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	<i>Coccinella septumpunctata</i> Linn. (Coleoptera: coccinellidae) as an effective biocontrol agent against <i>Tetranychus urticae</i> (Koch) (Acari: Tetranychidae)	
Priyanka Mittal	Ph.d Research Scholar B.B.D. Govt. College, Chimanpura, Jaipur, Rajasthan, India	
Vinod Kumari Assistant Professor B.B.D. Govt. College, Chimanpura, India		jasthan,
N P Singh	Retired Professor Rajathan University Jaipur Rajasthan India	
ABSTRACT Coccinella septumpunctata Linn. was recorded along with mite feeding on Ashwagandha, as a dominant predator, therefore, feeding efficiency of C. Septumpunctata was evaluated in the laboratory. The experiments were conducted in		

laboratory at Department of Zoology, B.B.D. Government college, Chimanpura ranging from 26°C to 32°C temperature with 60 to 77% relative humidity (RH). The data revealed that first, second, third and fourth instar grubs and adult devoured 34.7±0.47, 50.1±0.48, 70.4±0.6, 134.7±0.63 and 84.5±0.54 mites per day, respectively, out of 200 mites provided to them. It was found that as the age of grubs advanced, the predation rate also increased. Observations on the predatory potential of C. septumpunctata revealed significant reduction in the number of the two spotted spider mite and the consumption rates of all stages of the predator appeared to be statistically significant. In the light of the results of the current study, C. septumpunctata can be recommended as an effective biocontrol agent against T. urticae.

# Key words : Coccinella septumpunctata, predation rate, Tetranychus urticae, biocontrol agent.

### INTRODUCTION:

During the past two decades, incidence of the two spotted spider mite (TSSM) T. urticae on Ashwagandha have been reported to be on increase in India. So far chemical control methods were reported for the management of TSSM on Ashwgandha. But due to indiscriminate and injudicious use of chemical insecticides, several threats resurgence of minor insect-pests, insecticidal resistance in pests, destruction of natural enemies and various health hazards. To overcome the drawback of pesticides, biological control is a good and economical approach. The biocontrol agent like coccinellids, chrysopids and syrphids have been reported to be effective for controlling the mite (Singh and Malhotra, 1979; Saharia, 1981; Kalra, 1988 and Shukla, 1990). The coccinellids are extremely diverse in their feeding habits, and many of these are predaceous and beneficial from the view point of biological control of pests. These are known to prey on about 39 arthropod species viz; 24 species of aphids and 15 species of non aphid preys comprising aleurodids, delphacids, fulgorids, pyralids, noctuids, mites and spiders (Gautam 1989). The seven spotted ladybird beetle, Coccinella septempunctata Linnaeus, is a generalized predator and widely distributed throughout Rajasthan (Rolania, 2005).

Successful natural control of pests depends on the fact that a predator kills or consumes a sufficient number of pest individuals to maintain its density at a low level [Sengonca *et al.* 2005]. Such information would be useful for determining which developmental stage of *T. urticae* is the most vulnerable for predation and will facilitate further laboratory rearing of these insects, which is a prime objective in a biological control program. So in the present study, an attempt was made to assess the feeding potential of *C. Septumpunctata* against one of the most destructive mite pest, the two spotted spider mite *T. urticae*. The objective of this study was to investigate, under controlled conditions, the ability of *C. Septumpunctata* to use different phenological stages of *T. urticae* as food item.

#### MATERIAL AND METHOD:

The experiments were conducted in laboratory at Department of Zoology, B.B.D. Govt. college, Chimanpura, Jaipur ranging from 26°C to 32°C and 60 to 77% relative humidity (RH). Natural enemies of the two spotted spider mite, *Tetranychus urticae* (Koch) were surveyed during 2012-13 in already established crop located at B.B.D. Govt. college, chimanpura and on farmer's field in and around Chimanpura at weekly interval.

During intensive observation the leaves containing *C. Septumpunc*tata eggs were collected immediately after egg laying and transferred in the glass boxes in clear plastic box (1264 cm<sup>3</sup>) in which a hole (84 cm<sup>2</sup>) was made in the lid and covered with  $70\mu$  nylon mesh. The eggs were observed regularly. After hatching the larvae were reared in the same manner up to the emergence of adult. Sufficient food (*T. urticae*) was supplied regularly.

Predation trial: Mature infested Ashwagandha leaves were collected from potted plants. Leaf discs (9 cm<sup>2</sup>) with specific mite stage were prepared from the infested leaves having at least 200 preys. The leaf was changed every second day. Finally, A specific stage of one *C. Septumpunctata* individual was released on each disc. The leaf discs with prey and predator were placed on wet cotton wool within a plastic container of 90 mm diameter and 30 mm height, covered with a plastic lid having a hole of 8 mm diameter. The number of consumed preys were counted under a microscope after 24h. Consumption by four larval and adult stage of *C. Septumpunctata* of *T. urticae* was studied with 10 replications of each.

The data so recorded on numbers of pests and predators were transformed into mean values prior to subjecting these to statistical analysis for observing population reduction by predators (success or failure). The results of all experimental replicates were analyzed using one-way ANOVA.

#### **RESULT AND DISCUSSION:**

Coccinella septumpunctata was recorded along with mite feeding on Ashwagandha, as a dominant predator, therefore, feeding efficacy of C. septumpunctata vis-à-vis T.urticae was carried out in the laboratory. The average number of T. urticae consumed by various life stages of C. Septumpunctata in 24 hour are represented in table 1 and figure 1, respectively. The data presented in table revealed that there are four grub instars of C. Septumpunctata. It was observed that first, second, third and fourth instar grubs and adult devoured 34.7±0.47, 50.1±0.48, 70.4±0.6, 134.7±0.63 and 84.5±0.54 mites per day out of 200 mites, respectively. It was found that as the age of grubs advanced, the predation rate also increased. The rate of feeding among different larval instars varied greatly. The gradual increase in the feeding rate of older larvae explained their increased requirement of food due to their increase in size. The 4th instar larva of C. septumpunctata consumed the highest number of preys (134.70±0.63 mites), whereas first instar consumed lowest number of prey (34.7±0.47 mites) during 24 hours,. The predatory efficacy of the predator gradually increased from 1st to 4th instar larva. The predatory potential of *C. septumpunctata* was observed to cause significant reduction in the number of the two spotted spider mite and the consumption rates of all stages of the predator appeared to be statistically significant.

The present results are also in confirmation with reports given by Hull (1995) that Stethorus punctum consumed all stages of mites; adult consumed 75 to 100 mites/day and a larva devoured up to 75 mites/day. The larva passes through four larval stages in about 12 days, feeding on all stages of mites. Similarly, Zadeh and Pormirza (1999) studied the feeding potential of different life stages of Stethorus punctillum on the red spider mite and observed that first, second, third and fourth instars and adults consumed 6.80±0.07, 23.50±2.40, 37.30±4.50, 92.90±4.60 and 211±5.20 mites respectively/day. Biswas et al. (2007) who also found that the predation rate of fourth instar larva of S. punctillum was the highest whereas the first instar larva consumed the lowest number of two-spotted spider mites. The fourth instar larva of the predator consumed 135.8 eggs, 126.4 larvae, 96.6 nymphs and 72.8 adults per day separately. But the first instar consumed 41.6 eggs, 36.2 larvae, 26.8 nymphs and 16.8 adults during the same period. Abdallah et al. (2001) observed that the total number of T. urticae consumed by A. deductus during adult stage including pre-oviposition, oviposition and post-oviposition stages were 41.33±2.51, 124.83±4.65 and 39.11±3.46 respectively. The present findings are in confirmation with Sirvi et al. (2014) who found that C. septempunctata Linneaus is one of the predators for the two-spotted spider mite, T. urticae (Koch.). The mean predating potential of larvae and adult was 47.90  $\pm$  3.69 and 61.70  $\pm$  16.93 mites per day per individual, respectively.

However, Lucas et al. (1997b) who evaluated the voracity and feeding preferences of adult C. septempunctata L. and Harmonia axyridis Pallas in the laboratory on a common prey, the spirea aphid, Aphis citricola van der Goot, and on T. urticae Koch, found that adult males and females of *H. axyridis* consumed significantly more mites than adults of C. septempunctata. For H. axyridis, males consumed 41.3 spider mites in 24 h and females 48.4, whereas for C. septempunctata males and females consumed 14.1 and 15.2 preys, respectively. The consumption of spirea aphids by the males was similar for the two species, while consumption by the females was significantly more for H. axyridis (46.5) than for C. septempunctata (22.2). Two coccinellids showed a significant preference for A. citricola in the presence of T. urticae. This preference was more pronounced for C. septempunctata. Kianpour et al. (2011) observed C. septumpunctata as an effective biological control agent and ability to prey upon both aphids and mites on the infested plants. The number of T. urticae consumed by C. septumpunctata was found to be increased with the instar. The predation potential was more than 3-4 times as compared to predatory mite.

The predatory potential of C. septumpunctata was observed to cause significant reduction in the number of the two spotted spider mite and the consumption rates of all stages of the predator was found to be statistically significant. In the light of the results of the current study, this new species of the predatory potential of C. septumpunctata can be recommended as an effective biocontrol agent vis-a-vis T urticae

Table: Predatory Potentiality of ladybird beetle, C. septumpunctata on prey T. urticae / day during 2012-13.			
Different Stages of predator	Number of prey consumed per day out of 200 prey		
First larva	34.7±0.47		
Second larva	50.1±0.48		
Third larva	70.4±0.6		
Fourth larva	134.7±0.63		
Adult	84.5±0.54		
G.M.	37.34		
S.Em±	0.17		
C.D.5%	0.50		
C.V.%	1.47		



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