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Studies on feeding propensity of predatory mite, *Amblyseius alstoniae* Gupta and lady bird beetle, *Coccinella septempunctata* L. on okra mite, *Tetranychus cinnabarinus* (Boisduval)

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Abstract

Studies under laboratory conditions were conducted to observe the feeding propensity of predatory mite, *Amblyseius alstoniae* Gupta and lady bird beetle, *Coccinella septempunctata* L. which have been found feeding on okra mite, *Tetranychus cinnabarinus* (Boisduval). It was interesting to note that the feeding propensity of predatory mite, *A. alstoniae* was maximum in the first hour of release and then showed a decreasing trend. A single predatory mite consumed on an average 3.4 mites during first hour of release, however, it showed a decreasing trend in latter four intervals, where the feeding proficiency was observed to be 2.2, 1.3, 0.9 and 0.3 adults only. On the whole, a single predatory mite consumed 8.1 mites during 24 h with a range of 6-11 mites. In 2005, it was observed that a single predatory mite consumed on an average 3.1 mites during first hour of release, however, it showed a decreasing trend in latter four intervals, where the feeding proficiency was observed to be 2.0, 1.1, 0.9 and 0.3 adults only. On the whole, a single predatory mite consumed 7.4 mites during 24 h with a range (6-9 mites). In 2004, a single beetle of *C. septempunctata* consumed on an average 9.5 mites during first hour of release, and showed a decreasing trend in latter intervals, where the feeding proficiency was observed to be 6.7, 4.2, 1.8 and 1.0 adult mites. As a whole, a single beetle of *C. septempunctata* consumed 23.2 mites during 24 hours duration (range 21-25 mites), whereas in 2005 such consumption was 21.9 mites (range 18-25 mites) with similar trend of consumption at different intervals as observed in 2004.

Keywords: Feeding propensity, predatory mite, lady bird beetle, Mite, *T. cinnabarinus* and Okra

1. Introduction

Okra, *Abelmoschus esculentus* (L.) Moench also known as *Bhindi* or lady's finger, is grown throughout India for its immature fruits and occupies an important position among vegetables (Saroda and Lal, 1981). In India, it occupied over 0.31 million hectares area with an annual production of 3.65 million tonnes (FAO Report, 2007) [7], whereas, Rajasthan occupied 4456.0 hectares area with an annual production of 11447.0 tonnes during 2005-06 (Anonymous, 2006) [3]. The fully ripened fruits and stem contain carbohydrate (7.7%), protein (2.2%), fat (0.02%), fibres (1.2%), minerals (0.7%) and calcium (0.9%) and are also good source of iron, iodine and vitamins (Chauhan, 1965).

The okra crop is attacked by several species of insect pests right from the germination to the harvest (Ambegaonkar and Bilapate, 1984) [1]. In the recent years, the importance of mites as a pest of vegetable crops has been appreciated all over the world. The main contributing factor has been the excessive reliance on pesticide leading to serious upset in natural balance (Baker and Pritchard, 1960). Among the vegetable crops, okra and brinjal are the most affected by mites causing economic loss throughout the country. The red spider mites viz., *Tetranychus cinnabarinus* (Boisduval), *T. ludeni* Zacher and *T. neocaledonicus* Andre are of major significance to vegetable crops in India (Gupta, 1991 [8] and Rai *et al.*, 1991) [14]. Among the mite pests, *T. cinnabarinus* become abundant and cause appreciable damage to okra crop particularly during dry months of the year, even under drought conditions, as high as 20 per cent loss in okra has been estimated (Shankarappa *et al.*, 1981) [16]. The crop loss in Parbhani kranti variety of okra was reported to be 23.7%, 11-25%, 13-13.6% and 45-52% per cent at Navsari, Hisar, Varanasi and Pusa, respectively (Anonymous, 2004) [2]. The mite is polyphagous in nature and has been reported to infest more than 110 plants including fruits,

vegetables and field crops (Jeppson *et al.*, 1975) [9]. It sucks the cell sap from the leaves and produce white spots which latter get covered by thick web. In windy weather, these webs are filled with soil particles. The photosynthetic activity is retarded, affected leaves loose green colour, dry up and drop pre mature, finally resulting in poor fruit setting (Rahman and Sapra, 1945 [13]; Khot and Patel, 1956 [11]; Bharodia and Talati, 1976 [5] and Puttaswamy and Reddy, 1980) [12]. Expanding vegetable cultivation due to availability of high yielding hybrids is providing sufficient food and congenial environment for the mite to multiply on regular basis. As such, the present investigation has been carried out on seasonal incidence of *T. cinnabarinus* and its natural enemies on okra in semi-arid Rajasthan.

Material and Methods

The experiment was conducted on feeding propensity of predatory mite, *A. alstoniae* and lady bird beetle, *C. septempunctata* on okra mite, *T. cinnabarinus* at Department of Entomology, S.K.N. College of Agriculture, Jobner during *kharif*, 2004 and 2005. Feeding potential of the predatory mite, *A. alstoniae* was studied on detached leaf of okra using mobile stage of *T. cinnabarinus* as prey. Petri dishes of 15 cm. diameter, each with an okra leaf maintained on wet cottons swab were used for the experimentation. A single adult of predatory mite was released on the leaf containing 25 adults and interaction was observed for a period of 1, 2, 3, 6 and 24 hrs. Ten such sets were maintained simultaneously. Before releasing the predatory mite, it was kept starved for 3 hrs. In order to study the feeding propensity of lady bird beetle, *c. septempunctata*, a beetle was released in each glass jar containing 25 individuals (adult) of prey mite, *T. cinnabarinus* with few okra leaves. The mouth of each jar was closed with muslin cloth. Ten sets were kept for this purpose. The insect predator was also kept starved for 3 hrs before releasing into the jars. The interaction between insect predator and prey mite was observed after 1, 2, 3, 6 and 24 hrs of release of the beetle.

Result and Discussion

The feeding propensity of predatory mite was maximum in the first hour of release and then showed a decreasing trend. It was further observed that single predatory mite consumed on an average 3.4 mites during first hour of release, however, it showed a decreasing trend in latter four intervals, where the feeding proficiency was observed to be 2.2, 1.3, 0.9 and 0.3 adults only in 2004. On the whole, a single predatory mite consumed 8.1 mites during 24 h with a range (6-11 mites). In 2005 also, it was interesting to note that the feeding propensity of predatory mite was maximum in the first hour of release and then showed a decreasing trend. It was further observed that single predatory mite consumed on an average 3.1 mites during first hour of release, however, it showed a decreasing trend in latter four intervals, where the feeding proficiency was observed to be 2.0, 1.1, 0.9 and 0.3 adults only. On the whole, a single predatory mite consumed 7.4 mites during 24 h with a range of 6-9 mites.

During present studies, the phytophagous mite, *T. cinnabarinus* has been found to be predated by the predatory mite, *A. alstoniae* under field conditions, as such, the predatory propensity was studied in two consecutive years i.e.

2004 and 2005 under laboratory conditions. The feeding propensity was maximum in the first hour of its release and then showed a decreasing trend. It might be because of the fact that predatory mites were kept starved for three hours before releasing them for predation. Similar observations were also recorded by Jose *et al.* (1989) [10] and Sharma (2006) [17] and as such support the present findings. The lady bird beetle, *C. septempunctata* has been found feeding on adults of red spider mite, *T. cinnabarinus*, as such, the predatory propensity of the same was studied under laboratory conditions in 2004 and 2005. It was observed that the feeding propensity was maximum in the first hour of release and latter showed a decreasing trend. In 2004, a single beetle consumed on an average 9.5 prey mites during first hour of release, and showed a decreasing trend in latter intervals, where the feeding proficiency was observed to be 6.7, 4.2, 1.8 and 1.0 adult mite. On the whole, a single beetle consumed 23.2 mites during 24 h duration (range 21-25 mites), whereas, in 2005 such consumption was 21.9 prey mites (range 18-25 mites) with similar trend of consumption at different intervals as observed in 2004. Such observations were also made by Sharma (2006) [17] reporting the predatory propensity as 22-25 adult mites, *T. neocalidonicus* per day of *C. septempunctata*, thus support the present studies.

Table 1: Feeding propensity of predatory mite, *Amblyseius alstoniae* Gupta on adults of *Tetranychus cinnabarinus* (Boisduval) in *kharif*, 2004

No. of set	No. of adult consumed after release*					Total consumption
	1 h	2 h	3 h	6 h	24 h	
1.	4	2	2	1	0	9
2.	3	2	1	1	0	7
3.	2	1	1	1	1	6
4.	5	3	1	1	0	10
5.	3	2	1	0	0	6
6.	4	3	2	1	1	11
7.	3	2	2	1	0	8
8.	5	3	1	1	0	10
9.	3	2	1	1	0	7
10.	2	2	1	1	1	7
Average	3.4	2.2	1.3	0.9	0.3	8.1

* Release based on 25 adult mites/set

Table 2: Feeding propensity of predatory mite, *Amblyseius alstoniae* Gupta on adults of *Tetranychus cinnabarinus* (Boisduval) in *kharif*, 2005

No. of set	No. of adult consumed after release*					Total consumption
	1 h	2 h	3 h	6 h	24 h	
1.	3	2	2	1	0	8
2.	4	2	1	1	1	9
3.	2	2	1	1	0	6
4.	5	2	1	1	0	9
5.	3	2	1	1	1	8
6.	4	3	1	0	0	8
7.	2	2	1	1	1	7
8.	3	2	1	1	0	7
9.	2	2	1	1	0	6
10.	3	1	1	1	0	6
Average	3.1	2.0	1.1	0.9	0.3	7.4

* Release based on 25 adult mites/set

Table 3: Feeding propensity of predatory beetle, *coccinella septempunctata* L. on adults of *Tetranychus cinnabarinus* (Boisduval) in *kharif*, 2004

No. of set	No. of adult consumed after release*					Total consumption
	1 h	2 h	3 h	6 h	24 h	
1.	10	7	5	2	0	24
2.	9	6	4	2	2	23
3.	7	6	5	3	1	22
4.	10	8	3	2	2	25
5.	8	7	4	1	1	21
6.	10	7	5	2	0	24
7.	9	6	4	4	2	25
8.	13	6	3	1	0	23
9.	9	7	4	1	1	22
10.	10	7	5	0	1	23
Average	9.5	6.7	4.2	1.8	1.0	23.2

* Release based on 25 adult mites/set

Table 4: Feeding propensity of predatory beetle, *coccinella septempunctata* L. on adults of *Tetranychus cinnabarinus* (Boisduval) in *kharif*, 2005

No. of set	No. of adult consumed after release*					Total consumption
	1 h	2 h	3 h	6 h	24 h	
1.	11	7	3	2	1	24
2.	8	6	2	1	1	18
3.	9	6	5	3	0	23
4.	8	5	4	2	2	21
5.	11	7	3	1	1	23
6.	9	6	5	3	1	24
7.	8	5	4	2	0	19
8.	10	6	3	1	1	21
9.	9	7	3	2	0	21
10.	10	8	5	1	1	25
Average	9.3	6.3	3.7	1.8	0.8	21.9

* Release based on 25 adult mites/set

Conclusion

On the basis of this study, it is concluded that the feeding propensity of predatory mite, *A. alstoniae* was maximum in the first hour of release and then showed a decreasing trend. A single predatory mite consumed on an average 3.4 mites during first hour of release, however, it showed a decreasing trend in latter four intervals. A single predatory mite consumed 7.4 mites during 24 h with a range of 6-9 mites. In 2004, a single beetle, *C. septempunctata* consumed on an average 9.5 prey mites during first hour of release and showed a decreasing trend in latter intervals. A single beetle consumed 23.2 mites during 24 hours duration (range 21-25 mites), whereas, in 2005 such consumption was 21.9 prey mites (range 18-25 mites).

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