and deutonymphal stages and the quiescent stages were totally neglected by the predator. Prey consumption rates by the adult female, deutonymph, protonymph and the adult male of the predator were 63%, 52%, 50% and 33% respectively. Predator larva was recognized as a non feeding stage. Data when analysed statistically using the Two way ANOVA were found significant, thereby establishing *E. ovalis* as a potential predator of *T.macfarlanei*.

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INTRODUCTION

Mites of the family Phytoseiidae are important predators of plant mites as well as insect pests like the thrips, scale insects, aphids etc. Phytoseiid mites have been successfully used in biocontrol programmes all over the world (Jeppson *et al*., 1975; Mc. Murty *et al*., 1970). About 33 acarine families have been identified for the control of insects, mites, weeds and nematode pests (Gerson *et al*., 2003). Mites of the genus *Euseius* are considered as generalist predators or specialized pollen feeders (Mc.Murty and Croft, 1997). *Tetranychus macfarlanei* has been recognized as a serious pest causing damage to vegetables, fruit crops and medicinal plants (Moutia, 1958; Gupta, 2005). The edible green pods of *Abelmoschus esculentus* constitute a popular health food as these contain carbohydrates, proteins, minerals like Ca and K, fibres, folate content, vitamins like vitamin C and antioxidants (Khomsug *et al*.,2010). In the present study, the predatory potential of a generalist predator viz. *Euseius ovalis* has been studied on *T. macfarlanei*, a major spider mite pest with wide host range, inducing considerable damage and yield loss to the vegetable crop, *A. esculentus*, the commonly called okra plant.

MATERIALS AND METHODS

Live specimens of the predatory mite, *E. ovalis* required for the present investigation were collected from the plants cultivated in different localities of Malappuram district of Kerala from March to May, 2013. The pest mites were collected from severely infested *A. esculentus*, showing symptoms such as stippling, bronzing etc. Mite infested leaves were cut with scissors and put in a polythene bags for transportation to the laboratory. The mite specimens present on individual leaf were examined under a

Stemi DV_4 stereo zoom microscope in the laboratory. Successful rearing of predator/pest mites was carried out in controlled laboratory conditions in an incubator, at 30 ± 2^0 C and 64 ± 2 % RH, by adopting leaf flotation technique on leaves of *A. esculentus*. Leaf discs were kept in petridishes lined with water saturated cotton pads. Different life stages of pest and predatory mites were transferred on to leaf discs with the help of moistened Camel hair brush. Several cultural sets were maintained in the laboratory to study the feeding preference of individual stages of *E. ovalis* on the different life stages of *T. macfarlanei*. Known numbers of the various life stages of *T. macfarlanei viz.,* the egg, larva, protonymph, protonymph, deutonymph, quiescent phases of the larval and nymphal stages as well as the adult mites were offered to the various life stages of the predator. Regular observation was made to collect data on the feeding activity, nature of predation and the rate of feeding by individual stages of the predator. Data on the number of different life stages of the prey mite consumed by the predator and the total number of mites consumed by the predator in 24 hrs were recorded and the experiment was repeated for confirmation of results. Data obtained on feeding potential were subjected to Two way ANOVA for testing the significance.

RESULTS AND DISCUSSION

Results of field observations carried out during the present study revealed the constant association of *E. ovalis* with the spider mite, *T. macfarlanei*, leading to its population decline. Results of laboratory studies enabled to record the predatory potential of *E. ovalis.* on the various life stages of the pest mite. Feeding activity of the predator was initiated up on contact with the prey.

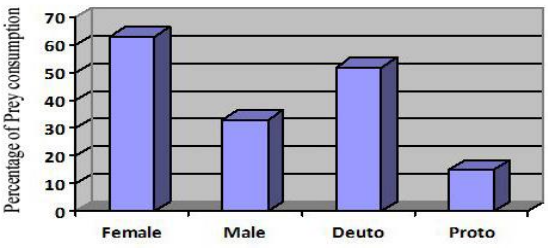

Fig. 1. Rate of Consumption (in %) of *Euseius ovalis* on the life stages of *Tetranychus macfarlanei.*

The predator was found holding the prey mite with its fore legs and subsequently penetrating the body of the prey with its mouth parts to suck out the internal contents. All stages of the predator were found feeding on the prey stages, except the larval stage. Per cent consumption by the various life stages of the predator on different stages of *T. macfarlanei* varied considerably (Table 1).

Feeding rate of the adult female predator was comparatively very high on the pest provided (Fig.1). Larval stage of the predator was recognized as a non feeding stage. The rate of consumption of the adult male, deutonymph and protonymph of *E. ovalis* were 33%, 52% and 15% respectively in 24 hours. Adult female was recognized as the most potential predator and its feeding preference towards the various stages of the pest mite decreased in the order : egg > larvae > protonymph > deutonymph (Table1). Data on the feeding potential of *E.ovalis* towards different stages of *T. macfarlanei* when subjected to Two way ANOVA showed P-value as (0.016) for prey and (.0005) for predator, the value being less than 0.05, appeared as significant. Predatory mites constitute an overwhelming group, providing promising results in the regulation of various phytophagous mites and insects. Of the various groups of predatory mites, phytoseiids represent an important and dominant group harbouring in arboreal ecosystems (Karmakar and Gupta, 2011). Over 2280 species of phytoseiids are known from all over the world (Chant and Mc Murtry, 2009; Mallik *et al* .2010) and over 190 species have been reported from India (Karmakar and Gupta, 2011).The supreme searching behavior coupled with their wide distribution pattern and excellent predatory potential raised the status of these mites as promising candidates for the implementation of pest control programmes (Mc Murty and Croft, 1997).

Several countries have successfully launched various IPM programmes by importing phytoseiid mites. Results of the present study enabled to record the predatory potential of the phytoseiid representative, *E. ovalis* on the serious spider mite pest, *T. macfalanei*. With the exception of the larval stage, all the other stages of *E. ovalis* were found to feed on all stages of the prey mite. The larva was recognized as a non feeding stage and which may be an adaptation to avoid cannibalism (Zang *et al.,* 2000).

Table 1. Consumption of different stages of *Tetranychus macfarlaeni* by different stages of *Euseius ovalis* in 24 hours at 30 ± 2°C and 64 ± 2% RH

Predator life stage		*Tetranychus macfarlanei*							*Tetranychus macfarlanei*						
		Number of prey stages provided							Number of prey stages consumed						
Adult		Egg	Larvae	Proto-	Deuto-	Quiscent	Adult	Total	Egg	Larvae	Proto -	Deuto-	Quiescent	Adult	Total
	Male	10	5	3	3	3	3	27	5	1	2	1	0	0	9
	Female	10	5	3	3	3	3	27	8	4	2	1	0	2	17
Immature stages	Larvae	10	5	3	3	3	3	27	Not feeding anything						
	Protonymph	10	5	3	3	3	3	27	2	1	1	0	0	0	4
	Deutonymph	10	5	3	3	3	3	27	6	4	1	1	0	2	14

The predator showed more preference towards eggs, there by supporting the earlier findings made on *Amblyseius bibiens* (Blommers *et al.*, 1975). Lowest preference was noted towards the quiesent stages, which may be due to the possession of hard cuticle.

The adult female predator was recognized as the most excellent predator, as it consumed 63% of the pest. Slight variation was noted in the rate of feeding of the predator with respect to the different life stages of the prey offered in the laboratory. The order of preference was found decreasing in the order of egg>larvae and protonymph>adult stages and least preference was noted towards quiscent stages. Another phytoseiid member viz. *Neiuseiulus womersleyi* also exhibited similar variation in the rate of consumption with respect to variations in life stages of the prey mite, *T. macfarlanei* (Kasap and Altihan, 2011). However, *N. womersleyi* showed more preference to larvae of *T. macfarlanei* and in the present study, *E. ovalis* showed more preference to the eggs of the pest mite. The present study supports the results of earlier studies of Blackwood *et al*. (2001) who recorded preference to eggs than larvae in several predatory mites like *Kampimodromus aberrans, Phytoseiulus macropilis, P.persimilis, Neoseius longispinosus* and *N. fallacies*. This difference in the feeding preference may be due to the difference in the species of the predator concerned.

Results of feeding preferences of various stages of predator towards to different stages of pests when analysed statistically by TWO-WAY ANOVA were found significant, thereby establishing *E. ovalis* as a significant predator of the pest mite, *T. macfarlanei.*

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C.K.Mohamed Liyaudheen*, P.K. Rekha, K. Anitha, and N. Ramani

Division of Acarology, Dept. of Zoology, University of Calicut, Kerala, 673 635, India.

*Communication author

Mobile : 09495174338,

E-mail: drnramani@gmail.com