



Impact of Plant Spacing on Population Dynamics of Sucking Pest of Cotton

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Abstract

The present study was carried out to find out the impact of plant spacing on population dynamics of sucking pest of cotton from June 2018 to February 2019. The main objectives of the study are to observe the population dynamics of jassid and whitefly under different plant population. The experiment was laid out in RCB design with three replications and five different treatments viz., T₁- 90x45 cm, T₂ - 90x40 cm, T₃- 90x35 cm, T₄- 90x30 cm, T₅ - 90x25 cm. The results revealed that peak population of jassid was recorded in last July to October and whitefly from August to October. Plant spacing showed a significant effect on the jassid population. It is clear from the results that maximum population of jassid (32.4), aphids (11.3) and whitefly (18.1) were recorded to be per leaf from those plots where minimum plant spacing (25 cm) was maintained. No of sucking insects were increasing with decreasing plant population.

Introduction

Cotton (*Gossypium spp.*) being the king of natural fibers is popularly known as 'white gold'. It is a cash crop and its every plant part is useful to the farmer. One of the most important reasons for low productivity is the damage done by insect-pests. During growth period of cotton crop, 148 insect pests have been recorded, out of which only 17 species have been recorded as major insect pests of cotton crop. Insect-pests of cotton can primarily be divided into sucking pests, foliage pests and worms. Among these, Jassid (*Amrasca biguttula*), whitefly (*Bemisia tabaci*), aphid (*Aphis gossypii*) and mealy bug (*Phaenococcus solenopsis*) are very serious sucking insect pests, but now there is a threat caused by sucking pests. Among the sucking pests, jassid (*Amrasca biguttula*) and whitefly (*Bemisia tabaci*) are of major importance. Whitefly sucks sap from the plants which leads to reduction in growth and vigor of the plants. It also acts as a vector of many viral diseases of cotton especially cotton leaf curl disease. Nymphs and adults of leaf hopper suck sap from leaves and cause damage to the lower surface of leaves by injecting its toxic saliva into tissues which cause shedding of leaves and young bolls along with reduction in fruiting capacity greatly. The incidence and development of these insect pests is very much dependent upon the prevailing environmental factors and crop stand. These insects multiply tremendously during the favorable weather conditions and take a huge toll. The role of temperature and relative humidity is likely to affect the occurrence (Aheer *et al.*, 1994). The continuous and indiscriminate use of large quantities of synthetic insecticides, besides creating health hazards to human and animal life, as well

as environmental pollution has also resulted in the crop failure in different parts of the world, outbreak of secondary pests and development of resistance against insecticides in large numbers of insects. In view of the existing situation it is necessary to develop a prerequisite for developing an effective pest management program to know the proper and appropriate plant spacing and ecological requirements, particularly weather factors like temperature, relative humidity and precipitation play the key role in multiplication and distribution of insect pests. The effect of these factors on the incidence and development of insect pests has given a great momentum to research approach. Owing to lack of information, the present study has been initiated not only to study an overall population situation of sucking insect pests of cotton in different plant spacings, but also to sort out the exact relationship between pest populations. These aims are to help the entomologist to develop the best IPM strategy for the control of the notorious insect pests of cotton.

Materials and Methods

The experiment was conducted at Cotton Research Farm of CDB, Sreepur, Gazipur and Sadarpur, Dinajpur comprising five treatments during the kharif season of 2018-19. The experiment was laid out in RCB design with three replications. The treatments were T₁- 90x45 cm, T₂ - 90x40 cm, T₃- 90x35 cm, T₄- 90x30 cm, T₅ - 90x25 cm. Cotton variety CB-14 was used as a test material. The crop was maintained well by adapting standard agronomic practices as per recommendations. Ten plants were selected randomly from each plot. The populations of sucking pests viz., jassid, aphids and

whitefly were recorded from top, middle and bottom leaves of ten tagged plants per plot. Sucking pest related data will be collected adult/nymph per leaf basis from July to October. Seed cotton yield was harvested on plot basis excluding border lines and expressed as t/ha.

Plant spacing effect on jassid population

Plant spacing showed a significant effect on the jassid population. It is clear from the results that maximum population of jassid was recorded to be 32.4 per leaf from those plots where minimum plant spacing (25 cm)

was maintained. The population of jassid was decreased as the plant to plant distance was increased. The population of jassid decreased significantly 28.5 per leaf where 35 cm plant to plant distance was maintained. The population of jassid did not show significant difference where plant spacing was maintained as 40 and 45 cm with 21.4 and 16.9 jassid per leaf, respectively.

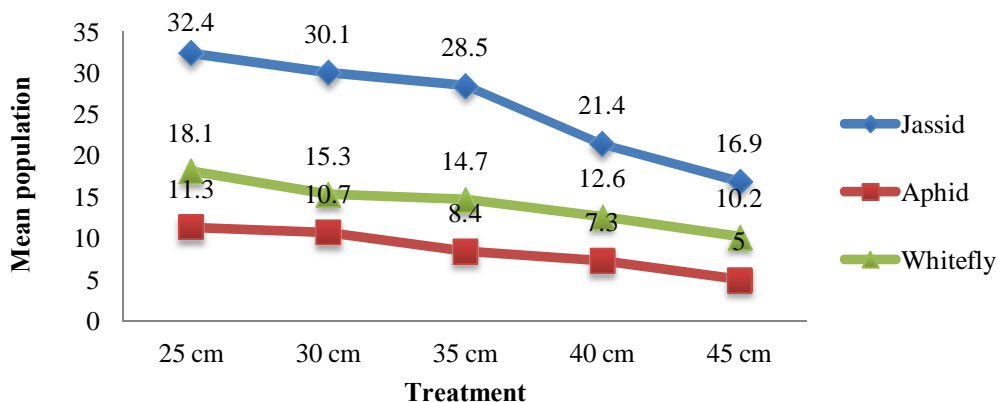


Fig. 1. Effect of plant spacing on sucking pest population

Plant spacing effect on whitefly population

Plant spacing showed a significant effect on the whitefly population. It is clear from the results that maximum population of whitefly was recorded to be 18.1 per leaf from those plots where minimum plant spacing (25 cm) was maintained. The population of whitefly was decreased as the plant to plant distance was increased. The population of whitefly decreased significantly 12.6 per leaf where 40 cm plant to plant distance was maintained. The population of whitefly did not show significant difference where plant spacing was maintained as 40 and 45 cm with 12.6 and 10.2 whitefly per leaf respectively.

Plant spacing effect on aphid population

Plant spacing showed a significant effect on the aphid population. It is clear from the results that maximum population of aphid was recorded to be 11.3 per leaf from those plots where minimum plant spacing (25 cm) was maintained. The population of whitefly was decreased as the plant to plant distance was increased. The population of whitefly decreased significantly 7.3 per leaf where 40 cm plant to plant distance was

maintained. The population of whitefly did not show significant difference where plant spacing was maintained as 40 and 45 cm with 7.3 and 5 whitefly per leaf respectively.

Plant population is a yield contributing parameter and has direct effect on the yield of cotton crop. It is evident from the data that there were significant differences among plant populations at different plant densities. In case of 25 cm plant spacing there were 37520 plants per hectare and at 30 cm there were 33897 plants per hectare, at 35 cm there were 29093 plants per hectare and at 40 cm number of plants were recorded as 26253 per hectare and 22630 for 45cm. So the number of plants per plot decreased significantly with increase in plant spacing and highest numbers of plants were recorded in case of 10 cm plant spacing. Increase in plant population with decrease in plant spacing has also been reported by Brar *et al.*, 2002. Due to sucking pest infestation no of plant population reduced in close spacing. That's why lowest yield obtained in case of close spacing (25 cm) 0.83 t/ha.

Table 1. Effect of plant spacing on population dynamics of sucking pest of cotton

Treatments	Plant population/ha	Plant height (cm)	Sympodial branches/plant	No.of bolls/plant	Single boll weight/plant	Yield(t/ha)
T ₁	22630	80.960	12.807	9.4833	2.0000	1.1400
T ₂	26253	84.717	14.910	9.3833	1.8000	1.1933
T ₃	29093	78.133	12.533	7.3667	1.8333	1.0267
T ₄	33897	65.497	13.633	8.3000	1.9333	1.2200
T ₅	37520	63.190	12.033	7.4000	1.5333	0.8300
CV	5.67	20.95	12.84	38.30	26.52	53.07
LSD	3.1888	29.387	3.1876	6.0482	0.9089	1.0812

The present findings are in conformity with those of Butter *et al.* 1992) Mohite and Uthamasamy 1997) who also reported that the population of jassid was higher at lower plant spacing. Furthermore, the present findings are not in agreement with those of Sohi *et al.*, 1995)who reported that incidence of jassid was less significant with different spacing. The present findings are not in agreement with those of Joginder *et al.* 1998) and Gogoi *et al.* 2000)who reported different periods of peak population of jassid as those of observed in the present study. This variation was due to different ecological condition and study period.The present findings are not in agreement with those of Al-Faisal and Kardu 1986 who reported two population peaks, one in early May and one in end of June or early July. The present findings are in conformity with those of Seif 1980), Isler and Ozgur 1992, Majeed *et al.* 1995, Sohi *et al.* 1995.

Conclusions

Jassids and whitefly remain active throughout the crop season. More plant spacing showed less population of sucking pests.

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