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

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ABSTRACT

A field experiment was conducted during *Kharif* season of 2018 at Agronomy Farm, RCA Udaipur, involving paired plot techniques for the estimation of yield loss due to major sucking pests infesting chilli (*Capsicum annum* L.). The chilli variety Pusa jwala was transplanted in 26 plots each with measurement of 3.6m x 4.2m size, with spacing of 60cm x 45cm. One set of plots were exposed to natural infestation throughout the crop growth and anther set was protected by recommended biopesticides and plant oils. The sucking pests infestation caused 27.91 per cent mean height reduction over protected plots, 31.28 per cent mean number of primary branches/plant reduction over protected plots, 35.64 per cent mean number of fruits/plant reduction over protected plots and 63.53 per cent mean yield of green chilli/plot reduction over control.

Keywords: Sucking pests, paired plot technique, chilli, losses, bio-pesticides and plant oils

INTRODUCTION

Chilli (*Capsicum annuum* L.) is one of the important vegetables, a commercial spice crop of India and is being widely cultivated throughout the warm temperate, tropical and subtropical countries. Chilli is famous for its pleasant aromatic flavor, pungency and high coloring substance. It is used mostly in culinary, pharmaceutical and beverage industries throughout the world. It is an important condiment used for imparting pungency and color to the food, being rich in vitamin C, A, B, oleoresin and red pigment (Tatagar *et al.*, 2011). In the world India is a second largest producer, consumer and exporter of chilli next to China. The major chilli exporting countries are China (25%), India (23%), Spain (17%), Mexico (9%) and Morocco (7%). Chilli is cultivating worldwide with an area 2020.910 thousand hectares and production 3762.134 thousand tons with productivity 1.86 tons/ha (Geetha *et al.,* 2017). In the world India stands as second largest producer, consumer and exporter of chilli next to China. Chilli is cultivated worldwide with an area 2020.910 thousand hectares and production of 3762.134 thousand tons with productivity 1.86 tons/ha (Geetha *et al.,* 2017). Though India has larger area of chilli but the average productivity is low due to the biotic and abiotic factors. Amongst all the known factors, insects and mites are of important biotic factor which significantly reduces the quality and production of chilli. Among those pests aphids (*Aphis gossypii* Glover), thrips (*Scirtothrips dorsalis* Hood), whiteflies (*Bemisia tabaci* Genn.) and mites (*Polyphagotarsonemus latus* Banks) are of major sucking pests contributing to tune of 12 to 90 per cent losses at national level which directly affects the crop yield. These insect-pests causes severe losses in terms of production and productivity and responsible for 50% loss in yield of chilli (Ahmed *et al.,* 1987) and also yield loss range from 50 to 90 per cent also observed in chilli (Nelson and Natrajan, 1994). Some of them are acting as vector and transmits virus causing severe losses to the chilli crop.

MATERIALS AND METHODS

Paired plot experiment was conducted as per proposed by Lece Clerg (1971) during *Kharif,* 2018 to estimate the losses due to major sucking pests infesting chilli crop.

Field layout

The seedlings of chilli variety “Pusa Jwala” were transplanted in second week of July, 2018. There were 26 plots each of 3.6 m 4.2 m size, the spacing maintained for row to row and plant to plant was 60 cm x 45 cm. Each plot was separated by 1.0 m buffer strip all around the each block and between the plots 1.0 m distance. All required and suggested horticultural practices and crop husbandry were undertaken.

Totally twenty six plots were taken to exploit this experiment, out of which one set of thirteen plots was allowed to natural infestation of pests whereas, another set of thirteen plots was protected by two foliar sprayings of mentioned/urged biopesticides upon occurrence of insect pests and the second spray was taken on fourteen days after 1st spray.

Observations

The population of major sucking pests was recorded on three leaves of randomly selected and tagged plants. The observations were recorded at10 days interval from both protected and unprotected plots. Observations regarding plant height, no. of primary branches, number of fruits/plant and weight of fruits/plot were observed on five randomly selected plants at first fruit picking stage.

Statistical analysis

Per cent loss in yield was calculated by comparing the yield obtained from protected and unprotected plots. The following formula was used to calculate percentage yield loss.

$$\text{Average loss in yield} = \frac{X_1 - X_2}{X_1} \times 100$$

Where,

X_1=Yield observation taken from protected plot

X_2=Yield observation taken from unprotected plot

Table 1. Influence of major sap sucking pests infestation on the yield contributing parameters of chilli (*C. annum* L.) var. Pusa Jwala during *Kharif,* 2018

S. No.	Yield Attributing Parameters	Mean values		Mean difference	Mean reduction (%)
		Protected	Unprotected		
1.	Plant height (cm)	49.26	35.4	13.77	27.91
2.	Primary branches (No.)	8.72	5.98	2.74	31.28
3.	Fruits/plant (No.)	76.90	49.27	27.63	35.64
4.	Yield of Green chilli/plot (Kg)	32.26	11.89	20.37	63.53

Table 1a. Effect of sucking pests infestation on the plant height of chilli (var. Pusa Jwala) during *Kharif*, 2018

S. No.	Plant height (cm)		Difference	Mean (%) reduction over protected plots
	Protected Plots	Unprotected Plots		
1.	49.26	35.4	13.77	27.91
1.	48.60	36.0	12.60	25.93
2.	46.80	35.0	11.80	25.21
3.	51.40	37.8	13.60	26.46
4.	46.60	35.8	10.80	23.18
5.	48.20	35.2	13.00	26.97
6.	46.60	35.2	11.40	24.46
7.	48.60	34.2	14.40	29.63
8.	53.00	40.0	13.00	24.53
9.	49.20	32.0	17.20	34.96
10.	46.00	32.0	14.00	30.43
11.	52.40	36.8	15.60	29.77
12.	50.60	35.4	15.20	30.04
13.	52.40	36.0	16.40	31.30
Mean	49.26	35.4	13.77	27.91

t cal 25.59**

**Significant at 1% level of significance

The yield data and yield attributing characters of plant will also subjected to statistical analysis and significance was tested by using 't' test as under:

$$\text{Standard deviation (sd)} = \sqrt{\frac{\text{Sum of square of the deviation from the mean difference}}{\text{Number of paired plots} - 1}}$$

$$\text{Standard error of mean} = \frac{\text{Standard deviation}}{\sqrt{\text{No. of paired plots}}}$$

$$\text{'t' calculated} = \frac{\overline{X}_1 - \overline{X}_2}{se}$$

Where,

X_1 = Average yield in treated plot (Protected)

X_2 = Average yield in untreated plot (Unprotected)

RESULTS AND DISCUSSION

The losses due to the sucking pests infesting the chilli variety Pusa Jwala were calculated by paired plot technique. Chilli crop was found infested by four sap sucking pests *viz*., thrips (*S. dorsalis* Hood), whiteflies (*B. tabaci* Genn.), aphids (*A. gossypii* Glover.) and mites (*P. latus* Banks.).

The avoidable losses accounted by naturally occurring sap sucking pests together with their effects on yield attributing characters like, Plant height, no. of primary branches, no. of fruits per plant and yield of green chillies/plot were taken and the results are presented in table – 1(a-d)

Height of plants

The plant growth was severely affected by sucking pests infestation. In protected plot the height of plants was ranged from 46cm to 53cm with a mean height of 49.26cm in comparison with non protected plots in which plants height ranged from 32cm to 40cm with a mean height of 35.79cm Table (1.a). These results show that the plants in protected plots were healthy with good height in comparison with unprotected plots plants due to protection measures taken.

Effect on primary branches

The major effects imposed by sucking pests on primary branches on chilli were recorded. In protected plot the number of primary branches ranged from 7 to 10.80 with a mean number of primary branches of 8.72 in comparison with non protected plots in which number of primary branches ranged from 4.40 to 7.40 with a mean number of primary branches of 5.98 (Table 1. b). These results shows that the plants in protected plots had more number of primary branches in comparison with unprotected plots plants due to protection measures were taken in protected plots.

Table 1b. Effect of sucking pests infestation on number of primary branches of chilli (var. Pusa Jwala) during *Kharif*, 2018

S. No.	Number of Primary branches/Plant		Difference	Mean (%)
	Protected Plots	Unprotected Plots		reduction over protected plots
1.	7.00	5.40	1.60	22.86
2.	7.20	5.20	2.00	27.78
3.	9.40	7.00	2.40	25.53
4.	7.60	4.40	3.20	42.11
5.	8.40	6.40	2.00	23.81
6.	7.60	4.80	2.80	36.84
7.	9.20	6.00	3.20	34.78
8.	10.20	7.40	2.80	27.45
9.	8.60	6.40	2.20	25.58
10.	8.40	5.40	3.00	35.71
11.	9.80	5.60	4.20	42.86
12.	9.20	6.80	2.40	26.09
13.	10.80	7.00	3.80	35.19
Mean	8.723	5.984	2.74	31.28

t cal 13.30**

** Significant at 1% level of significance

Table 1c. Effect of sucking pests infestation on number of fruits of chilli (var. Pusa Jwala) during *Kharif*, 2018

S. No.	Number of fruits/Plant		Difference	Mean (%) reduction over protected plots
	Protected Plots	Unprotected Plots		
1.	76.40	54.80	21.60	28.27
2.	59.60	38.40	21.20	35.57
3.	90.80	53.60	37.20	40.97
4.	65.20	42.80	22.40	34.36
5.	81.40	50.40	31.00	38.08
6.	62.80	47.40	15.40	24.52
7.	71.80	43.00	28.80	40.11
8.	83.80	58.80	25.00	29.83
9.	81.40	54.60	26.80	32.92
10.	72.00	45.20	26.80	37.22
11.	83.20	52.20	31.00	37.26
12.	81.00	45.20	35.80	44.20
13.	90.40	54.20	36.20	40.04
Mean	76.90	49.27	27.63	35.64

t cal 15.13**

** Significant at 1% level of significance

Table 1d. Effect of sucking pests infestation on yield of green chilli (var. Pusa Jwala) during *Kharif*, 2018

S. No.	Yield of green chilli/plots (kg)		Difference	Mean (%) reduction over protected plots
	Protected Plots	Unprotected Plots		
1.	34.00	15.20	18.80	55.29
2.	31.40	11.00	20.40	64.97
3.	33.20	15.60	17.60	53.01
4.	31.20	6.60	24.60	78.85
5.	35.40	15.20	20.20	57.06
6.	28.20	6.80	21.40	75.89
7.	30.80	12.20	18.60	60.39
8.	33.40	13.00	20.40	61.08
9.	35.20	16.00	19.20	54.55
10.	31.40	9.20	22.20	70.70
11.	33.60	12.80	20.80	61.90
12.	32.40	12.00	20.40	62.96
13.	29.20	9.00	20.20	69.18
Mean	32.26	11.89	20.37	63.53

t cal 41.74**

** Significant at 1% level of significance

Effect on number of fruits per plant

The numbers of fruits per plant were also severely affected due to sucking pests infestation. In protected plot the number of fruits per plant ranged from 62.80 to 90.80 with a mean number of fruits per plant of 76.90 in comparison with non protected plots numbers of fruits per plant ranged from 38.40 to 58.80 with a mean number of fruits 49.27 per plant (Table-1.c). These results show that there is significant difference between protected and unprotected plots. In protected plots, more number of fruits were recorded in comparison with unprotected plots plants.

Effect on green chilli yield per plot

The incidence of major sucking pests on chilli crop adversely affected the yield of the green chillies (Table - 8). The fruits yield per plot ranged from 28.20kg to 35.40 kg with a mean fruits yield of 32.while in unprotected plots the yield per plot ranged from 6.60kg to 16kg with a mean fruits yield per plots were 11.89kg (Table-1.d). These results show that there is significant difference between protected and unprotected plots.

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