

## STUDIES ON BIOLOGICAL CONTROL AGENT OF THREE COCCINELLIDS, *COCCINELLA SEPTEMPUNCTATA*, *CHEILOMENS SEXMACULATA* AND *HIPPODAMIA CONVERGENS* ON WHITEFLIES FROM NASHIK (M.S.).

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### ABSTRACT

*Coccinella septempunctata*, *Cheilomens sexmaculata*, *Hippodamia convergens*, are the members of Coccinellidae feed upon white flies which are most common agricultural pest damaging wide range of agriculture crops. In present investigations the work was carried out to understand feeding potential of coccinellidae on white flies. It was undertaken for the period one year from October 2015 up to September 2016 under laboratory conditions. Total 1125 whiteflies were provided as food for three different species of adult ladybird beetles viz, *C. septempunctata*, *C. sexmaculata* and *H. convergens* for the period of one month. Results of the present studies concluded that feeding potential of *C. septempunctata* on the whiteflies was dominant (18.76) while it was the lowest in *C. sexmaculata* (11.9). The average whiteflies consumption of *H. convergens* was found intermediate (13). The results of present studies thus suggest the effective implementation of adult coccinellids against the white fly as one of the biological control measures.

**KEYWORDS:** Coccinellidae; *Coccinella septempunctata*, *Cheilomens sexmaculata*, *Hippodamia convergens*; Whiteflies; feeding potential, etc.

### INTRODUCTION

Ladybird beetles are the member of class insect, order Coleoptera and belong to family Coccinellidae. As all other insects or beetles have an outer skeleton known as exoskeleton (Minks and Harrewijn, 1987). This outer skeleton cover gives protection and provides the attachment places for muscles. Body of ladybird beetle is consisting of three main regions: head, thorax and abdomen (White and Peterson, 1998). Ladybird beetles have very distinctive shape, or size and can be easily identified. Some species of ladybird beetles are judged as pests due to their attack on the vegetative parts of plants (Watts, 2004). But the larval and adult stages are very good predators of white flies and other small insects and mites (Hangay and Zborowski, 2010). Beetles act as bio control agent that feed very rapidly on white flies. In order to achieve the members of coccinellidae (coleoptera) are commonly called as lady bug beetle of the order coleoptera are natural predators of many sap sucker insect pest including white flies. Thus act as biological control agent at their larval and adult stages. (Gautama 1989, Omkar and Pervez, 2000, Rao *et al.*, 1989, Mani; 1995, Hippa *et al.*, 1978, Kring *et al.*, 1985).

Biological control is very famous for controlling the insect pests to the thresh hold level. Biological control is the policy for the integrated pest management (Turnbull and Chant, 1961). Biological control is the lowering of insect pest population by natural enemies and also involves the human role (Dreistadt *et al.*, 2004). Natural enemies of insect pests are known as biocontrol agents; include parasitoid, predator and pathogens (Sathe and Margaj, 2001). Many predators such as ladybird beetle are free living insects that attack on the large number of prey during their whole life. Ladybird beetles of many species act as biocontrol agents of many pests like White flies. Ladybird beetles are very common for controlling many insects like whitefiles and many studies have been done on them (Dreistadt, 2001). There are lots of methods to control the whiteflies population, the most famous and effective method is through ladybird beetles. Whiteflies are very common plant pests that attack on both ornamental plants as well as garden crops.

There are so many different species that are specific to the host plants and attack on the particular plant. Whiteflies are very destructive insects because they attack in colonies (Dixon, 1998). Clusters of ladybird beetle can be found on the young leaves, twigs, new branches and succulent shoots. Huge feeding on the plant by whiteflies causes leaves curl and dry out. There are many species of willow tree occur in the wide range of habitat. There is large range of insects attack on the willow tree. Several species of aphids feed on this tree.

Agriculture revolution has led to depend on various agrochemicals to improve the crop produce. Indiscriminate use of chemicals has resulted in environmental toxicity, mortality of beneficial organisms, ecosystem imbalance and adverse effects on human and other living population. By realizing the need for an alternative, in recent years biocontrol of pests and diseases is being viewed as one of the best alternative to the chemical control. Biological control has a broad meaning which refers to the manipulation of population of pathogens or pests. It can be achieved either by introducing or releasing species or providing or implementing congenial conditions for natural enemies of a pest, pathogen or parasite. Because of growing concern to the ecologically safe management methods for pest and disease control, biocontrol methods using natural enemies for various pathogens and pests of crop plants is becoming more and more popular because of its varied advantages to the global security especially for the nature and living population. Among the various natural enemies or bioagents the Coccinellidae beetles are the most successful and potential users in pest and disease management strategies.

In this study various Coccinellidae beetles and their potential application on whiteflies. *Coccinella septempunctata* is an important coccinellid (Coleoptera) species, which have experimentally appraised and established throughout Europe in glasshouse crops such as tomato, sweet papers and cucumbers. It is predaceous usually on aphids, thrips, whiteflies, mites and lepidopteron eggs (Gordon, 1985; Hagen, 1987). Additionally, mass rearing of *C. septempunctata* is easily achieved by supplying the best food (Omkar and Srivastava, 2003; Kalushkov and Hodek, 2004).

The earlier mark reported that *Coccinella septempunctata* has been used for the biological control of *T. tabaci* and *T. vaporariorum* in a greenhouse (Solomon, 1949). lepidopterous larvae White fly control is difficult and complex, because whiteflies rapidly gain resistance to chemical pesticides. It emphasis the need of searching its biological control agent. Keeping in view the above facts and importance of ladybird's beetles as biological control against whiteflies, the present studies were conducted to determine the feeding potential of three species of ladybird beetle such as *Coccinella septempunctata*, *Cheilomenses sexmaculata* and *Hippodamia convergens*.

## MATERIAL AND METHODS

The whiteflies were collected from the host plant guava *Psidium guajava* of farm field of Nashik (M.S.) and maintained under laboratory conditions. The adult ladybird beetles of *C. septempunctata*, *C. sexmaculata* and *H. convergens* were collected from different localities like the green grass, maize field and fruit crops acclimatized and reared on whiteflies *Trialeurodes vaporariorum* (Alerodidae) under the laboratory condition at temp.  $24 \pm 1^{\circ}\text{C}$  60-65%.

The ladybird beetles were fed with different stages like nymphs and adult whiteflies; *Trialeurodes vaporariorum* daily.



1) *Coccinella septempunctata* 2) *Hippodamia convergens* 3) *Cheilomenses sexmaculata*

## Experimental bioassay:

The experiment was carried out to identify variation in feeding potential among adult beetles; *Coccinella septempunctata*, *Cheilomenses sexmaculata* and *Hippodamia convergens* against whiteflies *Trialeurodes vaporariorum*. In each Petri plate one healthy adult ladybird beetle of each species was released separately and 25 whiteflies *Trialeurodes vaporariorum* were released for each beetle on almond leaf at a time. The behavior and feeding potential was observed for 24 hours and the same was continued for one month. The observed data was analyzed statistically by ANNOVA test.

## RESULTS AND DISCUSSION

It was undertaken for the period one year from October 2015 up to September 2016 under laboratory conditions. Total 1125 whiteflies were provided as food for three different species of adult ladybird beetles viz, *Coccinella septempunctata*, *Cheilomens sexmaculata* and *Hippodamia convergens* for the period of one month. Results of the present studies concluded that feeding potential of *Coccinella septempunctata* on the whiteflies was dominant (18.76) while it was the lowest in *Coccinella sexmaculata* (11.9). The average whiteflies consumption of *Hippodamia convergens* was found intermediate (13). Table-1 depicts the significance difference in the mean consumption of whiteflies *Trialeurodes vaporariorum*.

**Table- 1 Depict the feeding potential for three species of ladybird beetles**

Sr. No.	Biological name of ladybird beetle	Number of beetle released	Number of Whiteflies provided	Days	Average of whiteflies consumed	Calculated f- value
1	<i>Coccinella septempunctata</i>	1	25	30	18.76	3.94
2	<i>Hippodamia convergens</i>	1	25	30	13.7	2.65
3	<i>Cheilomens sexmaculata</i>	1	25	30	11.9	0.59

The results of present studies thus suggest the effective implementation of adult Coccinellids against the whiteflies as one of the biological control measures.

The *Coccinella septempunctata* consumed significantly more whiteflies than the other coccinellids. Kaur *et al.* (2010) and Desai Ashok *et al.*, (2015) reported that the ladybird beetles were bred by feeding on Aleyroid flies. The increase in feeding potential with age of beetle is in line with earlier findings of Ali and Razvi (2007) and Babu (1999). In the present studies the *Coccinella septempunctata* consumed more whiteflies than the other coccinellids significantly. These findings resembles with fourth instar larvae of *C. montrozieri* consumed *Maconellicoccus hirsutus* nymphs and adult female than other larval stages of the predator by (Mani and Thontadarya, 1987). The forth instar larvae of *Cryptolaemus montrouzieri* found to be voracious feeders of whiteflies as compared to other larval stages, (Fandi *et al.* 2010, Lucas *et al.*, 2004). Similar results were reported by Rosas Gaurcia *et al.*, (2009) they noted that the adult beetle of *Coccinella septempunctata* was most efficient adult predator as compared to other stages or other beetle. This is may be due to the fact that adult beetle *Coccinella septempunctata* are continues feeder and have a greater longevity.

Thus, are findings or suggested the further usefulness of *Coccinella septempunctata* as a biological control agent against the white flies. Many of the Coccinellidae beetles are proven as potential natural enemies for various major pests and diseases, better exploitation of these bioagents can be made as an alternative for chemical control with many advantages (Vijaya Kumari and Beula, 2015). This predatory beetle has potential to exploit for the control of mealy bugs, scale insects and whiteflies on different crops, vegetables and agricultural field from Nashik district. Thus, our findings are noticed that *Coccinella septempunctata* is more efficient predator of Aleroididae than *Hippodamia convergens* and *Cheilomens sexmaculata*.

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