

**POPULATION FLUCTUATION OF INSECT PESTS AND THEIR NATURAL
ENEMIES ON DIFFERENT CHILLI VARIETIES**

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Abstract

*A study on population fluctuation of insect pests and their natural enemies on different chilli varieties were carried out at main chilli Research Station located at Kunri major producing area of Sindh, during the kharif season of year 2012. Insect pests belonged to the following species (thrips, *Scirtothrips dorsalis* Hood, whitefly, *Bemisia tabaci* (Genn.), aphids, *Aphis gossypii* Glover, Mealy bug, *Phenacoccus solenopsis* (Tinsley), Termite, *Coptotermes acinaciformis*. Froggatt, mite (*Polyphagotarsonemus latus*), jassid, *Amrasca biguttula biguttula* (Ishida), and pod borers like *Helicoverpa armigera* (Hub.) and *Spodoptera litura* (Fab.) on chillies) were recorded from both varieties (Longi and Gotki) in chilli crop ecosystem. Thrips, mites and mealy bug were observed major sucking insect pests and were abundant from transplanting to harvesting. In chewing pests *S. litura* and *H. Armigera* were also major insect pests in both varieties their population was highest on 18th and 19th DAT, respectively. Predators related to the different species were recorded from both varieties in chilli ecosystem, they were (Spider, *Hippasa agelenoides*, 7-spotted, *Coccinella semtempunctata* (L.) *Brumus suturalis* (F.) Big Eyed Bug, *Geocoris* spp and Lace wing, *Chrysoperla carnae*). In both varieties it was observed that mite population was highest as followed by thrips, mealy bug and other insect pests. The data further indicates that comparative mean population of predators were highly significant with each other in longi and non-significant for gotki. It is concluded that in sucking pests, thrips and broad mite and in fruit borer *S. litura* and *H. Armigera* were found major pests of chilli from vegetative to reproductive stage and mealy bug was observed sporadically major pest of chilli. From consolidated population of pests of both varieties it was determined that abundance of pest growth was till 18th DAT, after that it started decreasing consequently that period of the crop is more sensitive therefore highly attention may be focused on pest scouting in crop.*

Key words: chilli, pests, natural enemies and population

1. INTRODUCTION

Insect pests are among the major restraints to improving production of chilli (*Capsicum annum* L.). In these days due to use of chemical pesticide in large number to bring pests under economic injury level, growers income have been falling particularly due to the increasing costs of inputs for plant protection (Ali, 2006.). Owing to lack of knowledge about alternative measures about Plant protection in the present days the farmers are generally concerned with chemical control (Ahmed and Prasad, 2010). In Pakistan, the applications of insecticides are applied in large number than other pesticides such as fungicides and herbicides. In commercial crops such as cotton, chilli, okra, cabbage and other vegetables, growers are applying 20 to 30 chemical sprays to the crop (Mari, 2011).

Yet, despite several sprays, crop losses are unavoidable. Among various insect pests, thrips, mites Mealy bug and fruit borers is count major insect pests and white flies, aphid, jassid are labeled as minor in chilli ecosystem (Sunitha, 2007). In large number usage of insecticides, from a lot of time

against insect pest, it developed a resistance and degradation of natural enemies, happened toxic residues in crop yield and side effect on human health and environment (Hosamani, 2008).

Natural enemy's predators and paractiods, although plentiful in agricultural systems, have mostly been thought to be poor Bio-control agents. This expectation is built mainly on theoretical thoughts (e.g., predators lack prey specificity and often have longer generation times than pests) (Riechert and Lockley, 1984). Predators also interfere with other predators in addition to preying upon herbivorous pests (Polis and Holt, 1992). This research has fixated on recognizing and manipulating characteristics of different verities and adjacent habitats to provide cause populations of predators to travel into agricultural fields (Barbosa, 1998). Despite theoretical reservations, increasing sign indicates that generalist predators can reduce pest populations in agroecosystems (Lang, 1997). We conducted population fluctuation of insect pests and their natural enemies on different chilli varieties.

2. MATERIALS AND METHOD

In order to study the population fluctuation of insect pests and their natural enemies on different chilli varieties" was carried out in main chilli Research Station located at Kunri major producing area of Sindh, during the kharif season of year 2012. Crop was grown in 1/2 acre area with a spacing of 60×60 cm. All suggested routine agronomic practices except plant protection were used. The experimental plot was divided into 10 equal parts. Population of pests and predators was recorded at weekly interval from 3 terminal leaves of 10 randomly selected plants in each plot. Observations were commenced with the arrival of pest and predators and continued up to last picking of the crop. The data thus obtained were converted as average number of pest per leaf and predator per plant. To determine the effect of biotic factors on fluctuation of pests the biotic and abiotic data collected were analyzed with the pest population and correlation coefficient values were worked out. Considering the significant relation of biotic and a biotic parameters, stepwise regression analysis have been performed and a population prediction model was developed by taking pest population (Y) as a dependent variable and predator parameters as independent variables. Weather data were collected from meteorological laboratory situated at the Tandojam.

3. RESULTS

3.1 Pest and predator phenology on different verities

Insect pests belonged to the following species (thrips, *Scirtothrips dorsalis* Hood, whitefly, *Bemisia tabaci* (Genn.), aphids, *Aphis gossypii* Glover, Mealy bug, *Phenacoccus solenopsis* (Tinsley), Termite, *Coptotermes acinaciformis*. Froggatt, mite (*Polyphagotarsonemus latus*), jassid, *Amrasca biguttula biguttula* (Ishida), and pod borers like *Helicoverpa armigera* (Hub.) and *Spodoptera litura* (Fab.) on chillies) were recorded from both varieties (Longi and Gotki) in chilli crop ecosystem. Thrips, mites and mealy bug were observed major sucking insect pests and were abundant from transplanting to harvesting (figure-1). The population of these pests was highest on 19th, 21st and 25th DAT, respectively. Aphid and termite appeared in both verities in late season. Whitefly and jassid were not major pests of chilli verities their population were recorded under economic threshold level. In chewing pests *S. litura* and *H. Armigera* were also major insect pests in both verities their population was highest on 18th and 19th DAT, respectively (figure-1, 2 and 3). The statistical analyses (t-test) were carried out separately between same species with verities. Thus, the results of the analysis indicated that there was highly significant difference between same species among verities; the pest population was greater in longi than in gotki (table 1).

Table 1. T-test analyses for differences between the populations of insect pests and predators with each other in different chilli verities

Insect pests	t-test values among species between verities	Predators	t-test values among species between verities
Mite	5.52***	Spider	8.93***
Thrips	10.65***	Brumus	6.72***
Mealy bug	8.83**	7-spotted	2.52*
Whitefly	9.12***	Lacewing	5.65***
Aphid	12.28***	Geocoris .Bugs	5.37***
Jassid	20.38***	* P< 0.05; ** P< 0.01; *** P< 0.001; NS= Not significant; Degree of freedom (df)= 38	
Termite	3.78**		
S. Litura	9.39***		
H. armigera	6.70***		

Predators related to the different species were recorded from both verities in chilli ecosystem, they were (Spider, *Hippasa agelenoides*, 7-spotted, *Coccinella semtempunctata* (L.) *Brumus suturalis* (F.) Big Eyed Bug, *Geocoris* spp and Lace wing, *Chrysoperla carnae*). The population abundance of all predators increased in both verities till 18th DAT. After that, a decreasing curve was observed in predator's population in both verities till harvesting. However, the statistical analyses (t-test) indicate that there were highly significant differences between same specie among verities (figure-4-5).

The consolidated population both verities indicated that pest growth increased till 18th DAT. The regression equation showed that the infestation growth with time interval was highly significant for pest in both verities. The slope rate of increase was 0.130X and 0.105X. The R² was 0.95 and 0.98 it shown that 95 and 98% difference in grow rate was by date interval in longi and gotki, respectively. Afterward, it decreased with a declining curve-0.182X and -0.155X. The R² = 98 and 97 indicated that 98 and 97% decrease in growth rate that was due to dates in longi and gotki, respectively. For predator the regression analysis depicted that the population growth with time interval was highly significant (= 0.033X and = 0.021X and R² = 98 and 97) for also predator in longi and gotki verities, respectively. After that, population decreased with rate of = -0.04X and -0.032X and R² = 99 and 97, respectively for longi and gotki (figure-6 and 7).

3.2 Interaction of pest and predators

In both verities it was observed that mite population was highest as followed by thrips, mealy bug and other insect pests. The ANOVA results revealed that all over mean population pests were highly significant in longi verity (F=132 df =8, P< 0.01) and it was also highly significant (F=57 df =8, P< 0.01) for gotki. The data further indicates that comparative mean population of predators were highly significant with each other in longi (F=10.4 df =4, P< 0.01) and it was non-significant (F=1.56 df =4, P< 0.05) for gotki. The consolidated population of pest and predators indicated that there was highly significant correlation (P< 0.01) between them in longi and as well as in gotki.

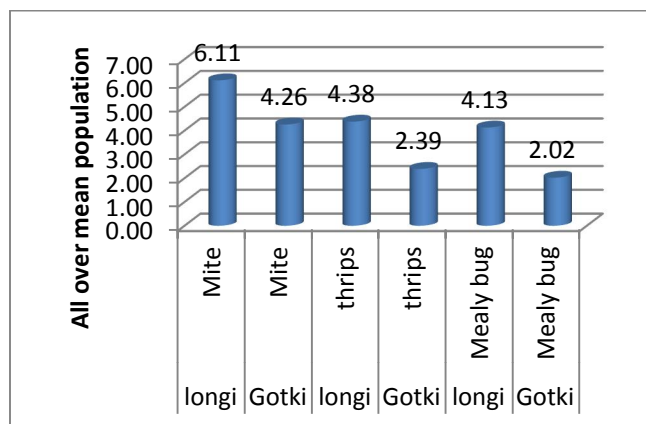


Figure-1. All over mean population of pests in chilli varieties

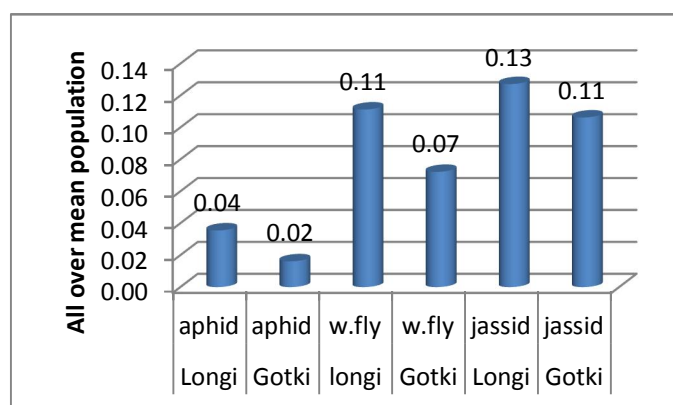


Figure-2. All over mean population of pests in chilli varieties

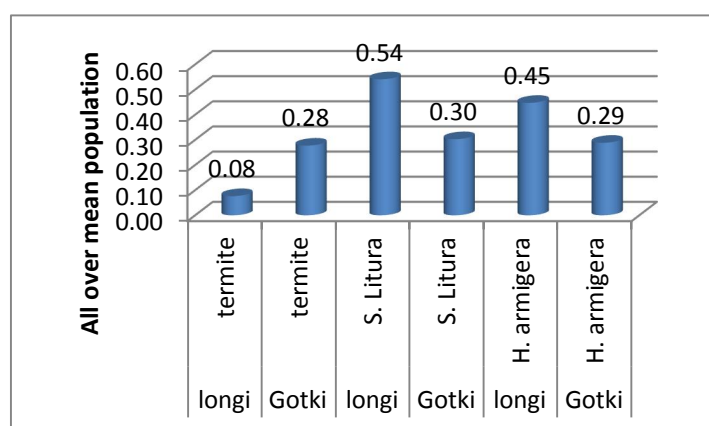


Figure-3. All over mean population of pests in chilli varieties

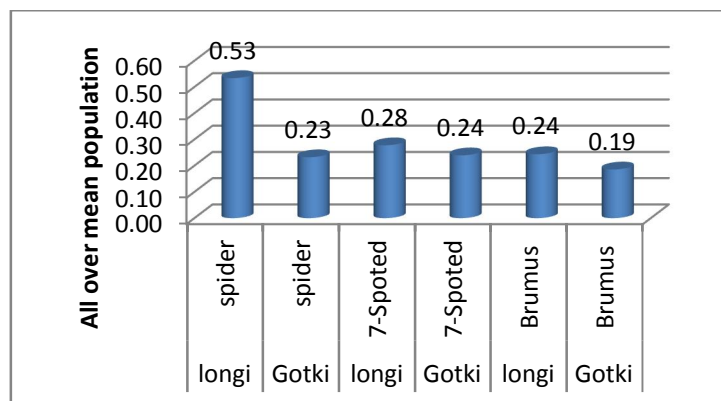


Figure-4. All over mean population of predators in chilli verities

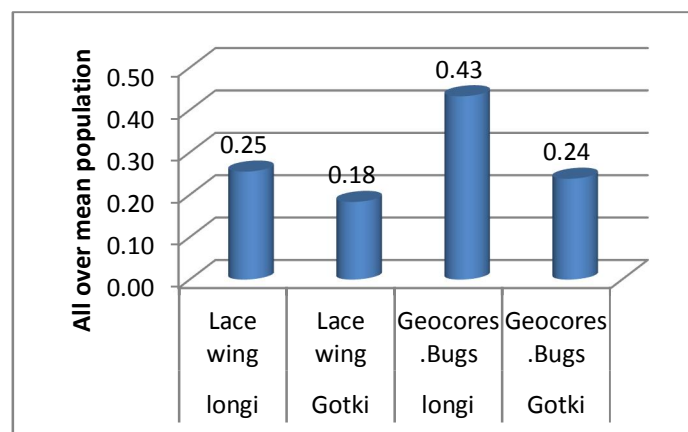


Figure-5. All over mean population of predators in chilli verities

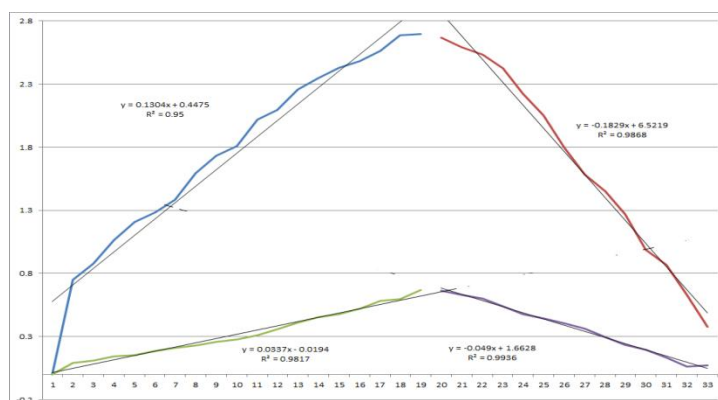


Figure -6. Consolidated population of pest and predators
in longi verity

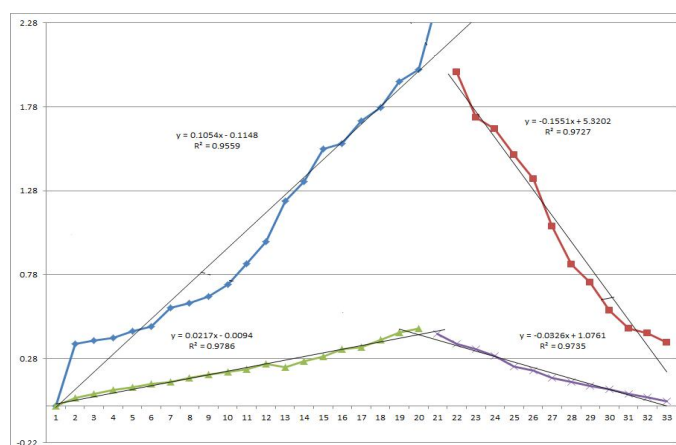


Figure -7. Consolidated population of pest and predators
in gotki verity

whitefly, *Bemisia tabaci* (Genn.), aphids, *Aphis gossypii* Glover, Mealy bug, *Phenacoccus solenopsis* (Tinsley), Termite, *Coptotermes acinaciformis*. Froggatt, mite (*Polyphagotarsonemus latus*), jassid, *Amrasca biguttula biguttula* (Ishida), and pod borers like *Helicoverpa armigera* (Hub.) and *Spodoptera litura* (Fab.) on chillies)

4. DISCUSSION

The results of the present investigations on the population fluctuation of insect pests and their natural enemies on different chilli varieties occurred at different growth stages of the crop and to evaluate their natural enemies for ecofriendly approaches in the management of pests of chilli varieties are discussed here. The present investigations revealed the incidence of sucking pests viz., thrips *S. dorsalis*, mite (*Polyphagotarsonemus latus*), whitefly, *Bemisia tabaci* (Genn.), aphids, *Aphis gossypii* Glover, Mealy bug, *Phenacoccus solenopsis* (Tinsley), Termite, *Coptotermes acinaciformis*. Froggatt, jassid, *Amrasca biguttula biguttula* (Ishida), and fruit borer *Helicoverpa armigera* and *Spodoptera litura* (Fab.) more or less were present in both varieties of chilli and caused a damage of the leaves it becomes yellow, malformed or stunted, and ultimately expire. Some of them inject toxic materials into the plant during feeding time, and some communicate disease organisms from vegetative to reproductive stage of crops. During our study it was observed that thrips and mite are major sucking insect pests of chilli. Our findings are in perfect agreement with those of Eswara Reddy (2005). Eswara Reddy and Krishna Kumar (2006) reported that chilli thrips *S. dorsalis* and mite *P. latus* are serious pests of chilli when experiment was conducted under protected and open field conditions. According our finding it was calculated that whitefly, jassid, mealy bug were not major sucking pests in chilli crop. The present findings are not in agreement with Vasicek et al (2001) who reported that, aphid was among the important pests of chilli, same observation were observed by Yasaraknc and Hncal (1997), Halima and Hamouda (1994) they reported that aphids are the major pests of capsicum. The reason may be different sowing time and due to agro climatic conditions. Usually in Pakistan chilli is cultivated in summer season at that time aphid is not an important pest in this crop but when it is cultivated in winter at that time aphid becomes a major insect pest of chilli. The findings of Singh et al. (1994) are quite close to our statement. They observed seasonal incidence of *Myzus persicae* on

cabbage and considered that the incidence aphid was correlated with temperature and relative humidity. The findings of Singh and Rai (1994) are substantially close they reported that suitable temperature, humidity and growth of crop are very imperative for the development of aphid.

Fruit borer was also found to cause 20.68 percent damage of the fruits at reproductive stage. Similarly, according to Vos and Frinking (1998), they reported that cotton bollworm *H. armigera* was found infesting the capsicum, but information on extent of damage is not available.

The pests observed under farmer field included cutworm (seedling stage), thrips, mites and aphids (vegetative and reproductive stage). Incidence of termites and fruit borer was noticed during reproductive stage of the crop. Similar results were reported by Puttaswamy (1984) from Dharwad, Karnataka and Patil et al (1987) from Maharashtra, who opined that these pests were devastating the crop at various crop phases.

From data it was found that predators related to the different species were recorded from chilli ecosystem, they were (Spider, *Hippasa agelenoides*, 7-spotted, *Coccinella semtempunctata* (L.) *Brumus suturalis* (F.) Big Eyed Bug, *Geocoris* spp and Lace wing, *Chrysoperla carnae*). The population abundance of all predators increased in both verities till 18th DAT. After that, a decreasing curve was observed in predator's population in both verities till harvesting. Our findings are in perfect agreement with those of Salim and Hussein (1994) they reported that In the chilli ecosystem, coccinellids are found to be the most predominant species and are responsible in reducing the populations of pests. It is also quite close to findings of Giraddi(2007),he carried out field experiment at Dharwad and assessed the activity of predator fauna of chilli insect pests. He recorded *Menochilus sexmaculatus* and *Chrysoperla carnea* were observed on the crop. The present results are in accordance with the findings of Varghese (2003), Smitha (2002), Gayatri devi (2006) and George (2006) from india they recorded coccinellids predators in chilli ecosystem.

5. CONCLSION

It is concluded that in sucking pests, thrips and broad mite and in fruit borer *S. litura* and *H. Armigera* were found major pests of chilli from vegetative to reproductive stage and mealy bug was observed sporadically major pest of chilli. A negligible amount of predators were also observed in chilli crop agro-ecosystem. From data it was observed that pest population was comparatively highest in longi from gotki. From consolidated population of pests of both verities it was determined that abundance of pest growth was till 18th DAT, after that it started decreasing consequently that period of the crop is more sensitive therefore highly attention may be focused on pest scouting in crop.

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