



## ESTIMATION OF YIELD LOSSES DUE TO MAJOR INSECT PESTS OF CHILLI (*CAPSICUM ANNUM* L.)

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### ABSTRACT

The pests adversely affected the different yield attributing parameters and brought in significant avoidable loss to the tune of 51.19 and 38.51 per cent fruit yield. The average height of plants, number of primary branches, number of fruits and marketable fruit yield were recorded maximum in the protected plots as compared to unprotected plots.

**Key Words:** Yield, height, branches

### INTRODUCTION

Chilli (*Capsicum annum* L.) is an important condiment as well as vegetable in every household in India. Two cultivated species (*Capsicum annum* L. and *Capsicum frutescens* L.; family Solanaceae) are raised in the tropics and subtropics. Chilli occupies a pride place among the vegetables, for its delicious taste and pleasant flavor. Nutritionally, it is rich in vitamins particularly, vitamin A and C. Being a popular and highly remunerative vegetable crop, it is grown throughout the world. The countries where capsicums are grown as a major vegetable crop are China, Mexico, Spain, Romania, Italy, Yugoslavia, Bulgaria, USA, Hungary, India, Hong Kong and other European, Central and South American countries. In India, it is intensively cultivated in Karnataka, Maharashtra, Tamil Nadu, Himachal Pradesh and in hilly areas of Uttar Pradesh in an area of 311 lakh hectares with an annual production of 3761 million tonnes. In Rajasthan, it is grown in Raipur and Mathania areas of Pali and Jodhpur districts and Khandar region of Sawai-Madhopur district. A number of factors are responsible for lower yields that include adverse climatic conditions, poor quality seeds, diseases, insects and mites which significantly affects both the quality and production of chilli. The yield losses have been estimated ranging from 50-90 per cent due to insect pests of chilli (Nelson and Natrajan, 1994 and Kumar, 1995). Chilli is infested by thrips, *Scirtothrips dorsalis* Hood, whitefly, *Bemisia tabaci* Genn., aphid, *Aphis gossypii* Glover, tobacco caterpillar, *Spodoptera litura* fruit borer, *Helicoverpa armigera* (Hubner) and mites, *Polyphagotarsonemus latus* Banks. right from germination to harvest of the crop. Among these thrips, whiteflies and aphids are major insect pests, responsible

for low productivity that reduce upto 50 percent yield (Ahmed *et al.*, 1987). Under severe infestation thrips alone cause 30-50 per cent loss in yield (Kandasamy *et al.*, 1990). In case of severe infestation, there is malformation of leaves, buds and fruits, which may damage about half of the crop. The attacked plants are stunted and may finally dry up. Overuse of pesticides has often led to the development of undesirable problems like destruction of natural enemies, pest resurgence and failure of control strategies leading to outbreak of leaf curl. In addition the presence of pesticide residues in chillies (Joia *et al.*, 2001) is of greater concern for export of chillies to developed countries. In the last few decades, awareness of health consciousness led to organically produced food stuff. The tremendous demand for organically produced food has led to creation of new export avenues for developing countries.

### MATERIALS AND METHODS

#### Layout and design

Experiment on the estimation of losses due to insect pests of chilli was conducted in paired plot design during *kharif*, 2015 and 2016. The seedlings of chilli variety "RCH-1" were transplanted on July 12<sup>th</sup>, 2015 and 2016. There were 26 plots each of 3 m × 2.25 m size having row to row and plant to plant spacing of 60cm and 45 cm, respectively. Each plot was separated by a buffer strip of 1.0 m all around the block and 1.0 m between two plots. All the recommended horticultural practices and crop husbandry were followed.

#### Observations

Out of 26 plots, one set of 13 plots was exposed to

natural infestation of insect pests, while, another set of 13 plots was protected by regular spraying of recommended insecticides right from appearance of the pests up to the maturity of the crop.

The effect of insect pest infestation on yield attributing characters *viz.*, plant height, number of primary branches and number of fruits per plant was analyzed from three randomly selected plants. Yield of green chilli per plot was recorded at each picking and the data were pooled together.

The marketable yield of chilli from protected and unprotected plots was recorded separately and loss in yield was estimated by using following equation given by Leclerg (1971).

$$\text{Mean loss in yield (\%)} = \frac{X_1 - X_2}{X_1} \times 100$$

Where,

$X_1$  = Yield in protected plot

$X_2$  = Yield in unprotected plot

#### Statistical Analysis:

The data on yield (quantitative) and plant growth characters (qualitative) were subjected to statistical analysis and significance was tested using 't' test as under:

Standard deviation ( $S_d$ ) =

$$\sqrt{\frac{\text{Sum of square of the deviation from the mean difference}}{\text{No. of paired plots} - 1}}$$

Standard error of mean difference ( $S_e$ ) =

$$t = \frac{\bar{X}_1 - \bar{X}_2}{S_e} \times 100$$

Where,

$X_1$  = Average yield in protected plot

$X_2$  = Average yield in unprotected plot

$S_e$  = standard error of mean difference

## RESULTS AND DISCUSSION

The losses caused by insect-pests of chilli were estimated by paired plot technique during *kharif*, 2015. The study revealed that the chilli crop was infested by whitefly, *B. tabaci*; thrips, *S. dorsalis*; aphid, *A. gossypii*. Actual amount of quantitative loss inflicted by the naturally occurring insect-pests together with their effects on yield attributing characters *viz.*, plant height,

number of primary branches, number of fruits per plant and marketable fruit yield of green chillies per plot were recorded and the data have been presented in Table (1).

#### Height of Plants

Plant growth was adversely affected due to insect-pest infestation. A significant difference was observed in plant height between protected and unprotected plots. The mean height of plant in protected plots was 51.92 cm in comparison to 44.16 cm in unprotected plot. The mean reduction in plant height in unprotected plots was 14.94 per cent. The results show that the plants in protected plots attained more height than the unprotected plots, perhaps due to being protected from infestation.

#### Effect on primary branches

The numbers of primary branches on chilli were also adversely affected due to insect-pest infestation. A significant difference in numbers of primary branches was observed between protected and unprotected plots. The data reveal that numbers of primary branches were significantly higher in protected plots than unprotected plots and over all plant growth was more in protected plots than unprotected plots. The mean number of primary branches in protected plots was 7.92, while in unprotected plots it was 5.32. The reduction in number of primary branches was 32.82 per cent.

#### Effect on number of fruits/ plant

The numbers of fruits on chilli plants were also adversely affected due to insect-pest infestation. A significant difference in number of fruits was observed between protected and unprotected plots. The mean number of fruits/plant in protected plots was 79.75, while 56.41 in unprotected plots, thus the mean reduction in number of fruits were 29.26 per cent.

#### Effect on green chillies yield/ plot

The mean fruit yield per plot was recorded as 19.61 kg in protected plots, while in unprotected plots, the healthy fruit yield was 9.58 kg. The fruit yield was higher in protected plots in comparison to unprotected plots. The mean reduction in fruit yield in unprotected plots was 51.19 per cent.

The losses caused by insect-pest of chilli were estimated during *kharif* 2016 by paired plot technique and data presented in table (2).

#### Height of Plants

Plant growth was adversely affected due to insect-pest infestation. A significant difference was observed in plant height between protected and unprotected plots. The mean height of plant in protected plots was 51.46

**Table 1. Effect of insect-pest infestation on the yield parameters of chilli (*C. annum* L.) var. RCH-1 during *kharif* 2015**

S. No.	Yield Attributing Parameters	Mean value		Mean difference	Mean reduction (%)
		Protected	Unprotected		
1.	Plant height (cm)	51.92	44.16	07.76	14.94
2.	Primary branches (No.)	07.92	05.32	02.60	32.82
3.	Fruits/plant (No.)	79.75	56.41	23.34	29.26
4.	Fruits/plot (Wt.)	19.61	9.58	10.04	51.19

\*Significant at 5 % level of significance

**Table 2. Effect of insect-pest infestation on the yield parameters of chilli (*C. annum* L.) var. RCH-1 during *kharif*, 2016**

S. No.	Yield Attributing Parameters	Mean value		Mean difference	Mean reduction (%)
		Protected	Unprotected		
1.	Plant height (cm)	51.46	41.96	9.50	18.46
2.	Primary branches (No.)	8.23	5.37	2.86	34.75
3.	Fruits/plant (No.)	79.33	56.03	23.30	29.37
4.	Fruits/plot (Wt.)	20.85	12.82	8.03	38.51

\*Significant at 5 % level of significance

cm in comparison to 41.96 cm in unprotected plot with mean 18.46 per cent reduction in plant height in unprotected plots. The results show that the plants in protected plots attained more height than the unprotected plots.

#### Effect on primary branches

The numbers of primary branches on chilli were also adversely affected due to insect-pest infestation. A significant difference in numbers of primary branches was also observed between protected and unprotected plots. The data revealed that numbers of primary branches were significantly higher in protected plots than unprotected plots and over all plant growth was more in protected plots than unprotected plots. The mean numbers of primary branches in protected plots was 8.23, while in unprotected plots the figure was 5.37. The reduction in number of primary branches was 34.75 per cent.

#### Effect on number of fruits/plant

The numbers of fruits on chilli plants were also adversely affected due to insect-pest infestation. A significant difference in number of fruits was observed between protected and unprotected plots with the mean number of fruits/plant in protected plots being 79.33 in

comparison to 56.03 in unprotected plots, thus the mean reduction in number of fruits was 29.37 per cent.

#### Effect on green chillies yield/plot

The mean fruit yield per plot was recorded as 20.85 kg in protected plots, while in unprotected plots, the healthy fruit yield was 12.82 kg. The fruit yield was higher in protected plots in comparison to unprotected plots. The mean reduction in fruit yield in unprotected plots was 38.51 per cent.

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