



## ASSESSMENT OF QUANTITATIVE LOSSES DUE TO INSECT PESTS OF PIGEONPEA

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### ABSTRACT

An experiment on the estimation of losses due to insect pests in pigeonpea was conducted following the paired plot design at the Instructional Farm of Rajasthan College of Agriculture, Maharana Pratap University of Agriculture and Technology, Udaipur, during *khari*, 2014. The insect pests infestation significantly influenced the yield attributing characters and pigeonpea yield. The mean height of plant, number of primary branches, pod length, mean pod damage, mean grain damage, yield per plant and yield per plot in protected and unprotected plots were 152.28 cm and 143.61 cm, 10.78 and 10 per plant, 5.43 cm and 4.91 cm, 6.20 per cent, and 40.34 per cent, 4.65 per cent and 42.47 per cent, 37.99 g and 19.88 g, 955.38 g and 628.92 g, respectively. The insect pests caused significant reduction in mean height of plant (5.62%), pod length (9.49%), number of primary branches (7.14%), mean pod damage (84.60%) and mean grain damage (89.12%). Based on the yield per plant, the mean avoidable loss was estimated to be 47.57 per cent; while that on a per plot basis it was 34.44 per cent.

**Key words:** Insect-pests, loss assessment, *pigeonpea*

### INTRODUCTION

Pigeonpea [*Cajanus cajan* (L.) Millsp.], an important pulse crop, is predominantly cultivated in tropical and subtropical regions of the world. It is a drought tolerant crop with large variation for days to maturity, ranging from extra short (90 days) duration to long duration (300 days). Globally, pigeonpea is cultivated in 4.64 million hectares, with an annual production of 3.43 million tons and a mean productivity of 780 kg ha<sup>-1</sup>. India is the primary pigeonpea growing country in the world, accounting for 3.82 million hectare area and 2.65 million tons of production (FAO, 2012-13).

Due to introduction of short duration and high yielding varieties, the crop is infested by many insect pests. The important insect pests of pigeonpea are the gram pod borer (*H. armigera*), plume moth (*E. atomosa*), spotted pod borer (*M. testulalis*), tur pod fly (*M. obtusa*), field bean pod borer (*A. atkinsoni*), aphid (*A. craccivora*), white fly (*B. tabaci*), pod bugs (*R. pedestris*), eriophid mite (*A. cajani*) and the leaf tier (*E. critica*). Among these, the pod borer complex *viz.*, gram pod borer (*H. armigera*), plume moth (*E. atomosa*), spotted pod borer (*M. testulalis*), tur pod fly (*M. obtusa*), blue butterfly (*L. boeticus*) are of major significance as they cause considerable losses in yield (Reed *et al.*, 1980). The present investigation was thus carried out to estimate the quantitative losses in seed yield caused by insect pests of pigeonpea.

### MATERIALS AND METHODS

The experiment on the estimation of losses in pigeonpea (variety *Manak*) was conducted in paired plot design as suggested by Leclerg (1971). There were 26 plots (13 paired plots) each measuring 3.6m × 3.0m; the row to row and plant to plant spacing of 60cm and 45cm, respectively, were maintained. One set of 13 plots was exposed to natural infestation by insect pests, while the other set of 13 plots was protected by providing an insecticidal umbrella to keep plants free from insect damage. The crop was sown in the second week of July, 2014 following all the recommended agronomic practices for its cultivation.

The effect of insect pests on yield attributing characters *i.e.* plant height, number of primary branches, pod length, mean pod and grain damage was recorded on five randomly selected plants and mean reduction (%) was worked out. The seed yield from each of the protected and unprotected plots was recorded separately and subjected to statistical analysis and mean reduction in yield was computed. The losses in yield were worked out by using following formula:

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

Where,

X<sub>1</sub> = Yield in protected plot.

X<sub>2</sub> = Yield in unprotected plot

The yield data subjected to statistical analysis and significance was tested by the “t” test.

$$\text{Standard Deviation (S}_d\text{)} = \frac{\text{Sum of square of the deviation form the mean difference}}{\text{No. of paired plots} - 1}$$

$$\text{Standard error of mean difference (S}_e\text{)} = \frac{\text{Standard deviation (S}_d\text{)}}{\text{Number of paired plots}}$$

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

$\bar{X}_1$  = Average yield in protected plot;

$\bar{X}_2$  = Average yield in unprotected plot

$S_e$  = Standard error of mean difference

## RESULTS AND DISCUSSION

Plant growth in terms of plant height was adversely affected due to insect injury. In protected plots, the mean height of plants was 152.28 cm in comparison to 143.61cm in unprotected plots that led to 5.63 per cent reduction in plant height. A significant difference was also observed in pod length and number of primary branches in protected and unprotected plots. The mean pod length in protected plots was 5.43 cm in comparison to 4.91 cm in unprotected plots that in terms of reduction in mean pod length was 5.42 per cent. A significant difference in number of primary branches was also observed between protected and unprotected plots; the mean number of primary branches in protected plots was 10.78, while in unprotected plots it was 10.0 that caused 7.14 per cent reduction in the number of primary branches. Adverse effects of insect pest infestation in pigeonpea have earlier been reported by Ameta and

Bhardwaj (1997), who observed a significant increase in plant height, pod length and number of primary branches in protected plots as compared to that in unprotected plots.

Effect of insect pest infestation on the grain yield was conspicuous; the mean pod damage in unprotected plots was 40.34 per cent as against 6.20 per cent in protected plots; similarly in unprotected plots, the mean grain damage was 42.47 per cent as against 4.64 per cent in protected plots. The mean grain yield per plant in protected plots was 37.99g, while in the unprotected plots the mean grain yield per plant was 19.88g. The mean grain yield from the protected plots was 955.38g as against 628.92g from the unprotected plots. The avoidable loss thus worked out to be 47.70 per cent on a per plant basis, while it was 34.17 per cent on a per plot basis (Table: 1).

In similar studies earlier on pigeonpea, Ameta and Bhardwaj (1996) reported that the mean pod damage in unprotected and protected plots was 43.02 per cent and 6.30 per cent, respectively; while, mean grain damage was 41.38 per cent and 4.07 per cent, respectively; and the mean grain yield was 39.27g and 19.57g in the protected and unprotected plots, respectively. Singh and Kumar (2003) observed that pod borers damaged the pods differently depending on the various stages of crop growth. Out of four major pod borers, *M. vitrata* was a minor pest, causing only 0.1 to 2.1per cent pod damage, while *H. armigera* caused the maximum pod damage (6.4-24.7 %). Subharani and Singh (2009) observed that maximum (38.06 q ha<sup>-1</sup>) and minimum yield (19.45 q ha<sup>-1</sup>) were recorded when the lowest (2.0 %) and highest (40.6 %) flower and pod infestation occurred during full protection (FP) and no protection (NP) treatments, respectively. Sujithra and Chander (2014) reported that the pod borer complex caused 19.11 per cent pod damage that could be attributed to *M. vitrata* (9.7 %), pod fly (5.3 %), gram pod borer (2.6 %) and leaf webber (2.3 %).

**Table 1. Assessment of quantitative losses in seed yield caused by insect pests of pigeonpea**

S.No.	Yield attributing characters	Mean		Standard deviation	t <sub>calculated</sub>	Loss (%)
		Protected	Unprotected			
1.	Plant height (cm)	152.28	143.61	4.22	7.41*	5.69
2.	Primary branches (No)	10.78	10.00	0.48	6.00*	7.24
3.	Pod length (cm)	5.43	4.91	0.20	8.50*	9.58
4.	Pod damage (%)	40.34	6.20	2.72	45.52*	84.63
5.	Grain damage (%)	42.47	4.64	2.74	49.76*	89.07
6.	Yield (g/plant)	37.99	19.88	2.11	31.22*	47.70
7.	Yield (g/plot)	955.38	628.92	53.28	22.11*	34.17

\*Significant at 5 % level of significance; t<sub>tabulated</sub> = 2.16\*

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