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Surveillance on the Sucking Insect Pests and their Natural Enemies on Tomato Crop

SAJJAD ALI KHUHRO*, ABDUL WAHEED SOLANGI, ABDUL GHANI LANJAR
Department Of Entomology, Sindh Agriculture University Tandojam
*Corresponding Author: SAJJAD ALI KHUHRO Email: sajjadento.sau@gmail.com

ABSTRACT
The experiment was conducted at the experimental area of Sindh Agriculture University Tandojam during 2013. The Roma variety was cultivated for this purpose, the all agronomic practices were carried out accordingly. The temperature 15-24ºC and relative humidity 45-68% was recorded during research work. The results of the present experiment showed that sucking insect pests as well as natural enemies' population was observed through out cropping season from 1st week of March to 1st week of May 2013. The results reveled that the maximum population of whitefly (5.5±0.16/leaf) was recorded followed by jassid (4.7±0.21/leaf), aphid (4.4±0.37/leaf) and thrip (2.9±0.17/leaf) on tomato crop. However, the maximum population *chrysoperla carniea* (1.2±0.16/plant) was recorded followed by spider (2.6±0.23/plant) and lady bird beetle (2.5±0.22/plant) was recorded on tomato crop. The results further reveled that the over all impact of relative humidity on the most of the insect pests showed negative correlation. However, the temperature showed that over all positive impact of all the insect pests and predators except whitefly and spider.
Key Word: Solanum lycopersicum, Surveillance, sucking insect pest, Predators

INTRODUCTION

Tomato (*Solanum lycopersicum*) is one of the most important vegetable in the world. Tomato has been bred to improve productivity, fruit quality, and resistance to biotic and abiotic stresses. Tomato has been widely used not only as food, but also as research material (Seisuke Kimura and Neelima Sinha 2008). The tomato are known to contain many compounds that play an important role in the prevention of cancer, heart disease, and many other common health problems. It is also rich source of several important nutrients, (Saleem Shaikh., 2011). It is a good source of vitamins A, B, and C. It is ranked second important vegetable crop after potato (Baloch, 1994). In Pakistan tomato is cultivated on 41.5,000 hectares. With an annual production of 426,3000 tons and in sindh province it is cultivated on an area of 6,2000 hectares with total production of 34,0000 tons (GOP,2005). Usually tomato crop is attacked by the many kinds of insect pests. All parts of the plants offer food, shelter and reproduction site for insects. Insects can cause unthrifty growth or death of the tomato plant and damage of fruit in the from of scarring, tissue destruction and abreaction of shape or colour (Lange, and Bronson 1981). One of the limiting factors to the profitable production of tomato is damage by insect pests (Praveen and Dhandapani., 2002). In recent years, sucking insect pests observed become major pests of tomatoes produced in open field and in high tunnels (Ayanava Majumdar., 2013). Insects inflict injury to plants and stored products either directly or indirectly in their attempts to secure food (Butani., 1979). Insects that cause more than 10% damage are considered as major pests (Butani and Jotwani 1984). This situation has risen mainly due to elimination of natural enemies, resurgence of pests, and development of insecticide resistance and out-break of secondary pests. The tomato aphid, are devastating insect pests of tomato in different districts of Punjab which are close to Sindh province (Aslam and Razaq, 2007). *Bemisia tabaci* alone can cause 10–90% damage depending upon the severity of the infestation and crop stage. Currently available cultivars lack sufficient plant resistance to provide protection against aphids. One of the major insect pests of tomato is *Aphis gossypii*. Crop plants attacked by this pest include cotton, citrus, coffee, egg plant, pepper and tomato (Rana, 2005). Insect-plant interactions involving the cultivated tomato and its relatives in the genus *Lycopersicon* have been intensively studied for several decades, resulting in one of the best documented and in-depth examples of the mechanistic complexities of insect-plant interactions, which encompass both herbivores and their natural enemies (George G. Kennedy 2003). The control of insect pests by natural enemies presents an environmentally friendly method of controlling pests. This involves the activities of predators, parasitoids and pathogens as well as climatic factors in maintaining the population of insect pests below the economic injury level (Douglas, 2003). Ladybird beetle, *Cheilomenes sp* for example is used in controlling aphid population, while the larvae of *Chrysopera carnea* feed on all soft-bodied insects like aphids and the white fly *B. tabaci* (Webb, 2004).

METHODOLGY

The experiment was conducted on "Surveillance on the sucking insect pests and their natural enemies on tomato" at the experimental field, of Sindh Agriculture University Tandojam, during 2013. The Roma variety was cultivated for this purpose on an area of one acre. The plant to plant and row to row distance was maintained

8-12" and 18-24" inches respectively. All agronomic practices were carried out accordingly. However, no pesticides, insecticides were used thought out cropping season. The data on the population of insect pests and their natural enemies were recorded on alternative day, 50 plants were selected randomly from experimental plot. Three leaves from each selected plant were examined from bottom, middle, and top portion of the plant carefully for the population of sucking insect pests, while the whole plant was examined for the population of natural enemies on tomato crop. The observations on the population density of sucking insect pests and natural enemies, was recorded after 30-35 days of sowing till the 20th February. The metrological record was also recorded during research work. The temperature remain during the research work was 15-24ºC and relative humidity was 45-68%. The data thus collected were subjected to analysis for variance. While, to compare the mean values was applied. For these analyses a Microsoft Excel package was used for obtained the significant results.

RESULTS

The results of the present experiment showed that sucking insect pests i.e. whitefly, jassid, aphid and thrip was appeared on the crop just after transplanting till last observation. Whereas, the population of predator insects such as *chrysoperla carniea*, lady bird beetle and spider were also observed through out cropping season from 1st week of march to 1st week of May 2013. The results are individual character are presented here under.

Table 1 Average population of sucking insect pests and their natural enemies on tomato crop.

	Sucking insect pests				Natural enemies		
DATES	**Whitefly**	**Jassid**	**Aphid**	**Thrip**	***C. carniea***	**Lady bird beetle**	**Spider**
04-03-2013	**2.7±0.15**	**2.3±0.21**	**2.1±0.23**	**1.1±0.16**	**0.3±0.11**	**1.4±0.16**	**1.1± 0.23**
11-03-1013	**3.9±0.37**	**3.9±0.23**	**3.2±0.44**	**2.5±0.22**	**0.9±0.23**	**2.5±0.22**	**1.7±0.15**
18-03-2013	**4.3±0.36**	**4.7±0.21**	**4.4±0.37**	**1.9±0.23**	**0.8±0.21**	**1.9±0.23**	**1.1±0.1**
25-03-2013	**5.5±0.16**	**3.5±0.16**	**2.1±0.48**	**2.1±0.17**	**1.2`±0.16**	**1.1±0.17**	**2.6±0.23**
01-04-2013	**4.8±0.32**	**2.2±0.13**	**3.5±0.5**	**2.9±0.17**	**1.0±0 .13**	**0.9±0.17**	**1.9±0.23**
08-04-2013	**3.8±0.20**	**3.9±0.23**	**2.1±0.37**	**1.7±0.26**	**0.8±0.23**	**1.7±0.26**	**1.7±0.3**
15-04-2013	**3.4±0.16**	**2.7±0.15**	**4.1±0.37**	**2.3±0.15**	**0.7±0.15**	**1.3±0.15**	**0.6 ±0.33**
22-04-2013	**2.9±0.25**	**3.4±0.16**	**2.9±0.26**	**1.5±0.22**	**1.1±0.16**	**1.5±0.22**	**1.1±0.1**
29-04-2013	**1.3±0.27**	**2.4±0.22**	**1.9±0.52**	**1.2±0.29**	**0.9±0.22**	**1.2±0.29**	**0.5±0.16**
06-05-2013	**2.6±0.32**	**1.7±0.25**	**2.6±0.30**	**1.9±0.27**	**0.7±0.25**	**0.8±0.27**	**1.2±0.29**

The data on the population of sucking insect pests and natural enemies are presented in Table No 1 indicate that the population of insect pests build up gradually from germination stage to the crop and reduce to words it's harvesting. The maximum population of whitefly (5.5±0.16/leaf) was recorded on the last week of March and the minimum population of whitefly (1.3±0.27/leaf) was recorded in the last week of April. The maximum population of jassid (4.7±0.21/leaf) was recorded during the third week of March while, the minimum population of jassid were appeared (1.7±0.25/leaf) in the 1st week of May. The maximum population of aphid (4.4±0.37/leaf) was recorded on third week of March while, the minimum population of aphids were recorded (1.9±0.52/leaf) during the last week of April. The highest population thrip (2.9±0.17/leaf) was recorded in the 1st week of April while, the minimum population of thrips (1.1±0.16/leaf) was recorded on 1st week of March. However, the maximum population *chrysoperla carniea* (1.2±0.16/plant) was recorded during the fourth week of March while, the minimum population (0.3±0.11/plant) was recorded in the 1st week of March. The maximum population of lady bird beetle (2.5±0.22/plant) was recorded during the second week of of March while, the minimum population of lady bird beetle (0.8±0.27/plant) was recorded in 1st week of May. The maximum population of spider (2.6±0.23/plant) was recorded in fourth week of March, however, the minimum population of spider (0.5±0.16/plant) was recorded during last week of April.

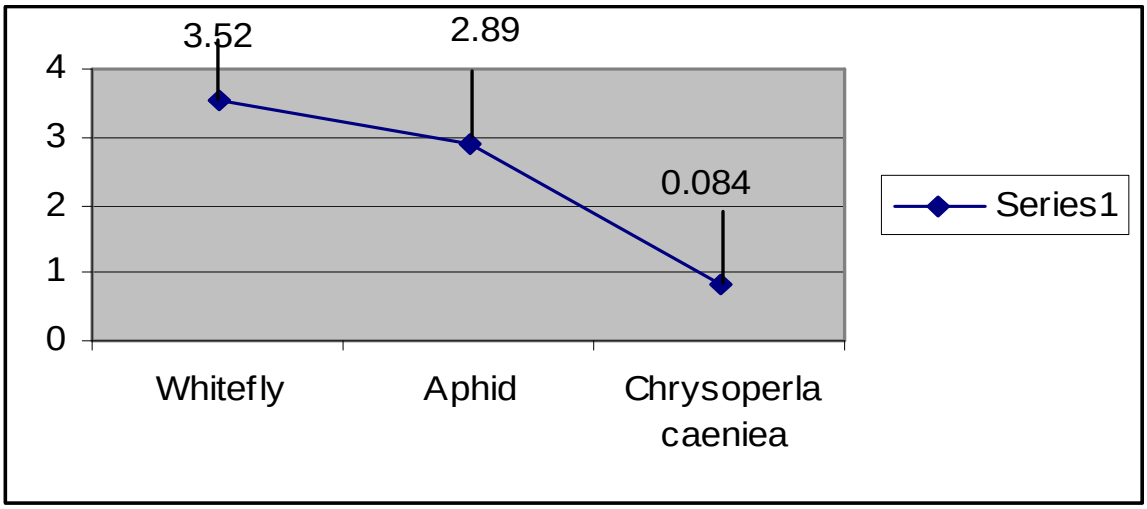

FIG: 01 Total average population of prey and predator tomato crop.

The Figure 1 indicate that the total average population of whitefly, aphid and C. *carnea* on tomato crop**.** The total average population (3.52/leaf) and (2.89/leaf) was recorded whitefly and aphid respectively. While the population of predator such as *C. carniea* (0.084/plant) was recorded on tomato crop.

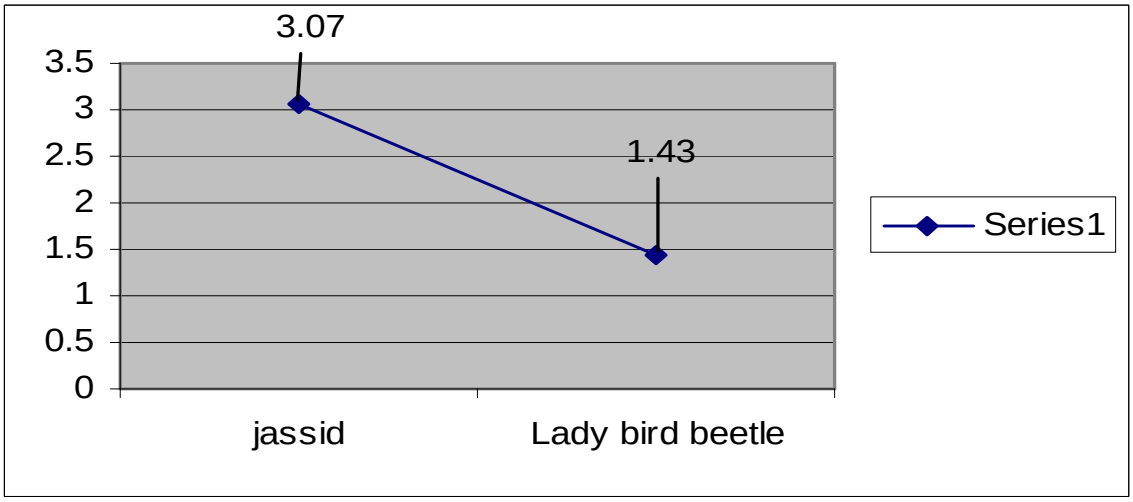

FIG: 2 Total average population of prey and predator tomato crop.

The Figure 2 indicate that the total average population of jassid and lady bird beetle on tomato crop**.** The total average population of jassid (3.07/leaf) was recorded, while the population of predator such as lady bird beetle (0.084/plant) was recorded on tomato crop.

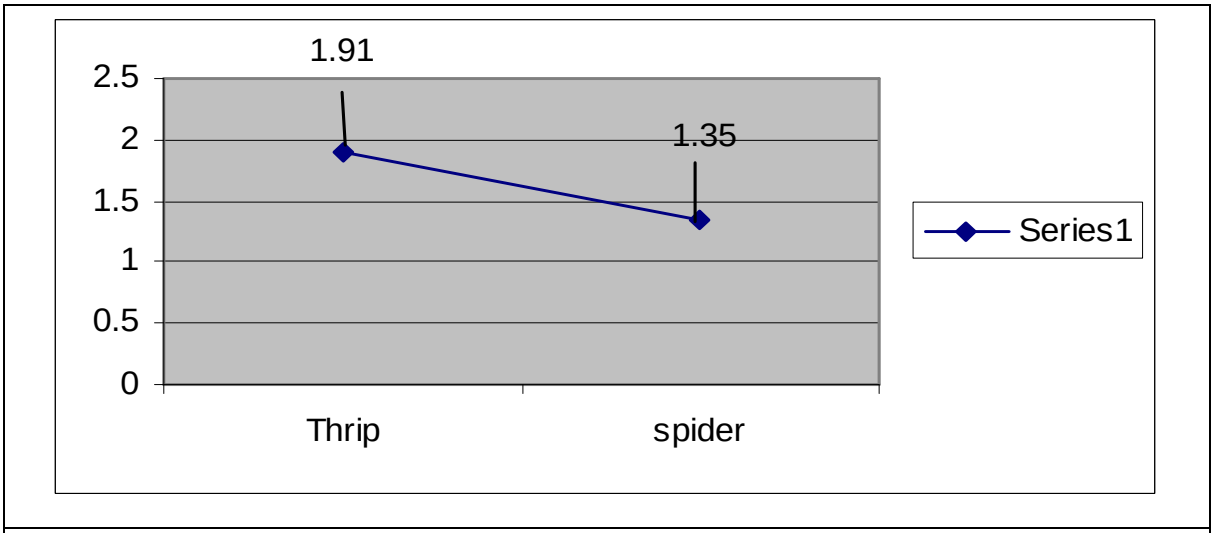

FIG: 3 Total average population of prey and predator tomato crop.

The Figure 3 indicates that the total average population of jassid and lady bird beetle on tomato crop**.** The total average population of thrip (1.91/leaf) was recorded, while the population of predator such as spider (1.35/plant) was recorded on tomato crop.

Table 02. Correlation between insect population and a biotic factors on tomato crop.

Insect	R.H	Temp
Whitefly	**-0.126**	**-0.002**
Jassid	**-0.427**	**0.221**
Aphid	**-0.519**	**0.209**
Thrips	**-0.356**	**0.179**
Chrysopa carniea	**0.647***	**0.625***
Lady bird beetle	**0.714****	**0.619***
Spider	**0.013**	**-0.211**

Table 2 showed that the population of white fly jassid, aphid and thrip, was negatively correlation with relative humidity, and only whitefly was negative correlation with temperature. The correlation values were non-significant insect pests on tomato crops. Among predator, the chrysopa and lady bird beetle showed highly positive significant correlation (0.647*) and (0.714**) with relative humidity and positive correlation (0.625*) and (0.619*) with temperature. Over all impact of RH indicated that most of the insect pests showed negative correlation. Temperature showed that over all positive impact of all the insect pests and predators except whitefly and spider

DISSCUSON

Different insect pests including whitefly, aphids, jassid, thrip and their natural enemies was attacked on tomato as well as malvaceae family (Hashmi, 1994). Tomato is also attacked by numerous insect pest species and in result the crop production is far below the potential yields. Whitefly, jassid, and aphid are considered as the devastating insect pests for tomato (Skoric *et al.* 2007). One of the limiting factors to the profitable production of tomato is damage by insect pests (Praveen and Dhandapani., 2002). Vegetables are affected by many species of pests like caterpillars and sucking insect pests in mid- to late-season. The findings of the present study indicated that whitefly population reached its peak (5.5±0.16/leaf) followed by jassid (4.7±0.21/leaf), aphid(4.4±0.37/leaf) and thrip (2.9±0.17/leaf) was observed on tomato crop. However, the maximum population of *chrysoperla carniea* (1.2±0.16/plant) was recorded followed by lady bird beetle (2.5±0.22/plant) and spider (2.6±0.23) was recorded on tomato crop. The insects are herbivore, ravaging the crops and a threat to agricultural productivity (Reddy and Zehr, 2004). In recent years, sucking insect pests like the leaf-footed bugs and stink bugs have become major pests of tomatoes produced in open field and in high tunnels (Ayanava Majumdar., 2013. Insects are found in all types of environment and they occupy little more than two thirds of the known species of

animals in the world. Insects inflict injury to plants and stored products either directly or indirectly in their attempts to secure food (Butani., 1979).

CONCLUSION:

On the basis of results it is concluded that: Many of the insects in winter –sown crop carried its activities even in the month of low temperature. Natural enemies was appeared when pest population incidence reach EIL. A biotic factor are also support to the population of insect pest as well as natural enemies. Natural enemies active throughout cropping season, the best prey and predation was recorded insect pest and natural enemies.

Recommendation

Whitefly, Jassid, Aphid are serious pest of tomato crop, for the management of that pests bio control agents should be encouraged in tomato field. During January and February months the pest management strategies should be applied if pest population reaches at EIL.

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