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ASSESSMENT OF QUANTITATIVE LOSSES DUE TO INSECT PESTS OF BLACKGRAM

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Abstract

A field experiment was conducted during *kharif* 2013 and 2014 at Instruction Farm, RCA, Udaipur (Rajasthan), India involving the assessment of quantitative losses due to insect pests of blackgram. The blackgram variety PU-31 was sown in 26 plots with each plot measuring 4.0m × 3.6m. One set of plots was kept protected from insect infestation by regular application of recommended pesticides and the other set was exposed to natural infestation throughout the crop growth. Infestation by insect pests in blackgram significantly reduction in plant height was 15.85 and 15.52 per cent, respectively; likewise, the loss in mean number of pods, mean number of seeds per pod and seed yield per plant was 20.42 and 18.27; 15.76 and 11.45; 27.09 and 23.49 per cent during both the years, respectively. On the basis of difference obtained in net yield between protected and unprotected plots, the avoidable quantitative loss was estimated as 27.10 per cent during 2013 and 23.49 per cent during 2014.

Key words : Insect pests, losses, blackgram.

Introduction

Pulses belong to one of the largest family Leguminacae. India is a major pulse growing country in the world. In recent years considerable emphasis has been laid on the improvement of the yield levels of pulse crop by placing them in the list of national priorities. The black gram in India is mainly grown in the states of Madhya Pradesh, Uttar Pradesh, Bihar, Punjab, Maharashtra, West Bengal and Tamil Nadu. Black gram is mostly grown as a rainfed crop during summers in Northern India and in winters in Peninsular and Southern India. With increase in irrigation potential, the area under black gram cultivation has registered an increase in recent years. The low productivity of blackgram both at national and state level is attributed to abiotic and biotic stresses like drought, weeds, insect pests and diseases. Among these, insect pests often pose a serious threat to blackgram production by increasing cost of cultivation and impairing quality of the produce in many ways. An estimated 200 insect pests that belong to 48 families in orders *viz.,* Coleoptera, Diptera, Hemiptera, Hymenoptera, Isoptera, Lepidoptera, Orthoptera, Thysanoptera and 7 mites of order Acarina are known to infest greengram and blackgram (Talekar, 1990). They cause significant damage to blackgram foliage and pods, besides causing damage to other related legumes. Durairaj (2001) recorded the floral damage value due to *M. pustulata* feeding pigeonpea (47.93 per cent), cowpea (37.00 per cent), urdbean (26.67 per cent) and mungbean (17.53 per cent). Duraimurugan and Tyagi (2014) observed that the avoidable losses due to insect pest complex on different varieties of mungbean and urdbean ranged from 27.03 to 38.06 per cent and 15.62 to 30.96 per cent with an average of 32.97 and 24.03 per cent. In the present investigation the effect of insect pests on yield and various yield attributing characters *viz*., plant height, pods/plant, seeds/pod, seed yield/plant (g), seed yield/plot (kg) and seed yield (kg/ha) were analyzed.

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Materials and Methods

The field trial was carried out at Instructional Farm of Rajasthan College of Agriculture, Maharana Pratap University of Agriculture and Technology, Udaipur during *kharif* 2013 and 2014. The trial was laid out in randomized block design with three replications. blackgram variety PU-31 was sown at 30 cm spacing (row to row) having plot size of 4m × 3.6m. The estimation of losses due to insect pests of blackgram was worked out using paired plot design as suggested by Le clerg (1971). One set of plots was kept protected from insect infestation by regular

Table 1 : Comparative losses due to insect pest infestation in blackgram PU-31 (2013).

S. no.	Parameters	Protected	Unprotected	t- calculated value	Mean Loss (%)
1.	Mean plant height (cm)	34.31	28.86	20.58*	15.85
2.	Mean number of pods/plant	29.52	23.48	10.98*	20.42
3.	Mean number of seeds/ pod	4.57	3.84	9.46*	15.76
4.	Mean yield /plant(g)	5.17	3.75	12.01*	27.09
5.	Mean yield /plot(kg)	1.23	0.89	11.19*	27.10
6.	Estimated mean yield (Kg/ha)	856.62	620.00	11.19*	—

*The t-value significant at P = 0.05

Table 2 : Comparative losses due to insect pest infestation in blackgram PU-31 (2014).

S. no.	Parameters	Protected	Unprotected	t- calculated value	Mean Loss (%)
1.	Mean plant height (cm)	34.38	29.05	23.61*	15.52
2.	Mean number of pods/plant	29.55	24.13	9.35*	18.27
3.	Mean number of seeds/ pod	4.78	4.21	7.22*	11.45
4.	Mean yield /plant(g)	5.06	3.85	11.19*	23.49
5.	Mean yield /plot(kg)	1.21	0.92	10.32*	23.47
6.	Estimated mean yield (Kg/ha)	841.31	638.69	10.34*	—

*The t-value significant at P = 0.05

application of recommended pesticides and the other set was exposed to natural infestation throughout the crop growth. Five plants were selected randomly from each plot both in the protected and unprotected sets and various yield attributing characters *viz*., plant height, pods/plant, seeds/pod, seed yield/plant (g), seed yield/plot (kg) and seed yield (kg/ha) were recorded separately.

The losses consequent to infestation by insect pests were calculated by the formula given by Le Clerg (1971).

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

Where,

X_1 = Yield in treated (protected) plot

X_2 = Yield in untreated (unprotected) plot

The yield data and yield attributing characters of plant were also subjected to statistical analysis and significance was tested using the "t-test" as under:

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

$$t = \frac{\overline{X_1} - \overline{X_2}}{\sqrt{S^2\left(\frac{1}{n_1} + \frac{1}{n_2}\right)}} \sim t_{n_{1+}\, n_{2-2}}\ \text{d.f}$$

$$S^2 = \frac{1}{n_1 + n_2 - 2}\left[\left\{\Sigma x_1^2 - \frac{(\Sigma x_1)^2}{n_1}\right\} + \left\{\Sigma x_2^2 - \frac{(\Sigma x_2)^2}{n_2}\right\}\right]$$

Where,

$\overline{X}_1$ = Average yield in treated plot (Protected)

$\overline{X}_2$ = Average yield in untreated plot (Unprotected)

Sd = Standard deviation

S^2 = Pooled variance

n_1 = Sample size for Protected

n_2 = Sample size for Unprotected

't' = Calculated value

Results and Discussion

The losses due to insect pests in "PU-31" variety of blackgram were worked out by paired plot technique. Actual amount of quantitative loss inflicted by the insect pests together with their effects on yield attributing characters *viz*., plant height, pods/plant, seeds/pod, seed yield/plant (g), seed yield/plot (kg) and seed yield (kg/ha) were recorded separately and have been presented in tables 1 and 2.

As evident from table 1, it can be noted that the mean height of plants when protected from pest infestation by organic treatment was 1.19 times more than when the

plants were left untreated. The mean numbers of pods were 1.26 times more in the treated plots than that under untreated condition. The mean number of seeds per pod was 1.19 times more under treated condition as compared to that under untreated condition. The mean yield per plant (5.17g/plant) and mean yield per plot (1.23kg/plot) were significantly more when the crop was kept protected. The yield data recorded from protected and unprotected plots of blackgram was converted to kg/ha. The seed yield with mean of 856.62 kg/ha in protected plots in comparison to with mean of 620 kg/ha in unprotected plots. The overall mean loss worked out to be 27.10 per cent due to the insect pest infestation during 2013.

During the year 2014, from table 2, it can be observed that the mean height of plants under protected condition was 1.18 times more than that when unprotected. The mean numbers of pods were 1.22 times more when the crop was protected than when left unprotected. The mean numbers of seeds per pod under protected condition were 1.13 times more; the mean yield per plant (5.06g/plant) and mean yield per plot (1.21kg/plot) was significantly more when the crop was kept protected from insect infestation. The seed yield with mean of 841.31 kg/ha in protected plots in comparison to with mean of 638.69 kg/ha in unprotected plots. The overall mean loss worked out to be 23.49 per cent due to the insect pest infestation. Similarly, the estimated yield loss to greengram during *kharif* season up to the extent 48.11 per cent was reported by Kan Singh (2002). The loss to greengram was estimated to range from 48.30 to 61.50 per cent (Goud, 2004). The loss estimated by pod borers and seed weevil (*A. Ampulum)* on greengram was 55.56 for pod and 62.20 per cent for seed (Deshmukh *et al.,* 2007). Abudulai *et al.* (2012) reported that the yield loss in soybean ranged from 25.8 to 42.8 per cent in untreated plots. Vikrant *et al.* (2015) reported the estimated avoidable loss due to insect pest infestation in blackgram was 55.20 per cent when sole crop of blackgram was exposed to insect infestation.

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