International Journal of Agriculture Innovations and Research
Volume 4, Issue 3, ISSN (Online) 2319-1473
Manuscript Processing Details (dd/mm/yyyy) :
Received : 15/05/2015 | Accepted on : 22/05/2015 | Published : 11/12/2015

Effect of Temperature and Relative Humidity on Population Dynamics of Predators of Cotton Pests

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Abstract **– The study on effect of biotic factors on population dynamics of predators of cotton pests was conducted in farmer field school Kotchutta, Punjab Pakistan during cotton growing season 2015. The population of predators was noted on weekly basis and data of temperature and relative humidity was taken from meteorological department. Data revealed that major predators of cotton was spider, ants, *chyrsopia, campiloma* and orius bug. It was observed that there was positive correlation between ants and temperature (0.296), while there was negative correlation between temperature and *campiloma* (-0.699), spider and temperature (-0.4575) and there was also negative correlation between temperature and orius bug (0.11305). There was positive correlation between *Chrysopa* and temperature (0.543866). Humidity had positive correlation with orius bug (0.43058), spider (0.700366) and *campiloma* (0.835869) while it had negative correlation with ants (-0.21196), *chrysopa* (-0.37335).**

Keywords **– Temperature, Relative Humidity, Population Dynamics, Cotton Pests.**

I. INTRODUCTION

Cotton is a major cash crop in Pakistan contributing about 2 percent of GDP and 8.2 % of value added in Agriculture, with total area under crop 2.9 million hectare and production of 10.0 million bales average 571 kg seed cotton per hectare. In 1999-2000 the cotton production was 11.24 million bales which declines to 10.73 million bales in 2000-01, it further dipped to 10.61 million bales in fiscal year 2001-02 and 10.21 million bales in 2002-03, the downslide continued till 2003-04 reaching 10.0 million bales with 1.6% lower yield than the last year (Eco. Survey of Pak. 2003-04). The production of cotton in 2006-07 was 12.9 million bales which was decreased by 11.7 million bales in 2007-08.In 2010-11 the cotton production was estimated 11.46 million bales and the production of cotton crop has increased in 2011-12 valued as 13.59 million bales (Eco. Survey of Pak. 2011-12).Heavy insect/pest attack and lack of resistant varieties were the main causes of this decline. The country at present imports over 10 billion of pesticides annually through registered firms alone. About 90% of these are being used on cotton (Ingram, *et al*. 1989).

Thus there is a need to develop alternative methods. Biological control seems to have great potential in terms of profitability, safety for humans and animals and for environment and for the sustainability of agriculture activities. It requires the knowledge of biology, ecology, phenology and behavior of pests and their natural enemies (Mallah, *et al*. 2001). Biological control is the most important component of IPM because a number of pests of a crop, remain under natural control. In sampling southwestern desert cotton, Haggier and Narnjo, 1993 have identified approximately 25 species of predatory arthropods associated with spotted bollworms population. Field assessment revealed highest population of predators early in the season with rapid decline associated with pesticide application. *Chrysoperlacarnea* and *Geocorispuncipes*were notable exceptions and were found to increase through the season. Among the most common predators were *Chrysoperlacarnea, Groceries spp., Oriustriticolor and Nabisalternatus.*

Mullah *et al*. 2001 described that the characteristics of predators that it should be able to survive in all the niches and throughout the climatic range occupied by the pest. The relationship of its development and voracity to temperature determines whetherit can cause mortality sufficiently early in the pest annual cycle and whether it can avoid being outstripped be the pest. Keeping in view the importance of above facts and economic importance of Integrated Pest Management in the cotton crop, the study on appearance and abundance of various insect predators (natural enemies) with relation to temperature and relative humidity was conducted during cotton growing season 2015 .

II. MATERIALS AND METHODS

The trail was laid out at plot in Kot chutta, a surrounding village of Tehsil D.G.Khan District, D.G.Khan, Pakistan during the cotton growing season 2015. The trail was laid in a randomized complete block designed with three replicates. 1st CESA (Cotton Ecosystem Analysis) was taken on 19-06-2015 and last CESA was taken on 25-09-2015. Cotton ecosystem analysis comprised of weekly agronomical and entomological data was taken from selected twenty five plants from the whole plot. Agro meteorological data for temperature and relative humidity was taken from Agro metrological center Multan. Each plant was observed thoroughly, data for predators was collected from whole plant. Total number of predators were divided with total number of plants examined to get average per plant. At the end of season, the data was subjected for statistical analysis to get simple correlation between predators of insect pests of cotton and weather factors (temperature and relative humidity).

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III. Results and Discussion

Population dynamics of Chrysopa spp.

The population of Chrysopa *(Chrysoperacarnea)* was at its peak value 8.2 at 30 C^0 and 77.45 relative humidity on last week of August highest temperature and lowest humidity. Data in table. 1 shows that population of Chrysopa is negatively correlated (-0.3733) with temperature and it is positively correlated with relative humidity (0.543886). The present findings are in agreement with those of Mari *et al.* (2006) who described that consolidated in population of predators was maximum on 13th September and showed there was direct relation of pest with population of predators. Radhhakrishnan and Muraleedhnan (1994) observed the seasonal abundance of *C.carnea.* The same results were reported by Holz(1994). Similarly Atakan and Ogur (1994) studied the effect of *C.carnea.*

Population dynamics of Campiloma

The population of Cmpiloma was at its peak value 6.8 at 29.55 C^0 and 81.6% relative humidity on last week of August (fig. 1) Table. 1 showed that temperature had negative correlation with population of compiloma (-0.699) and positive correlation with humidity (0.835869). Present finding are in agreement with those of Mari *et al*. (2006) who described that consolidated in population of predators was maximum on 13th September and showed there was direct relation of pest with population of predators.

Population dynamics of Orius Bug

Population of Orius bug was at its peak value 10.1 at 32.5 C^0 and 77.9% relative humidity on 2nd week of August (fig. 1) Table.1 showed that population of Orius bug has negative correlation with temperature (-0.11305) and positive correlation with humidity (0.43058). Present findings are in agreement with those of J.M. Mari *et al*. (2006) who described that consolidated in population of predators was maximum on 13th September and showed there was direct relation of pest with population of predators.

Population dynamics of Spider

Population of Spider was at its peak value 3.48 at 30.6 C0 and 77.4 5% relative humidity on 3rd week of August (fig. 1) Table. 1 showed that population of spider had negative correlation with temperature (-0.4575) and had positive correlation with humidity (0.700366). Present study was in conformation with Mao (1984) who reported that spiders were present from late June to late August.

Population dynamics of Ants

Population of ants was at its peak value 5.89 at 29.55 C0 and 81.6% relative humidity on 3rd week of August (fig. 1) Table. 1 showed that population of ants had positive correlation with temperature (0.296) and had negative correlation with humidity (-0.21196) present findings are in agreement with those of Mari,*et al*. (2006) who described that consolidated in population of predators was maximum on 13th September and showed there was direct relation of pest with population of predators.

Table 1. Correlation of Campiloma, Ants, Orius Bug, Spider and Chrysopasppa with Temperature and Humidity during cotton growing season 2015

	Campliloma	Ants	Orius	Spider	Chrysopa
Humidity	0.835869	-0.21196	0.43058	0.700366	-0.37335
Temperature	-0.699	0.296	-0.11305	-0.4575	0.543886

Correlation at 5% level

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