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# ESTIMATION OF YIELD LOSSES DUE TO MAJOR INSECT PESTS OF GROUNDNUT

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**ABSTRACT**

**A field experiment was carried to estimate the yield losses due to the groundnut leaf miner *Aproaerema modicella* (Deventer), tobacco caterpillar *Spodoptera litura* (F), leafhoppers *Empoasca kerri* (Pruthi) and thrips *Scirtothrips dorsalis* (Hood). The results showed the insect pests caused a significant reduction in plant height and other yield attributing characters. They caused a mean reduction of plant height (22%), primary branches (29.1%) reduction in pods/ plant (54.6%) and (44.5) reduction of kernels/ plant. There was a higher yield in the protected plots with 2050 kg/ ha due to spray of insecticides when compared to unprotected plots with 1123 kg/ ha, with a yield increase of 82.5%.**

**Key words:** Groundnut, *Spodoptera litura*, *Aproaerema modicella, Empoasca kerri, Scirtothrips dorsalis*, insecticides, yield losses, attributing characters, protected plot, unprotected plots

Groundnut is also known as peanut, earthnut, monkey nut, and manilla nut, it is a grain legume as well as an oil crop due to its high oil content. Among different constraint for the low output of groundnut, such as the main threat comes from large insect pests. Leaf miner, *Aproaerema modicella* (Deventer), tobacco caterpillar, *Spodoptera litura* (Fabricius), gram caterpillar, *Helicoverpa armigera* (Hubner), Thrips, *Thrips palmi* (Karny), *Scirtothrips dorsalis* (Hood), Leafhoppers *Empoasca kerri* (Pruthi), and Termites, *Odontotermes obesus* (Rambur) (Atwal and Dhaliwal, 2008). Two primary sucking pests attacking this crop are leaf hoppers, *Empoasca kerri* (Pruthi), and aphids, *Aphis craccivora* (Koch) which inflict significant damage directly and indirectly act as vector for viral diseases. Aphids are major vectors of groundnut rosette virus and peanut mottle virus, which causes 40% loss in groundnut crop (Khan and Hussain, 1965). Whereas defoliator pests causes direct damage to the crop yield. These pests cause losses ranging from 24 to 92%, 16 to 42%, 17 to 40%, and 9 to 22%, respectively (Amin, 1987), and lowers the mean plant height (20.50%), major branches (24.93%), pods per plant (25.26%), and mean kernel damage (29.61%) (Ahir et al., 2018). As the groundnut is a sensitive crop and is mainly grown in India the yield loss caused by insect pests can be prevented by taking the appropriate measures. However, there will be no experimental evidence to show the estimation of yield loss due to major insect pests of groundnut. Hence present experiment was executed for accurate estimates of yield losses in groundnut.

## MATERIALS AND METHODS

The experiment was conducted at Regional Agricultural Research Station, Palem during *rabi,* 2021-22. The experiment was laid out in paired plots with two treatments, unprotected and protected plots with thirteen replications. The plot size was 5 x 5 $m^2$, with a spacing of 22.5 cm row to row and 10 cm plant to plant. The protected plots were kept free from insect pests damage through applications of insecticides (Novaluron 5.25%+Indoxacarb 4.5% SC @ 1.25 ml/ l, Chlorantraniliprole 18.5 SC @ 0.4 ml/ l, Flonicamid 50 WG @ 0.3g/ l and Thiamethoxam 75% SG @ 0.5 g/ l at regular intervals throughout the crop growth period. The protected plots were inspected visually at frequent intervals to maintain pest-free. Another plot was left unprotected until the crop was harvested, allowing for natural insect infestation. In both protected and unprotected plots, five plants were chosen, and observations regarding various yield attributing characteristics like plant height (cm), number of branches, number of pods per plant, number of kernels per pods, and total yield per plot (kg) were recorded. The data on

major insect pests (*A. modicella, S. litura, E. kerri, S. dorsalis*) in protected and unprotected plots were also recorded one day before the spray and 3, 5, and 7 days after the spray. The yield from both plots was separately subjected to statistical analysis. Pods from protected and unprotected at the time of harvest were recorded separately from each net plot and data is subjected to paired t-test. The yield increase in protected plots over the unprotected (control) and avoidable yield losses are computed using the formula of (Pradhan, 1969).

## RESULTS AND DISCUSSION

The data in both protected and unprotected plots had a major difference with respect to plant height. The height in the protected plot was in the range of 25.5 to 29.2 cm, whereas in the unprotected plot the height varied from 19.2 to 22.5. The plant height has been increased to 21.8% by taking the protection measures. The number of branches in protected and unprotected plots were having a significant difference. The number of branches per plant in a protected plot ranged from 5.0 to 6.8 with a mean of 5.81 and in the unprotected plot, it ranged from 3.2 to 4.8 with a mean of 4.09 while there was an incremental increase in the number of branches per plant by 29.4%. Both protected and unprotected observations were recorded, and a notable difference was seen. The protected plants had a mean of 26.2% and between 24.2 and 28 pods/ plant. In contrast, the unprotected plot had a mean of 11.8 pods/plant with a range of 10.0 to 14.8 pods. However, there was a 54.6% increase in the number of pods/plant as a result of spraying. The observation on protected and unprotected plots showed a significant difference pertaining to the number of kernels/pods. The number of kernels per pod in the protected plot ranged from 3-2 kernels/pod with a mean of 2.47. While in the unprotected plot, it ranged from 1 to 1.6 kernels/pod with a mean of 22.2. There was an increase by 46.5% in the protected plot due to the spray of insecticides. The pooled mean of 3, 5, 7 days after two sprays resulted that *A. modicella* incidence was in the range of 1.05 to 1.53 in the protected plots. Whereas the incidence was from 4.73 to 5.98 larvae/ plant unprotected plot. There was an average reduction of 79.6% reduction in the population of leaf miner in the protected plots than that of unprotected plots. The data on *S. litura* incidence of ranged from 1.04 to 1.40 in the protected plots as compared to unprotected plots with 4.06 to 5.79 larvae/ plant.

Reduction was 79.5% in the protected plots than in unprotected plots. It is evident from the data presented in Table 1 that there was a minimum incidence of *E. kerri* in the protected plots (1.19 to 1.53). There was high incidence of *E. kerri* in the unprotected plots with 3.78 to 5.18 leafhoppers/ 3 leaves. However, 76.2% less *E. kerri* incidence was recorded from protected plots as compared to unprotected plots. The data on *S. thrips* showed that there was a minimum incidence in the protected plots (1.18 to 1.63 thrips/ 3 leaves) as compared to unprotected plots (3.98 to 4.92 thrips/ 3 leaves). The % reduction of thrips was 74.3%. The results showed that the yield in the protected plots was substantially higher. In the protected plots the yield obtained was 2050 kg/ ha whereas in the unprotected plots it was 1123 kg/ ha. There was an 82.5% increase in yield. The avoidable yield loss was found to be 45.2% due to the major insect pests of groundnut during rabi, 2021-22. There was a yield increase of 927 kg/ ha in the protected plots than that of the unprotected plots. Taking plant protection measures in the protected plots avoid the losses caused by the various insect pests up to 45.2%. The ICBR for the protected plots were worked out and the results revealed that there was an increase of 1:4 in the protected plots.

These results are in accordance with those of Dabhade et al. (2012) reported that the pod yield and fodder were highest in the protected plots, and C:B ratio was high with 1: 6.51 in the protected plots and the avoidable yield loss due to the insect pests of groundnut was 48.57% in pod and 42.11% in fodder in the untreated control plot and the yield in the protected plots increased by 94.45% in the pod yield and 72.74% of fodder. According to Singh et al. (1992), groundnut yield loss from insect pests ranged from 23.9 to 31.4% at various growth stages. According to Baskaran and Rajavel (2013), defoliators and sucking pests were responsible for 24.5 and 15.7% yield loss in groundnut. Vikranth et al. (2015) reported that the avoidable yield loss due to insect pests of blackgram was 55.2%. Herbert et al. (2007) reported that 30% of yield loss occurred due to thrips. Ramesh et al. (2018), found that after spraying the chemicals, there was a significant reduction in *S. litura* and semiloopers in the protected plots over the unprotected plots, and there was an increase in yield in the treated plots over the untreated plots, with about 20-45% losses. According to Saini et al. (2023) whitefly, thrips and spotted pod borer caused a yield loss of 3.98, 63.98, 66.29 and 21.01% reduction in plant height, number of pods, number of grains and grain weight, respectively. Musser et al. (2022) reported that 15.36% of yield loss were caused by soybean pests. Dotasara et al. (2022) reported that the infestation of aphids started in

Table 1. Incidence of pests in protected and unprotected plots after two sprays

| S.No | Mean incidence and % reduction over control of two sprays | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | *A. modicella* | | | *S. litura* | | | *E. kerri* | | | *S. dorsalis* | | PRC |
| | Pooled mean P | Pooled mean UP | PRC | Pooled mean P | Pooled mean UP | PRC | Pooled mean P | Pooled mean UP | PRC | Pooled mean P | Pooled mean UP | |
| 1 | 1.09 | 4.82 | 81.8 | 1.29 | 4.06 | 70.7 | 1.19 | 4.37 | 79.6 | 1.28 | 4.92 | 81.8 |
| 2 | 1.22 | 5.20 | 81.9 | 1.40 | 4.30 | 78.1 | 1.42 | 4.69 | 80.0 | 1.53 | 4.33 | 72.9 |
| 3 | 1.22 | 5.93 | 82.5 | 1.37 | 4.57 | 79.7 | 1.30 | 4.60 | 79.7 | 1.22 | 4.76 | 77.7 |
| 4 | 1.09 | 5.78 | 88.7 | 1.14 | 5.01 | 82.1 | 1.35 | 4.72 | 77.0 | 1.36 | 4.12 | 72.6 |
| 5 | 1.21 | 4.87 | 78.0 | 1.06 | 4.64 | 85.9 | 1.31 | 4.35 | 76.1 | 1.56 | 4.26 | 72.9 |
| 6 | 1.42 | 5.98 | 78.6 | 1.35 | 4.33 | 75.8 | 1.36 | 4.07 | 71.4 | 1.73 | 4.38 | 67.0 |
| 7 | 1.53 | 4.90 | 73.9 | 1.29 | 4.68 | 74.0 | 1.53 | 5.18 | 74.9 | 1.27 | 4.58 | 80.0 |
| 8 | 1.48 | 4.73 | 71.6 | 1.24 | 4.68 | 80.3 | 1.30 | 3.78 | 78.5 | 1.18 | 4.21 | 78.0 |
| 9 | 1.14 | 5.27 | 81.8 | 1.21 | 4.78 | 76.1 | 1.52 | 3.99 | 68.8 | 1.40 | 3.98 | 68.3 |
| 10 | 1.37 | 4.80 | 74.4 | 1.28 | 5.79 | 83.8 | 1.42 | 5.16 | 75.6 | 1.29 | 4.27 | 75.5 |
| 11 | 1.24 | 4.77 | 80.0 | 1.17 | 4.60 | 77.4 | 1.25 | 5.18 | 79.4 | 1.66 | 4.75 | 68.7 |
| 12 | 1.31 | 5.27 | 79.2 | 1.19 | 5.20 | 81.9 | 1.53 | 5.08 | 73.8 | 1.33 | 4.61 | 76.7 |
| 13 | 1.05 | 5.03 | 83.2 | 1.04 | 5.21 | 82.5 | 1.37 | 5.01 | 76.9 | 1.63 | 4.70 | 74.0 |
| CD at 5% | 0.13 | 0.18 | | 6.35 | 9.16 | | 0.5 | 0.34 | | 0.5 | 0.30 | |
| CV(%) | 5.23 | 8.21 | | 0.03 | 0.13 | | 5.63 | 9.65 | | 2.78 | 6.82 | |
| SEm± | 0.04 | 0.13 | | 0.09 | 0.25 | | 0.02 | 0.13 | | 0.02 | 0.07 | |

PRC- % reduction over control

January and caused an avoidable yield loss of 41.14%. in mustard crop. Kumar et al. (2022) found that maximum seed yield losses due to mustard aphids was 26.25% in RH 725 genotype when compared to RB (25 92%).

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**AUTHOR CONTRIBUTION STATEMENT**

PN conducted the experiment and wrote the manuscript. SO designed the research. DRV and AM provided the seed material for conducting the experiment. MR helped in statistical analysis of data. All the authors read and approved the manuscript.

**CONFLICT OF INTEREST**

No conflict of interest.

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