

**ROLE OF FENVALERATE ON GROWTH AND YIELD OF COTTON (*GOSSYPIUM HIRSUTUM* L.)**Singh Mamta<sup>1</sup> and S. D. Narkhede

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**ABSTRACT**

Saubhagya variety of *Gossypium hirsutum* was selected to carry out the research work during the period of 2004-2007. Variety LRK 516 was used as a check variety with known characters. Cotton crop is highly susceptible to various insects' pests. The cotton bollworm *Helicoverpa armigera*, the whitefly *Bemisia tabaci*, *Jassids*, *Aphids*, *Empoasca devastans* and the pink bollworm (*Pectinophora gossypiella*) have been causing economic damage to cotton crop all over the country. However, by the end of the first 60-75 days, fenvalerate treated cotton fields were looking as good as those which were unsprayed. This elicited a strong positive response. Fenvalerate is a synthetic compound primarily used as an insecticide. It acts as a fast-acting neurotoxin in insects. It is easily degraded on soil and plants.

**Keywords:** *Gossypium hirsutum*, fenvalerate sprays, morphological characters and yields

**INTRODUCTION**

Cotton (*Gossypium hirsutum*) is one of the main cash crops and a major contributor to financial stability and economic viability of India. A number of sucking insect-pests are associated with American cotton (*Gossypium hirsutum* L.) in India. Cotton is reported to be a host for about 166 different species of insect pests throughout its growth cycle. The major pests of cotton are causing considerable economic losses to the crop production. Amongst these the cotton bollworm (*Helicoverpa armigera*), the Whitefly (*Bemisia tabaci*), *Jassids*, *Aphids*, *Empoasca devastans* and the pink bollworm (*Pectinophora gossypiella*) have been causing economic damage to cotton crop all over the country. It has developed a high degree of resistance against several chemical classes (Denoholm *et al.*, 1998; Elbert and Nauen, 2000). Therefore, in an effort to find an effective chemical against this pest, Fenvalerate (10 EC), a synthetic pesticide, was evaluated to assess the response of pest population.

Cotton crop is highly susceptible to various insects' Pests because insecticides had been recognized universally as easy, convenient and effective pest control options, farmers were enthusiastically using them to reap good benefits. Overuse and misuse of insecticides led to problems

of harmful residues, pest resurgence, development insect resistance to insecticides and ecological upheavals because of insect problem, cotton is also known to be consuming half of the total pesticides used in this country (Elliot *et al.*, 1992 )

The pest population has to be curtailed to a minimum biological activity to avoid economic loss to crop fields. The objective of Fenvalerate application, besides keeping the pest population under check should also be to avoid the pollution and damage to the non-targets. Keeping in view the importance of this treatment, the present study was carried out to assess the effects of Fenvalerate on growth and yield of cotton.

**MATERIALS AND METHODS**

The experiment was carried out in fields at Institute of Science, Nagpur University, Nagpur during 2005-2007. A randomized complete block design, replicated three times, was used. Individual plots consisted of ten rows, 5 m long and 50 cm apart. Plants within the rows were 20 cm apart maintaining 25 hills/row. Block to block and plot to plot distance were 3 m and 2 m, respectively. Saubhagya variety (*Gossypium hirsutum*) was used as planting material. Variety LRK 516 was used as a check variety with known characters. Seeds were sown at the rate of 3-4 seeds/hill.

Watering was done immediately after sowing. Plots were hand-weeded at 14, 28 and 42 DAP (days after planting). Thinning to two plants per hill was done at 14 DAP. Compost was applied as basal treatment at the rate of 15.9 t/ha before land preparation. Side dressings were applied at 15, 30 and 45 DAP with NPK of 15-15-15, 12-24-12 and 13-21-13 at the rate of 312.5, 187.5 and 187.5 kg/ha, respectively.

The experiment consisted of three insecticidal treatments including control. Insecticide used was Fenvalerate 10 EC. Insecticide applications were made at 30, 60 and 90 DAP using a knapsack sprayer. The rate of applications were 1 l/ha, in 400 liters of water for Fenvalerate. Adjuvant (IBA spreader) was added to spray volume at the rate of 0.5 ml/liter for better adhesion of insecticides on plant surface.

Data were collected on second day after application of each spray. For this purpose, 20 plants per plot were randomly selected for counting larvae and adults and observing the morphological characters and yield. The efficacy of insecticide Fenvalerate was calculated by comparing them with the untreated control plot.

The following morphological characters and fiber properties were taken in consideration for these two varieties. These are - plant height, number of nodes on the main stem, monopodia and symposia, number of leaves per plant, boll

number per plant, boll weight, and yield. The monopodia, symposia and number of leaves were counted separately in five tagged plants and average number was recorded at the time of harvest. The average plant height in cm of five tagged plants was recorded at harvest from the base of the plants to the growing tip.

## RESULTS AND DISCUSSION

The efficacy of Fenvalerate was investigated in the field for controlling insect pests of *Gossipier hirsute* variety Surah in two growing seasons. It was observed that the Fenvalerate significantly reduced population of bollworm, (*Helicoverpa armigera*), and the Whitefly (*Bemisia tabaci*), *Jassids*, *Aphids*, *Empoasca devastans* and the pink bollworm (*Pectinophora gossypiella*) compared to control.

Fenvalerate showed the highest growth and yield and reduction of pest's population among the treatments. Fenvalerate showed significant difference over all treatments on 90 DAP and significant difference was observed among the others controlled plants. All treated lines were found on par with each other and significantly superior to the control on 90 DAP. On the other hand, all treatments significantly suppressed the pests population and increase the growth and yield over the control on 90 DAP but no significant difference was observed in control lines.

**Table 1: Mean value showing variation in growth characters under study by treatment with Fenvalerate**

Name of treatments	Plant Height (cm)	No. of monopodia	No. of symposia
SauUT <sub>1</sub> R <sub>1</sub>	92	2	13
SauUT <sub>2</sub> R <sub>2</sub>	96	1	11
SauUT <sub>3</sub> R <sub>3</sub>	95	1	10
SauT <sub>1</sub> R <sub>1</sub> F	112	4	18
SauT <sub>2</sub> R <sub>2</sub> F	110	5	16
SauT <sub>3</sub> R <sub>3</sub> F	98	5	15
L UT <sub>1</sub> R <sub>1</sub>	92	1	10
L UT <sub>2</sub> R <sub>2</sub>	98	3	11
L UT <sub>3</sub> R <sub>3</sub>	110	2	12
L T <sub>1</sub> R <sub>1</sub> F	123	5	15
L T <sub>2</sub> R <sub>2</sub> F	134	6	16
L T <sub>3</sub> R <sub>3</sub> F	137	5	14

Sau - Saubhagya; L – LRK 516; UT – Untreated controlled plant; T – Treated with insecticides; F- Fenvalerate; R – No. of replication

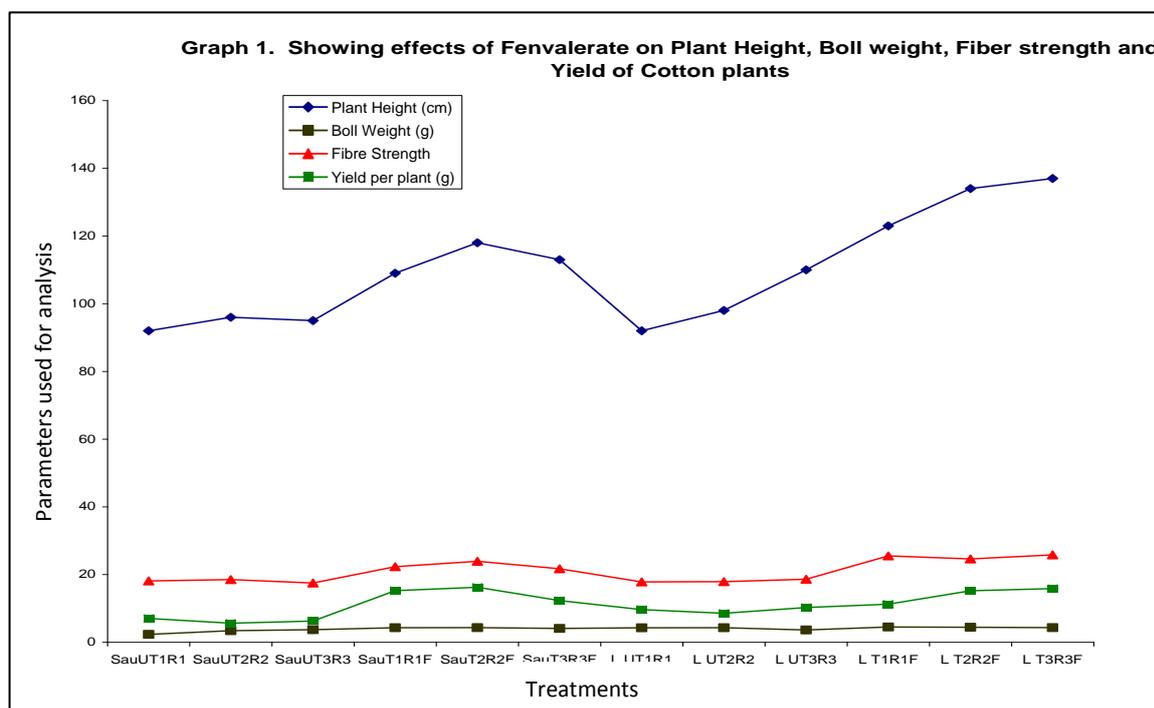
It is estimated that the plant height in Saubhagya plant (SauT<sub>1</sub>R<sub>1</sub>F) was found to be high (112 cm.) by treatment with insecticide Fenvalerate. The number of monopodia and sympodia were higher in treated variety Saubhagya. The results obtained were compared with check variety LRA- 516, which are presented in Table 1. Yield and yield parameters like boll weight,

seed index, ginning out turn, lint index, 2.5% span length, uniformity ratio, micronaire value, fiber strength were found higher and promising in treated lines. In Saubhagya variety (SauT<sub>2</sub>R<sub>2</sub>F) treated with Fenvalerate, the average yield was found to be as high as 16.25 g which also has higher boll weight (4.31 g), seed index (8.53g), GOT (40.98%), lint index (4.58 g) (Table. 2).

**Table 2: Mean value showing variation in yield and yield parameters under study after treatment with Fenvalerate**

Name of treatments	Boll Weight (g)	Seed index (g)	Ginning Out Turn (%)	Lint Index (g)	2.5% span length (mm)	Uniformity Ration	Micronaire	Fibre Strength	Yield per plant (g)
SauUT <sub>1</sub> R <sub>1</sub>	2.32	5.45	30.81	3.23	24.27	43	3.8	18.1	7.04
SauUT <sub>2</sub> R <sub>2</sub>	3.41	4.25	32.52	3.43	24.18	46	3.6	18.5	5.62
SauUT <sub>3</sub> R <sub>3</sub>	3.71	5.36	36.25	3.21	25.30	47	3.3	17.5	6.25
SauT <sub>1</sub> R <sub>1</sub> F	4.28	8.36	40.52	4.56	25.43	52	4.3	22.3	15.23
SauT <sub>2</sub> R <sub>2</sub> F	4.31	8.53	40.98	4.58	26.57	49	4.7	23.9	16.25
SauT <sub>3</sub> R <sub>3</sub> F	4.08	8.2 6	40.50	4.65	24.05	51	4.8	21.7	15.25
L UT <sub>1</sub> R <sub>1</sub>	4.25	7.36	40.26	4.29	23.52	44	2.6	17.8	9.63
L UT <sub>2</sub> R <sub>2</sub>	4.28	7.52	32.25	4.38	23.54	43	2.8	17.9	8.56
L UT <sub>3</sub> R <sub>3</sub>	3.61	7.58	38.45	4.59	26.58	48	3.3	18.6	10.25
L T <sub>1</sub> R <sub>1</sub> F	4.51	8.36	42.25	5.32	25.75	51	4.9	25.5	11.23
L T <sub>2</sub> R <sub>2</sub> F	4.42	8.52	41.26	4.58	26.54	53	4.6	24.6	15.21
L T <sub>3</sub> R <sub>3</sub> F	4.32	8.42	41.85	4.62	27.85	51	4.8	25.8	15.85

Sau - Saubhagya; L – LRK 516; UT – Untreated controlled plant; T – Treated with insecticides; F- Fenvalerate; R – No. of replication



The traits 2.5% span length, Uniformity ratio, micronaire value and fibre strength was found to be higher as compared to untreated lines of Saubhagya.

In all the treated plants, insecticides treatment provided significantly better control over the pest population at 30, 60 and 90 DAS after sprays. Plants sprayed with Fenvalerate generally continued to maintain significantly low population of the pest than the control. Pest population on the crop was quite low and in several plots it reached zero after spray. Fenvalerate suppressed the pest for a longer duration and showed promising growth and yield in Surabhi variety.

Russell and Kranthi (2006) also made similar observations who stated that whitefly thrips population was low at a faster rate in insecticide treated plots than untreated control plots. Other workers have reported that Fenvalerate was effective against these pests – *bollworms*, *Bemisia tabaci*, *thrips*, *aphids* etc. (Attique and Ghaffar, 1996). Highest yield was recorded in Fenvalerate treated plot which differed significantly from controlled lines.

It was obvious from the experiment that Fenvalerate provided better control by reducing insect pests in and increase in the growth and yield. Reduced population of bollworm, *Helicoverpa armigera*, the Whitefly *Bemisia tabaci*, *Jassids*, *Aphids*, *Empoasca devastans* and the pink bollworm *Pectinophora gossypiella* were observed at all sampling days in Fenvalerate treated plots. Field and green house studies were conducted by Jiang *et al.* (1999) and they reported that alpha-Fenvalerate 5% EC was effective in controlling

*Helicoverpa armigera*, *Jassids* and aphids and increasing the yield and morphological characters. A field evaluation of some insecticides was made by Uddin *et al.*, (1993) and Slosser *et al.*, (2000) for the control of spotted pod borer in the field of cowpea in Bangladesh. They reported that the best control of this pest was achieved by three sprays of Fenvalerate (0.007%).

Our investigation also showed less number of infested pods caused by *Empoasca zinckenella* in Fenvalerate treated plots. The effect of contact as well as systemic insecticides on pests population of *Ophiomyia phaseoli* (Tryon) (Diptera: Agromyzidae) in soybean was investigated by Gohokar *et al.*, (1985). The effectiveness of some insecticides against the *H. armigera* on gram (*Cicer arietinum*) was evaluated in the field studies in Maharashtra, India by Gohokar *et al.* (1985) and Russell and Kranthi (2006). They observed that the application of 0.009% Fenvalerate was made at 50% flowering and 15 days later reduced the incidence of *H. armigera*, followed by 0.006% Fenvalerate and the highest yield was obtained from plots treated with 0.006% Fenvalerate, followed by controlled lines.

It was concluded that insecticides treatments had overall adverse effects on plant growth, yield and fibre quality. Therefore, it is always essential to recommend proper dose of Fenvalerate for increasing the yield and keeping the pests population under control. From this study it was revealed that Fenvalerate had better efficacy in controlling major insect pests of *Gossypium hirsutum* resulting the highest yield.

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