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Research Article

Population Dynamics of Cotton Jassid (*Amrassica Biguttula*) in Relation to Weather Parameters in Multan

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Abstract

Cotton (*Gossypium hirsutum L.*) is one of the important crops globally named as white gold. In Pakistan, it is one of the major cash crops. However, cotton production is not being increased within the several years. It is mainly because of being attacked by the sucking insect fauna especially by the cotton Jassid. Thus, the present experiment was conducted to know about the seasonal fluctuation of Jassid. Data was recorded from May – December in Multan, 2017. During the study, Jassid population was noted on two genotypes,Bt (MNH-992) and non-Bt (Cyto-124). The impact of weather parameters like temperature, humidity and rainfall on cotton jassid was recorded. The results revealed that the minimum population of Jassid was observed on2nd week of May and the pest population was 0.83-1.20/3 leaves, while the maximum population was recorded during the 1st week of September i.e. Bt (9.96/3 leaves) and non-Bt (6.40/3 leaves) respectively. The correlation of Jassid population showed significant effect with the temperature and rainfall, while the relative humidity has non-significant effect. Thus, it can be concluded that the climate change has prominent effect on the Jassid population.

Keywords: Cotton Jassid; Temperature; Humidity; Rainfall; Multan

Introduction

Cotton (*Gossypium hirsutum* L.,) is an important crop and globally named as white gold. The economy of Pakistan is mostlydepending on the agriculture and its products. According to economic survey, cotton itself contribute 7-10 % value added to agriculture (Anonymous, 2012-13). Pakistan is the 4th largest cotton producing country in the world, as an exporter of raw cotton and ranks 3rd in number. Cotton is cash crop,susceptible to the attacked by various type of insect pest like sucking as well as chewing, which lead to significant reduction of cotton production [1,2].

Among them, sucking insect pests like Thrips (*Thrips tabaci* (Lind), whitefly (*Bemisia tabaci* (Genus) and jassid (*Amrasca biguttula biguttula*) are major threat to cotton industries in all over the world [2-4]. The quality as well as quantity in the form of yield and production of cotton reduce due to severe attack of sucking insect pests [3,5-7].

Among the sucking insect pests, jassid is the major threat for cotton growing areas of the world including Pakistan [8,9]. The pear shaped, yellowish white and elongated eggs laid by A. biguttula biguttula on the upper leaf surface of plants. Nymphs are whitish–pale–green, wingless while adults are pale green, wedge-shaped and 2 to 3 mm long in size. About 15-29 eggs laid by female. Female prefer to lay eggs on mature leaves. Nymphal and adult period last for 7 to 21 days and 5 to 8 weeks, respectively. There are 10 to 12 generations of jassid per year. Within 15-46 days life cycle is completed. Adult and nymph, both suck the cell sap from the plants twigs and leaves, which directly affect the photosynthetic mechanism of plants and resulting the reduction of the boll formation. Approximately 19.0% cotton yield is reduced due to Jassid infestation [10]. The mosaic virus disease is spread during severe attack of jassid [11].

Furthermore, other weather parameters like rainfall, humidity and temperature play a remarkable part in the expansion, occurrence and population alteration of sucking insect pests throughout

the cotton season [12-14]. The weather parameters like humidity and temperature also fluctuate the jassid population [9,15]. The jassid populations have significant positive association with temperature while negative with rainfall and humidity was non-significant Ali., *et al.* [10].

The excessive use of insecticides for the prevention of crops from the attack of these pests, caused resistance in pests. Not only cause resistance but also become major problem for environmental pollution [2] and harmful for natural enemies such as biological fauna. The current study was carried out to study the pest population and also provide information about the relationship of pest with weather parameters like temperature, humidity and rainfall. Information on weather parameters will help the entomologists and policy makers to take up an effective decision for (IPM) pests management strategies.

Materials and Methods

Experiment Site

The experimental study was conducted at Research Farm of Muhammad Nawaz Shareef University of Agriculture, Multan during the cropping season 2017. To check the effect of abiotic factors on the jassid population, two cotton verities, Bt (MNH - 992) and Non-Bt (Cyto - 124) were sown by using Randomize complete block design (RCBD) with four replications. Entire filed was divided into eight blocks, and block size (25 - 26 sq. feet) with distance (P×P = 9″) and (R×R = 2.5″).The geographic site of experiments was 30.1575° N Latitude, 71.5249° E Longitude and Elevation above sea level 129 m or 423 ft. No insecticide was sprayed during the whole study to allow cotton jassid to multiply. During the whole cropping duration, all recommended agronomic practices were applied for rising the crop production.

Data recording

Population of cotton jassid was recorded weekly basis on randomly selected plants leave sat early morning (7:00 am) from May to December 2017. Thirty different plants leaves were randomly selected from individual plot, counted the jassid number either adults and nymphs from upper, middle and lower leaves of first, second and third plant, respectively. In addition, during the study climatic factors viz. total rainfall, temperature and humidity were also documented. The weekly basis weather data obtained from Metrological Department of Central Cotton Research Institute, Multan, Pakistan.

Statistical analysis

The recorded data was statistically analyzed by using the analysis of variance in "Statistix v8.1" (Analytical Software, 2005) and through least significant difference test (LST) ($\alpha = 0.05$) treatment significance was determined to separate the means (Khan., *et al.* 2012).

Results

Jassid population

Jassid is key sucking pest of cotton, observed throughout the crop season from May-December 2017. The study revealed thatcotton jassid population was lowest (0.83 - 1.20/3 leaves) at early stage of cotton while cross the thresh hold level from September to October. The cotton jassid population was highest on Bt cotton compared to non-Bt.The maximum population (>1 2.03/3 leaves) were found during the 2nd week of September on Bt and(9.96/3 leaves) on non Btwhile minimum population (6.40/3 leaves) was recorded on Bt and non Bt (3.56/3 leaves) genotype. The jassid population was found high (6.76/3 leaves) in last week of August. The study showed that Jassid population remains above the Economic Threshold Level (ETL) throughout the study duration except in month of July.

Correlation of jassid population with weather parameters

The weather parameters like humidity, temperature and rainfall were helpful for the jassid population. During the whole study maximum temperature and humidity was 30-37.90C and 77.6%, respectively while 20-23.2°C was minimum. However, jassid population was maximum at 30.90C temperature and 76.6% relative humidity (RH).

The results showed that the cotton jassid population has positive correlation with temperature and negative non-significance correlation with the morning and evening relative humidity. It was observed that the population of jassid abruptly build up after the rainfall so, humidity is favorable for jassid growth and development. The study revealed that rainfall, humidity and temperature have a significant role for the incidence of jassid population.

Discussion

The results of current study are similar with Bishnol., *et al.* [16] who reported that jassid population have positive correlation with weather parameters like humidity and temperature. The similar findings recorded by Ei-Mezayyen., *et al*. (1997) that pest population is greatly affected by temperature and relative humidity. Our study results are agreements with the results of Majeed., *et al*. [17] that weather parameters are influenced the jassid population.

Our results are same as Shitole and Patel (2009), Kaur., *et a*l. (2009), Prasad., *et al*. [18], Dhaka and Pareek [19], Ramamurthy., *et al*. [20] and Rao., *et al*. (2001), reported that the maximum temperature had a non-significant and negative association with jassid population. Kavitha., et al. [21], Singh., *et al*. [22], Aheer., *et al*. [12], Shitole and Patel (2009) and Selvaraj., et al. [23] observed that minimum temperature and rainfall had negative association with jassid population. Nemade., *et al*. [24], Kavitha., *et al*. [21] and Sewasingh., *et al*. (2004) reported that rainfall and temperature had positive correlation with jassid population. Our observations with respect to rainfall are different from Mahmood., *et al*. [25].

According to Mahmood., *et al.* [25] extreme temperature has optimistic correlation while humidity and rainfall has adverseresult on cotton jassid. The evening relative humidity and rainfall was positively correlated with cotton jassid as reported by Soujanya., *et al.* [26].

During the study maximum and minimum temperature was 30-39°C and 20 to 23.5°C, respectively. The similar results about temperature have been recorded by Prasad., *et al*. [18] and Kaur., *et al*. (2009). Abdullah [27] and Mohapatra (2008) stated that the pest population was high in the months of September and August, respectively and is similar to our findings. The study reported that number of jassid were high in last week of august which is similar to Abro., *et al*. [28] and Solangi., *et al*. [29] studies. The warm and humid condition in these months is the main reason of high population. The pest population was high in the first week of August and continue to decrease in the last week of October as stated by Shad., *et al*. [30], Khan and Ullah [31] and Gupta., *et al.* [8].

Conclusion

The purpose of current study was to check the jassid population on cotton with relation to weather parameters like temperature, humidity and rainfall. Present work concludes that cotton jassid was found high on Bt. Cotton. Among weather factors humidity, temperature and rain fall play the significant role in population fluctuation of leaf miner on cotton crop [32-38].

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