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Estimation of yield losses due to major insect pests of groundnut (*Arachis hypogaea* L.)

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Abstract
A field experiment was conducted to estimate the losses caused by insect pests of groundnut at Instructional farm, College of Technology and Engineering (CTAE), MPUAT, Udaipur during *Kharif* 2014. The insect-pests infestation adversely affected the plant height and other yield attributing characters of groundnut. The insect pests caused significant reduction in mean height of plant (20.50%), primary branches (24.93%), pods per plant (25.26%), kernel per pod (6.80%) and yield per plot (35.71%); while increase in mean pod damage (50.99%) and mean kernel damage (29.61%). The mean yield data recorded form protected and unprotected plots indicated that insect pests caused 35.71 per cent loss in yield, equivalent to a loss of 8.05 q/ha.

Keywords: Groundnut, yield attributing character, estimation of losses, insect pests

1. Introduction
Groundnut (*Arachis hypogaea* L.) is an annual legume crop. It is grown in tropical and subtropical countries. In India, it is cultivated in an area of 4.72 M ha with production of 4.70 MT and productivity is 995 kg/ha [1]. In India, it is mainly grown in the southern and north-western states; Gujrat, Andhra Pradesh, Tamil Nadu, Karnataka, Maharashtra, and Madhya Pradesh, together occupying about 90 per cent of the groundnut area in the country [2]. Many soil pests attack on groundnut, of which, white grub, *H. consanguinea* Blanch. and termite, *Odontotermes obesus* Rambur are most destructive. The termite caused 10-45 per cent damage in western Rajasthan [3]. While, white grub caused 50 to 100 per cent loss in groundnut yield [4]. Yield losses from pest attack are difficult to estimate because of the localized and sporadic nature of the outbreaks, but it is believed that overall 17 per cent of yield losses occur due to field pests and 6-10 per cent because of storage pests [5]. Yield loss of about 16 per cent was recorded in groundnut in India due to a complex of insect pests, the prominent one being *A. craccivora* [6]. The avoidable yield loss in groundnut due to defoliator (24.5%); sucking pest (15.7%); defoliator and sucking pest (40.2%). The total loss due to insect pests of groundnut was 47.3 per cent [7].
Eventually, it is necessary to study the actual amount of the losses caused by the insect pests in order to prevent such losses and produce a quality crop for which a sound and perfect pest management technique is essential; thus the present investigation was carried out to estimate the yield losses due to major insect pests of groundnut (*Arachis hypogaea* L.).

2. Materials and Methods
2.1 Location
The experiment was conducted at instructional farm, College of Technology and Engineering (CTAE) MPUAT, Udaipur during *Kharif*, 2014.

2.2 Variety and Sowing
Groundnut variety, "Pratap Mungphali-1 was sown on 9th July 2014. There were two treatments with one set of plots being kept protected and the other set unprotected; each set was replicated thirteen times. Losses due to insect pests were estimated by the paired plot experiment as suggested by Laclerg [7]. There were 26 plots each of 3.6 × 4.0 m size having row to row and plant to plant spacing of 30 cm and 10 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. The plots referred as protected were provided complete protection by application of insecticides at regular weekly intervals.

The protected plots were inspected visually at frequent intervals to maintain them pest-free. In the unprotected plots no insecticide was used and the crop was exposed to natural pest infestation.

2.3 Obeservation

Five plants were selected in each replicate of the protected and unprotected sets and observation pertaining to various yield attributing characters viz., plant height, number of primary branches, number of pods per plant, number of kernel per pod, mean pod damage, mean kernel damage and yield per plot were recorded.

2.4 Statistical Analysis

The yield from each protected and unprotected plot was recorded separately and subjected to statistical analysis and mean reduction in seed yield was computed. The losses in yield were worked out by using following formula as suggested by Leclerg [8].

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

Where,

X_1 = Yield in protected plot

X_2 = Yield in unprotected plot

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

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

Standard error of mean difference

$$(S_e) = \frac{\text{Standard deviation } (S_d)}{\sqrt{\text{Number of paired plots}}}$$

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

Where,

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

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

S_e = Standard error of mean difference

3. Results and Discussion

The pest adversely affected the plant height, number of primary branches, number of pods per plant, number of kernel per pod, mean pod damage, mean kernel damage and marketable pod yield per plot. In protected plots, the range of plant height (cm), number of primary branches, number of pods per plant, number of kernel per pod, mean pod damage, mean kernel damage and marketable pod yield per plot (kg) were 23.00 to 27.20, 5.00 to 6.20, 12.80 to 16.60, 1.90 to 2.14, 0.09 to 0.18, 0.17 to 0.24 and 2.98 to 3.52, respectively. While, in unprotected plots, the range of plant height (cm), number of primary branches, number of pods per plant, number of kernel per pod, mean pod damage, mean kernel damage and marketable pod yield per plot (kg) were 18.50 to 21.40, 3.40 to 5.00, 8.80 to 12.40, 1.73 to 2.05, 0.20 to 0.34, 0.25 to 0.37 and 1.79 to 2.41, respectively.

In protected plots, the average plant height, number of primary branches, number of pods per plant, number of kernel per pod, mean pod damage, mean kernel damage and marketable pod yield per plot recorded were 25.16 cm, 5.62, 14.42 per plant, 2.01 per pod, 0.13, 0.21 and 3.23 kg/plot, respectively. While in unprotected plots, the average plant height, number of primary branches, number of pods per plant, number of kernel per pod, mean pod damage, mean kernel damage and marketable pod yield per plot recorded were 19.98 cm, 4.22, 10.78 per plant, 1.87 per pod, 0.27, 0.30 and 2.07 kg/ plot, respectively. The mean reduction due to insect pests in average plant height, number of primary branches, number of pods per plant, number of kernel per pod, mean pod damage, mean kernel damage and marketable pod yield per plot were 20.50, 24.93, 25.26, 6.80, 50.99, 29.61 and 35.71 per cent, respectively. The mean yield data recorded form protected and unprotected plots of groundnut indicated that insect pests caused 35.71 per cent loss in yield, equivalent to a loss of 8.05 q/ha.

The findings of present investigation are in conformity with the findings of Jagtap [6] and Singh and Sachan [9] in groundnut. All these earlier workers have been reported that insect pest infestation caused adverse effect on growth and yield attributing characters of plant. A perusal of data (Table 1) on marketable pod yield indicates significant reduction in marketable pod yield per plots in unprotected plots. The reduction in marketable pod yield was 35.71 per cent in *Kharif*, 2014. The pests caused 22.2 and 23.0 per cent yield loss of pods and haulms respectively, in groundnut [10]. Yield loss due to termites, which predominantly damage harvested kernels, was estimated at 9.6-30.4 per cent and was significantly correlated with percentage of plants damaged by termites [11]. The avoidable groundnut pod yield loss was 39.31 per cent [12]. The yield losses in untreated pots ranged between 23 to 30 per cent [13]. The avoidable yield loss due to major insect pests of groundnut was 48.57 per cent in pod and 42.11 per cent in fodder in untreated control plot. The data on yield in protected plots revealed that 94.45 per cent additional yield in pod and 72.74 per cent additional yield in fodder could be realized over unprotected plots [14]. The avoidable yield loss in groundnut due to defoliator (24.5%); sucking pest (15.7%); defoliator and sucking pest (40.2%). The total loss due to insect pests of groundnut was 47.3 per cent [7].

Table 1: Influence of insect pests infestation on plant growth and yield attributing characters of groundnut during *Kharif*, 2014.

S. No	Parameters	Range		Mean		Mean reduction (%)	$T_{cal.}$ at 5%
		Protected	Unprotected	Protected	Unprotected		
1.	Plant height (cm)	23.00 - 27.20	18.50 – 21.40	25.16	19.98	20.50	17.77*
2.	No. of primary branches	5.00 – 6.20	3.40 – 5.00	5.62	4.22	24.93	13.49*
3.	No. of pods/plant	12.80 – 16.60	8.80 – 12.40	14.42	10.78	25.26	28.41*
4.	No. of kernel/pod	1.90 - 2.14	1.73 – 2.05	2.01	1.87	6.80	15.09*
5.	Mean pod damage	0.09 – 0.18	0.20 -0.34	0.13	0.27	50.99	11.23*
6.	Mean kernel damage	0.17 -0.24	0.25 – 0.37	0.21	0.30	29.61	10.13*
7.	Marketable pod yield/plot	2.98 - 3.52	1.79 -2.41	3.23	2.07	35.71	14.09*

$t_{tb.}$ = 2.18

*Significant at 5 % level of significance

4. Conclusion

The present study concluded that insect pest infestation in groundnut crop significantly influenced the yield attributing characters like plant height, number of primary branches, number of pods per plant, number of kernel per pod, mean pod damage, mean kernel damage and marketable pod yield. The mean yield data recorded form protected and unprotected plots indicated that insect pests caused 35.71 per cent loss in yield, equivalent to a loss of 8.05 q/ha. Thus, this study helpful in future we can manage the loss caused by insect pests in groundnut.

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