Time specific threshold in activity of *Coccinella septempunctata* in mustard field

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Abstract

The parasitoids and predators are generally free-living in their adult stages and visit the crop at specific time in a day. Therefore, avoiding chemical application in this duration reduces the chances of direct exposure of natural enemies to the pesticides. The present work demonstrates the timed peaks in *Coccinella septempunctata* captures under field condition. The threshold in captures was noticed in morning and evening hours while least number of individuals were noticed during mid day on the mustard crop.

Introduction

To conserve natural enemies it is generally recommended that the chemical control schedules should be modified in such a way that applied molecules have least probability to come in contact with visitors (natural enemies) of crop pests in field. Over the past few years, the use of diurnal behaviour in economic entomology to control insect pests has taken off. Generally, Insects prefer to forage at time when the environmental conditions impose least threat to their survival or help them by enhancing their searching efficiency. Insects therefore must regulate their feeding behavior to synchronize with the favorable periods of the environment. Hence it can be concluded that insect populations are selected in such a way that every insect have a specific time range for their activity in a day.

The above hypothesis becomes vague when there is continuous presence of any stage of predators with both stages feeding on the same host, fore example *Coccinella septempunctata*. Therefore our objectives in this study were to determine the diurnal mobility periods of adult beetle based on time-specific increase in their number in the crop field and its correlation with the environmental parameters. Our study provides information about the time-periods at which *Coccinella septempunctata* are highly abundant in mustard crop. This information may be used to formulate safe chemical spray schedules for mustard crop with least hazard to this predator.

Materials and Methods

(i) Study Area: This study was conducted at oilseed block, crop research centre, GBPAUT, Pantnagar. INDIA where field consists of early and late stages of plant succession. The field is situated at river bank and has a footway on the other side. Three varieties were sown as per Randomized Block Design. Each block has five replications. Different replications have different level of aphid infestation.

(ii) Sampling Method:

The sampling procedure developed by Frazer and Raworth (1985) was used to make following two inferences for our methodology: (1) visual method will give a proper picture of adult abundance within a sampling unit, and (2) if we use an absolute method for sampling, there is no need of adjusting data on the basis of abiotic and biotic factors for calculating absolute estimates (Frazer and Raworth, 1985).

Therefore, in the present study, Quadrate counts were selected as a sampling tool for gathering accurate (unbiased) estimates of population densities. An increase in sampling area in quadrate method increase the likelihood of capturing rare individual (Southwood, 1978). Sampling unit captures have an inherent insect activity component highly influenced by existing weather conditions (Southwood, 1978). However, changes caused by daily weather conditions are averaged by the constant exposure of the sampling unit and their measurement (Tollefson and Calvin, 1994).

(Coccinella septempunctata adults encountered in each sampling unit were counted. recorded and then released again, daily (Ives, 1981; Michels et aI, 1997). The duration of sampling was from January to March in 2005.

Results and Discussion

Depending on the prevailing environmental conditions during the day, *Coccinella* beetles were not visible before 14th January. Initially, Individuals were often observed on the top portions of plant when the aphid population was less and generally restricted to the tender portions. For two of the three months (February and March), mean capture was tl1Unci higher at 9:30 AM and 4.00 PM in comparison to other two sampling timings. We have noticed that the mean capture was negatively correlated with the dew and this seems to be the true explanation for January when higher numbers of individuals were observed at 11.00 AM than 9:30AM.

Table1: Numbers of adults captured at different times of day during different months

Time of day	Numbers of adults captured		
	January	February	I March
	Mean (% of Total)	Mean (%of Total)	Mean (%of Total)
9:30AM	2.00 (18.18)	4.4 (61.11)	3.4 (24.64)
11:00AM	2.6 (23.64)	1.0 (13.89)	1.6 (11.59)
12:00PM	1.6 (14.55)	0.4 (5.56)	1.2 (8.70)
4:00PM	4.8 (43.64)	3.4 (19.44)	7.6 (55.07)

Lower number of captures of adult beetles during mid-day may be explained by the behavior of this insect to avoid extremes of temperatures and dew in environment. Our results also demonstrate that during low temperature prevalence the activity of the beetle spread through out the whole day (as in January). Such situations are likely to occur early in season when the average environmental temperature is low. A perusal of table also made an inference that beetle population increases as the season progress but the percentage of captures on a time to the total capture on that day was still shows the above trend. Our findings are in contrast with the well established fact that natural enemy activity are lowered in evening hours while we have noticed threshold in count during these timings.

Concussion

The threshold for *Coccinella septempunctata* in captures was noticed in morning and evening hours while least number of individuals were noticed during mid day on the mustard crop.

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