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Research Article

Interrelation between the Number, Stages of the Pest Mite and Feeding Potential of *Amblyseius multidentatus* (Predatory Mite) at Different Durations

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ABSTRACT

The feeding potential of Amblyseius multidentatus was studied against pest mites Tetranychus cinnabarinus and Eutetranychus orientalis (pest mites of crops). A. multidentatus had a clear-cut preference for T. cinnabarinus over E. orientalis (tcal 3.18) irrespective of the stage of egg, larva, nymph and adult. A. multidentatus preferred to consume eggs of T. cinnabarinus than to feed on E. orientalis eggs. The most preferred stage of T. cinnabarinus was larva (S=1.84), followed by adult and egg stages (S=1.62, S=1.57, respectively). Consumption of different stages of the pest with respect to number and duration showed a significant difference. Interaction between stage and duration showed no significant statistical difference with each other. Interaction between stage (S) and number (N) showed a significant difference (N=0.41. 0.87, 0.83).

Keywords: *Pest, mites, feeding, potential, Amblyseius multidentatus.*

INTRODUCTION

Phytoseiid mites are predatory mites. They belong to the family Phytoseiidae. They feed on the pest mite belonging to families Tetranychidae, Tenuipalpidae, Tarsonemidae and Eriophydae. Besides, insect pests representing aphids, coccid thrips etc., are also their known prey (Manjunatha et al., 1999). Thus, they play a very important role in biological control programmes and have become one of the most active ingredients in integrated pest management (IPM) strategies. Mite species, known as pests a few years ago, have assumed pest status (Onzo et al., 2012). Phytoseiid mites are recognized as predators of pest mites. They are very efficient predators since they have shorter life cycles than their prey, have equivalent reproductive potential and can thrive on alternative food such as caster, pollens etc. (Gupta, 1991; Manjunatha et al., 1999; & Onzo et al., 2012).

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MATERIALS AND METHODS

Leaves from fruit, vegetables and ornamental crops were collected from three canopies of the plant and brought to the laboratory in individually labelled polythene bags. Mites were collected with the help of a needle or brush and preserved in 70 % alcohol. Permanent slides were prepared in Hoyer's medium. Identification of mites was made with the help of keys. A culture of pest and predatory mites were raised in the laboratory. The culture of *T. cinnabarinus* was maintained in the laboratory on Brinjal leaves and *E. orientalis* on Anjeer leaves. These mites were reared in the laboratory on small leaves, which were kept on wet filter paper and wet cotton in Petri dishes. Water was added periodically so as to keep the cotton supersaturated and thereby keeping the leaf disc in a turgid condition. A thin film of water was maintained, which acted as a barrier and thus prevented the escape of mites. These Petri dishes were kept in a BOD incubator at a constant temperature of 30±1ºC and 70% relative humidity (RH). Observations were taken daily after every 24 hours under a stereo binocular microscope. Culture of Phytoseiid mite, *A., multidentate* was maintained in the laboratory at a temperature of 30±1ºC, and 70% RH in a BOD incubator on Brinjal leaves. *A. multidentate* was provided with all stages of *T. cinnabarinus* as food material. Fresh leaves were provided whenever required. The mites were observed daily for fecundity and longevity. The developmental stages of the pest mite, *i.e.* egg, larva, nymph and adult, were used at fine different prey densities (1, 2, 3, 4 & 5) in each Petri dish. The predators used were adults of *A. multidentatus* and various developmental stages other than eggs. The mites were released on leaf bits with the help of a fine needle carrel hair brush. Each treatment was replicated five times. The dead individuals were considered consumed by the predatory mite *A. multidentatus* for different stages of *T. cinnabarinus* and *E. orientalis* were noted. In the control test, the predator was not there, keeping the other things the same. Statistical analysis was done through t-test and factorial ANOVA to find out the best predator among both the pest mites.

RESULTS AND DISCUSSION

It is evident from the Table 1 that *A. multidentatus* preferred *T. cinnabarinus* over *E. orientalis.* Therefore, a detailed study was conducted on *T. cinnabarinus.* Studies on the feeding behaviour of *A. multidentatus* were undertaken to know the effect of population density and duration of stages of the pest mite (Table 2). It clearly indicates that *A. multidentatus* had a preference for *T. cinnabarinus* over *E. orientalis* as food irrespective of the stages, *i.e.* egg, larva, nymph and adult pest mite. It suggests that *A. multidentatus* may be much more beneficial for biological control of *T. cinnabarinus* (Gupta, 1985; & Gupta, 1993).

Data regarding the interrelationship between the number, stages of *Tetranychus cinnabarinus* and feeding potential of *A. multidentatus* at different durations was presented in Table 2. It is evident from the Table that the most preferred stage of *T. cinnabarinus* was larva (1.84 pooled mean S), followed by adult and egg stage (1.62 & 1.57) respectively. The least preferred stage was nymph (S=1.34) statistically. Consumption of different stages of the pest with respect to number and duration showed a significant difference. Duration-wise, there was no significant difference, as it was clear from the pooled means of durations (D=1.69, 1.65, 1.49, 1.50 & 1.44). Maximum consumption (D=1.69) was observed on day 1 (Table 2).

Interaction between stage and duration showed no significant difference with each other. Irrespective of duration, the interaction between stage (S) and number (N) showed a significant difference in the prey density of 1, 2 & 5 (N=0.41, 0.87, 1.83). Values at the prey density of 3 & 4 were statistically at par with each other. Number-wise, the maximum consumption (N=2.60)occurred when the pest mites were supplied at the prey density of 4 with respect to all the stages as it is clear from the Pooled means of Number (Table 2).

These findings are in agreement with those of Puttaswany and Channabasavana (1989), Gupta (1999), and Patel et al. (1993), who reported that predatory mites consumed more prey with an increase in prey density of T. ludeni. A review of the predatory-prey relationship of Phytoseiid mites controlling destructive mites in India has been reported by many researchers (Onzo et al., 2012).

In the present research, *A. multidentatus* preferred larva mites most (S=1.84), followed by adult and egg stages. However, Dhooria (1981) observed that *A. multidentatus* preferred the protonymph and larval stage over other pest mites *E. orientalis stages*. Similar results were also reported by Li et al. (2015).

Table1. Feeding potential of *A. multidentatus* on *T. cinnbarinus* and *E. orientalis*

Stages	Average Feeding potential of *A. multidentatus* adults/day		
	T. cinnbarinus consumed	***E. orientalis consumed***	t_{cal}
Egg	3.5	1.4	0.03
Larva	3.8	2.6	0.15
Nymph	2.8	1.9	0.21
Adult	3.6	2.0	0.03

Note: t_{tab}=3.18

Table2 Interrelationship between the number, stages, and feeding potential of *Amblyseius multidentatus* at different durations

Number of pest	Number of pest stages consumed/predator																													
	Day 1					Day 2					Day 3					Day 4					Day 5					Mean (s)				Pooled Mean (N)
	E	L	N	A	M	E	L	N	A	M	E	L	N	A	M	E	L	N	A	M	E	L	N	A	M	E	L	N	A	
1	0.4	0.4	0.6	0.6	0.50	0.2	0.4	0.4	0.8	0.45	0.2	0.4	0.6	0.4	0.40	0.6	0.4	0.2	0.6	0.45	0.0	0.4	0.0	0.6	0.25	0.28	0.20	0.36	0.60	0.41
2	1.0	1.4	1.0	1.2	1.15	0.6	1.0	1.4	1.4	1.10	0.8	1.4	1.0	0.8	1.00	0.8	1.0	1.0	1.4	1.05	0.6	0.4	1.4	1.2	0.90	0.76	1.04	1.16	1.2	0.87
3	2.0	1.6	1.4	2.6	1.40	1.8	2.0	1.4	1.8	1.75	2.0	1.6	1.2	2.2	1.95	1.4	1.2	1.2	1.8	1.40	1.2	1.0	1.0	1.6	1.20	1.88	1.76	1.24	2.00	2.43
4	3.2	3.5	2.8	3.4	3.25	2.6	3.6	2.2	2.2	2.64	1.8	3.6	2.2	1.6	2.30	2.6	3.2	1.8	2.2	2.45	2.0	3.8	1.8	2.0	2.40	2.44	3.76	2.16	2.28	2.60
5	2.8	2.0	2.0	1.8	2.15	2.0	3.0	2.2	2.2	2.35	3.0	2.2	0.8	2.0	2.00	2.0	2.4	2.2	2.0	2.15	2.8	3.0	1.8	2.2	2.45	2.52	2.44	1.80	2.04	1.83
Mean	0.88	1.80	1.56	1.92		1.44	2.0	1.56	1.68		1.56	1.84	1.16	1.4		1.48	1.64	1.28	1.6		1.32	1.72	1.20	1.52						
Pooled Mean (D)					1.69					1.65					1.49					1.50					1.44					
Pooled Mean (S)																										1.57	1.84	1.34	1.62	

CD at 5%

Stages (S) = 0.1038 S×N = 0.2320 S×N×D = 0.5188 E = Egg, L = Larva, N = Nymph, A = Adult, M = Mean

Number (N) = 0.1160 S×D = 0.2320

Duration =0.1160 N×D = 0.2594

CONCLUSIONS

It may be concluded from the present study that *A. multidentatus* preferred to consume eggs of *T. cinnabarinus* than to feed on *E. orientalis* eggs. The most preferred stage of *T. cinnabarinus* was larva (S=1.84), followed by adult and egg stages (S=1.62, S=1.57, respectively). Consumption of different stages of the pest with respect to number and duration showed a significant difference, whereas interaction between stage and duration showed no significant statistical difference.

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