

## RESEARCH PAPER

# Abundance of sucking insect pests of Bt cotton and their natural enemies under different intercropping systems

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The abundance of sucking pest of Bt cotton was studied under different intercropping systems during *Kharif* 2013 at VNMKV, Parbhani, Maharashtra. The results revealed that all intercropping systems were superior over sole cotton in respect of sucking pest population. Cotton + greengram and cotton + blackgram were the most effective intercropping systems that recorded lowest incidence of sucking pests followed by cotton + soybean and cotton + sesamum.

**Key words :** Bt cotton, Intercropping, Sucking pests

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## INTRODUCTION

Cotton (*Gossypium hirsutum* L.), is the “King of Fibre” popularly known as “White Gold”, an important cash crop in India. India occupies first place in area and second in production on global basis after China. Among the various causes of low productivity of cotton in India, the insect pest is one of the major causes. About 200 insect pests are reported to attack cotton crop in India (Anonymous, 1992). The pests of major significance in Bt cotton are sucking pests like aphids (*Aphis gossypii*, Glover), jassids (*Amrasca biguttula*, Ishida), whiteflies (*Bemisia tabaci*, Gennadius) and thrips (*Thrips tabaci* Linnman). These affect the yield considerably causing losses of 11.20 per cent to 20.90 per cent in Marathwada region. Sucking pests, also referred to as “sap feeders”, limit the realization of potential productivity of cotton, they are deleterious to the cotton plant growth and development by being assimilate sappers, stand reducers and light stealers. The heavy infestation of nymph and adults of sucking pests resulted in leaf yellowing, wrinkled leaves, leaf distortion and oily spots on leaves. Secondly, they found to secrete honey dew which leads to growth and development of sooty mould fungus (*Capnodium* sp.) on leaves. The fungus inhibits the photosynthetic activity of the plants resulting into chlorosis

that affect the seed cotton yield. Moreover, whitefly also acts as a vector to transmit leaf curl disease in cotton. Growing of intercrops in cotton is commonly followed practice under Maharashtra conditions that provides an additional income to the cultivators. Some intercrops may deter or others may attract sucking pests of cotton. Therefore, in present investigation seasonal incidence of sucking pests of Bt cotton and their natural enemies in different intercropping systems was studied.

## RESEARCH METHODOLOGY

Studies on the seasonal incidence of sucking pest of Bt cotton in different intercropping systems was carried out during *Kharif* 2013 at research farm, Department of Agriculture Entomology, Vasantrya Marathwada Krishi Vidyapeeth, Parbhani (M.S.). The cotton variety *Bunny* Bt was grown in the observation plots with recommended agronomic package of practices without any crop protection measures. The experiments were carried out in Randomized Block Design (RBD) with eight treatments and three replications. The plot size was 5.5×4.7m. In the present investigation, seven intercrops *viz.*, greengram, blackgram, soybean, sesamum, lentil, kidneybean and marigold were

evaluated and compared with sole cotton regarding incidence of sucking insect pest complex of Bt cotton.

Observations on the number of nymph and adults of aphids, jassids, thrips and whiteflies was recorded at weekly interval from three leaves per plant selected from top, middle and bottom canopy of five randomly selected plants per quadrant from 30<sup>th</sup> day after germination. The data obtained was subjected to  $\sqrt{x+0.5}$  transformations before analysis. The data was statistically analyzed by standard analysis of variance method suggested by Panse and Sukhatme (1967).

## RESEARCH FINDINGS AND ANALYSIS

Studies on population dynamics of sucking insect pests of Bt cotton in different intercropping systems concluded that the pooled data showed that the lower numbers of sucking pests were recorded in all the intercropping systems and were found statistically significant over sole cotton.

### Aphids :

The lowest incidence of aphids was recorded from the plots intercropped with cotton + greengram (3.28 aphids/3 leaves) followed by cotton + blackgram (3.99 aphids/3 leaves). The next promising treatments in minimizing aphid population were cotton + soybean (4.62 aphids/3 leaves), cotton + sesamum (5.63 aphids/3 leaves) and cotton + marigold (7.12 aphids/3 leaves). Statistically all these intercropping systems were found at par. Moreover, cotton intercropped with lentil (8.98 aphids/3 leaves) and cotton + kidneybean (11.08 aphids/3 leaves) recorded highest aphid population amongst the intercropped plots. However, maximum incidence of (16.57 aphids/3 leaves) was observed from sole cotton plots. More or less similar trends of population of aphid were studied by (Parajulee *et al.*, 1997) they found that the relay crops over a period of three years increased the predator activity in cotton that delayed increased in aphid population. Sivagurunathan *et al.* (1999) noticed decreased aphid incidence on cotton intercropped with greengram, blackgram, clusterbean and fieldbean. Godhani (2006) showed that cotton intercropped with maize, sesamum and soybean suppressed the incidence of sucking pests over sole crop. Intercropping of greengram, cowpea, sorghum, cassia *etc.*, in *G. hirsutum* cultivars reduced aphid population (Anonymous, 2009; Godhani *et al.*, 2009 and Sree Rekha *et al.*, 2008).

### Jassids :

The population of jassids was quite less over the entire cropping season. The pooled average indicated that cotton + greengram intercropping system recorded lowest population of jassids (1.28 jassids/3 leaves) followed by cotton + blackgram (1.99 jassids/3 leaves) and cotton + soybean (2.41

jassids/3 leaves) and were found statistically at par with each other. The other treatments in order of reducing jassid population were cotton + sesamum (2.88 jassids/3 leaves), cotton + marigold (3.25 jassids/3 leaves), cotton + lentil (3.66 jassids/3 leaves) and cotton + kidneybean (4.40 jassids/3 leaves). All these intercropping systems were statistically at par with each other. The sole cotton crop harbored more number of jassids (5.59 jassids/3 leaves) as compared to intercropped plots.

Similar trends of results on population of jassids on cotton were studied by Venkatesan *et al.* (1987) they noticed significant reduction in leaf hopper population when cotton was intercropped with greengram than sole cotton crop. Further, intercropping with greengram, blackgram, clusterbean and mustard reduced leaf hopper population in cotton (Anonymous, 1992). Cotton intercropped with greengram, blackgram, cowpea, soybean and sorghum recorded significantly less number of leaf hoppers due to increased activity of natural enemies population (Surulivelu, 2009 and Sree Rekha *et al.*, 2008). Furthermore, Seshadri and Natarajan (1909) reported that there was significant reduction in jassid population when cotton was intercropped with soybean.

### Thrips :

The pooled data showed that the lower population of thrips was recorded from all the intercropping systems and it was found statistically significant over sole cotton. However, the treatments with cotton + greengram recorded lowest incidence (6.88 thrips/3 leaves) followed by cotton + blackgram (7.64 thrips/3 leaves), cotton + soybean (8.05 thrips/3 leaves) and cotton + lentil (12.85 thrips/3 leaves) which were at par with each other.

Whereas, the sole cotton system recorded highest thrips population *i.e.* 23.66 thrips per 3 leaves. Godhani (2006), he found that cotton intercropped with maize, sesame and soybean suppressed the incidence of sucking pests over sole crop.

### Whiteflies :

The observations recorded on incidence of whitefly in different intercropping systems showed that all the intercrops tested were significant in reducing whitefly population over sole crop. The pooled average showed that cotton + greengram recorded lowest (0.01 whiteflies/3 leaves) and was the most superior treatment followed by cotton + blackgram recorded (0.05 whiteflies/3 leaves), cotton + soybean (0.31 whiteflies/3 leaves), cotton + sesamum (0.40 whiteflies/3 leaves), cotton + marigold (0.84 whiteflies/3 leaves), cotton + lentil (1.10 whiteflies/3 leaves) and cotton + kidneybean (1.31 whiteflies/3 leaves). However, all the intercropping systems were statistically at par with each other. Sole cotton crop recorded

maximum whitefly population *i.e.* 3.32 whiteflies/3 leaves.

Earlier workers also quoted similar trends of results in respect of whitefly. Simwat (1994) recorded lower whitefly population on *G. arboreum* cotton when cowpea, greengram and blackgram were grown as intercrops. Godhani (2006) revealed that cotton intercropped with maize, sesame and soybean suppressed the incidence of sucking pests over sole crop.

**Natural enemies :**

*Lady bird beetle :*

The data recorded on effects of different intercropping systems on population of potential predator lady bird beetle revealed that cotton + soybean was the most superior treatment showing highest number of predators (4.53 lbb/3 leaves) followed by cotton + sesamum (4.25 lbb/3 leaves), which were found at par with each other. The next treatment that recorded higher count of lady bird beetle was cotton + greengram (3.33 lbb/ 3 leaves). Whereas, all other intercropping systems had no difference with sole cotton in harboring lady bird beetle, since, they were statistically at par.

**Chrysopa :**

All the intercropping systems recorded more no. of chrysopa as compared to sole cotton (0.23 chrysopa/3 leaves) except cotton + kidneybean (0.53 chrysopa/3 leaves). Among the different intercropping systems cotton + soybean was the most superior treatment showing highest count (1.36 chrysopa/3 leaves) of the predator. The next promising treatments were cotton + blackgram (1.21 chrysopa/3 leaves) and cotton + greengram (1.06 chrysopa/3 leaves) that have showed no statistical difference.

**Spider :**

The population of spiders in all the intercropping systems were found statistically significant over sole cotton and showed more abundance of spiders. The

treatments with cotton + soybean recorded highest (2.13 spiders/3 leaves) followed by cotton + blackgram (1.66 spiders/3 leaves) and were statistically at par with each other. The next treatments showing higher count of spiders were cotton + greengram, cotton + sesamum, cotton + marigold, cotton + lentil and cotton + kidneybean that recorded 1.41, 1.20, 0.95, 0.76 and 0.70 spiders/3 leaves, respectively. Whereas, the sole cotton system recorded least spider count *i.e.* 0.50 spider/3 leaves. The results indicated that intercropping favored population buildup of spiders.

The work done by earlier workers in respect of effect of different intercropping systems on abundance of natural enemies of sucking pests of cotton are discussed here. Similar trends of abundance of lady bird beetles observed by (Lester and Furr, 1972). They reported that cotton + sesame interplanting (24:4rows) favored buildup of ladybird beetles. Patel (2001) reported that different intercropping systems cotton + maize, cotton + cowpea and cotton + sesamum enhanced arthropod natural enemies of cotton pests *viz.*, chrysopids, coccinellids and spiders due to habitat manipulation that ultimately suppressed the damaging pests. Cotton intercropped with legumes *viz.*, soybean, blackgram, *etc.* attracted more natural enemies, Zhang, (1990). When cotton intercropped with cowpea, marigold and sorghum (*Chrysoperla* spp., coccinellids, and spiders) population was significantly higher than sole cotton, Jindal, (2009). Godhani (2009 b) concluded that cotton intercropped with maize, sesame and soybean enhanced the population of various natural enemies of insect-pests attacking cotton. Intercropping of cotton with jowar, marigold and castor increased the population of natural enemies, Nagesh, (2009). Patel and Vyas (1985) studied the ovipositional site preference of females of *Chrysoperla scelestes* Banks on cotton + greengram intercropping. Rajaram (2006) observed increased *Chrysoperla carnea* population when cotton intercropped with cowpea, sunflower, black gram, green gram and okra.

**Table 1 : Effect of different intercropping systems on incidence of sucking pests of Bt cotton and their natural enemies (Kharif-2013)**

Sr. No.	Treatments	Pooled average of sucking pests/3 leaves				Pooled average of natural enemies/3 leaves		
		Aphids	Jassids	Thrips	Whitefly	LBB	Chrysopa	Spider
1.	Cotton + Greengram	3.28 (1.88)	1.28 (1.18)	6.88 (2.65)	0.01 (0.07)	3.33 (1.78)	1.06 (1.15)	1.41 (1.25)
2.	Cotton + Blackgram	3.99 (2.02)	1.99 (1.45)	7.64 (2.79)	0.05 (0.01)	2.53 (1.58)	1.21 (1.22)	1.66 (1.34)
3.	Cotton + Soybean	4.62 (2.16)	2.41 (1.57)	8.05 (2.87)	0.31 (0.09)	4.53 (2.04)	1.36 (1.28)	2.13 (1.47)
4.	Cotton + Sesamum	5.63 (2.35)	2.88 (1.79)	9.06 (3.05)	0.40 (0.06)	4.25 (1.98)	0.85 (1.07)	1.2 (1.30)
5.	Cotton + Lentil	8.98 (2.91)	3.66 (1.78)	12.85 (3.36)	1.10 (0.12)	1.51 (1.32)	0.68 (1.03)	0.76 (1.07)
6.	Cotton + Kidneybean	11.08 (3.39)	4.40 (2.11)	14.62 (3.80)	1.39 (0.43)	1.66 (1.34)	0.53 (0.97)	0.70 (1.04)
7.	Cotton + Marigold	7.12 (2.72)	3.25 (1.89)	10.49 (3.18)	0.84 (0.35)	2.13 (1.49)	0.83 (1.08)	0.95 (1.11)
8.	Sole cotton	16.57 (4.11)	5.59 (2.31)	23.66 (4.67)	3.32 (1.75)	1.36 (1.28)	0.23 (0.85)	0.50 (0.98)
	S.E. ±	0.26	0.12	0.23	0.20	0.10	0.04	0.06
	C.D. (P=0.05)	0.87	0.41	0.76	0.66	0.34	0.15	0.19

\* indicates of significance of values at P=0.05, respectively

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