



## **Population Dynamics of Predatory Insects In Cotton Ecosystem And Their Correlation With Abiotic Factors**

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### **ABSTRACT**

The population dynamics of natural enemies of major sucking pests of Bt cotton along with their correlation with weather parameters were studied during Kharif 2013, at the Experimental Farm, Department of Agricultural Entomology, VNMKV, Parbhani. Three major predatory insects were recorded viz, ladybird beetle, *Coccinella septempunctata* (Linnaeus); green lacewing, *Chrysopa* spp. (Stephens) and spider, *Dictyna* sp. (Linnaeus) under unprotected condition. Densities of natural enemies peaked from 37<sup>th</sup> to 46<sup>th</sup> meteorological week. The highest density of 2.60 *C. septempunctata* per plant on 41<sup>st</sup> MW, 1.30 *Chrysopa* spp. per plant in 43<sup>rd</sup> MW and 1.20 *Dictyna* sp. per plant in 45<sup>th</sup> MW were recorded. The natural enemies completely disappeared after mid-November. Simple correlation analysis revealed that maximum temperature showed significant positive effect on all the predatory insects. The minimum temperature showed negative effect on spider population and non significant effect on ladybird beetle and green lacewing bug population. Precipitation was negative effect, whereas relative humidity was non significant negative effect on ladybird beetle, relatively non significant effect on lacewing bug and spider population.

**KEYWORDS:** population dynamics, abiotic factors, correlation, natural enemies.

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### **INTRODUCTION**

Cotton, *Gossypium hirsutum* L. (Family Malvaceae), is one of the most commercially important fiber crops in the world. It is a perennial semi-shrub grown as an annual crop in both tropical and warm temperate regions. In addition to textile manufacturing, it produces seeds with a potential multi product base such as hulls, oil, lint and food for animals (Ozyigit *et al.* 2007) [1]. It is cultivated about 9.2 million ha with a production of 21.3 million bales of seed cotton (Anon, 2005) [2]. The average productivity of cotton in Indian is 463kg per ha (Anon., 2006) [3]. India is the third largest cotton producer contributing 18.3% of world production. Thus India ranks first in area and fourth in production on global basis (Anon., 2007) [4].

*Chelonus blackburni* Cameron, *Trichogramma achaeae* Nagraja, *T. brasiliensis* (Ashmead), *Chrysoperla carnea* Stephens, *Coccinella septempunctata* Linnaeus, *Menochilus sexmaculatus* Fabricius and spiders have been observed as potential natural enemies of key pests of cotton and play an important role in the cotton ecosystem (Dhaka and Pareek, 2007) [5]. Information on natural enemies of sucking pests of Bt cotton helps to take up effective management strategies. Keeping this in view present study was undertaken.

### **MATERIALS AND METHODS**

The field experiment was carried out during Kharif 2013 at the Experimental Farm, Department of Agricultural Entomology, VNMKV, Parbhani. Bt cotton hybrid 'Bunny-Bt' BG-II was used for the experiment. The crop was raised as per the package of practices recommended by the VNMKV. The observations on number of *Chrysopa* (larval and adult), Coccinellids (grub and adult) and Spiders (adult) were recorded weekly from randomly selected plant. Observation were recorded early in the morning

before 8.00 am in each metrological week on five randomly selected plants per plots from untreated plot of bunny Bt (BG -II) cotton hybrid.

## RESULTS AND DISCUSSION

### Population dynamics of natural enemies in Bt- Cotton

#### Population dynamics of ladybird beetle *Coccinella septempunctata* (Linnaeus)

The occurrence of ladybird beetle started from 30<sup>th</sup> MW. The first peak was observed during 37<sup>th</sup> MW. Thereafter second peak was observed during 41<sup>st</sup> MW (2.60/plant) then the population is gradually decreased from 46<sup>th</sup> MW and zero after 49<sup>th</sup> MW (Fig. 1).

The present findings are in agreement with those of Purohit *et al.*, (2006) [6] who reported the maximum population of lady bird beetle (*Coccinella* spp.) during 2<sup>nd</sup> week of September (36<sup>th</sup> MW) during 2004. Some earlier researchers had also found higher population of *Septempunctata* in August Godhani *et al.* (2009) [7].

#### Population dynamics of green lacewing bug *Chrysopa* spp. (Stephens)

The occurrence of *Chrysopa* started form 38<sup>th</sup> MW and the peak activity 1.30 *Chrysopa* /plant in 43<sup>rd</sup> MW. Thereafter population decreased upto 45<sup>th</sup> MW (Fig. 1). The present findings are in agreement with those of Parasi and Shashtry (2009) [8] who observed the population of predators (Coccinelids and Chrysopa) from 30<sup>th</sup> to 50<sup>th</sup> SMW. It means that predators were present all the time when there was incidence of sucking pests. Gosalwad *et al.*, (2009) [9] found green lacewing (*Chrysopa* spp.) population was low in the second week of October.

#### Population dynamics of predatory spider *Dictyna* sp. (Linnaeus)

The occurrence of spider started in 30<sup>th</sup> MW and goes to its peak 1.20 spiders /plant in 45<sup>th</sup> MW population was zero in 49<sup>th</sup> to 52<sup>nd</sup> MW (Fig. 1). The present findings are more or less in agreement with those of earlier research workers like Liu *et al.*, (2003) [10] they showed the seasonal dynamics of spider population was low in early stage of the *Bt* cotton but built up quickly in middle and late stages, reaching a peak, of 454 spider per 100 plant. Agrawal *et al.*, (2007) [11] reported that amongst the natural enemies spiders were more predominant on all the hybrids in comparison to other predators.

## ROLE OF ABIOTIC FACTORS IN POPULATION FLUCTUATION OF PREDATORY INSECTS

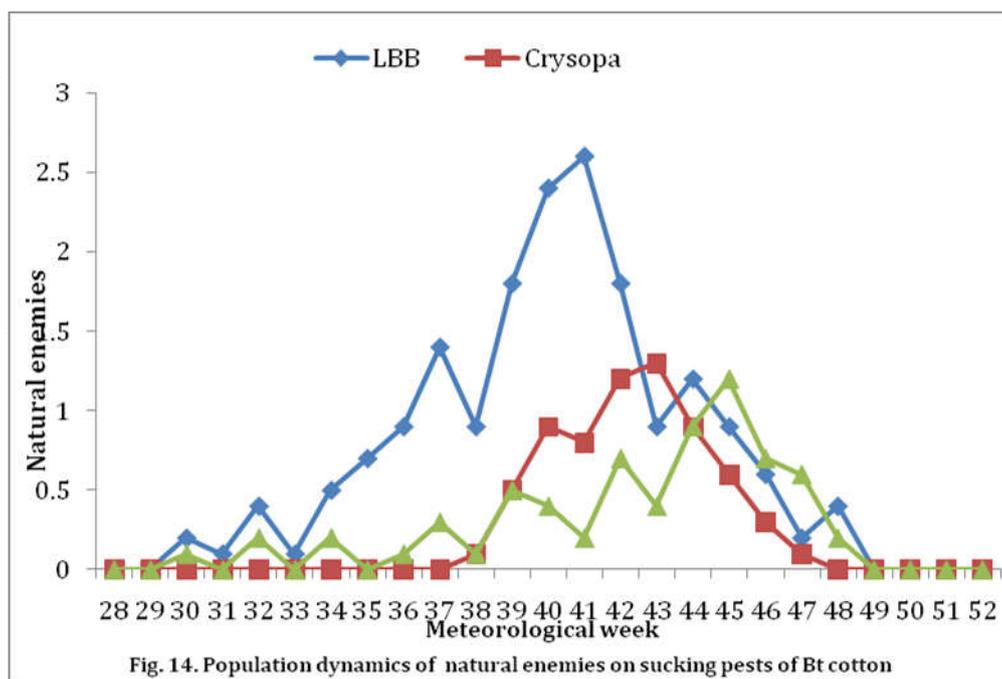
### Simple correlation

The results regarding the correlation between abiotic factors and population of ladybird beetle, green lacewing and spider were given in Table1. Ladybird beetle population was positive and highly significant with maximum temperature. The ladybird beetle population shows non- significant positive association with other parameters except rainfall shows negative correlation. The Chrysopa population shows positive highly significant correlation with maximum temperature. The data findings are in confirmation with thereof earlier researchers. Like Dhaka and Pareek (2007) [12] who reported that negative significant temperature with Chrysopa population while relative humidity and rainfall had no effect on incidence of Chrysopa. The spider population was positively significant with maximum temperature negatively significant correlation with evening RH. The spider population were negatively non significant correlated with all other parameters. The above finding are in confirmation with those of earlier researchers like Dhaka and Pareek (2007) [13] who reported that maximum temperature, minimum temperature and evening RH has positive significant effect on spider population.

**TABLE 1.** Correlation matrix of natural enemies and abiotic factors

Name of the Predatory insect	Maximum temperature	Minimum temperature	Morning Relative humidity	Evening Relative humidity	Rainfall
Lady bird beetle	0.679**	0.358	0.240	0.112	-0.049
Green Lacewing bug	0.481**	0.081	-0.058	-0.141	-0.252
Spider	0.420*	-0.193	-0.389	-0.409*	-0.398

Significant at 5%, \*\* Significant at 1%



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