Plant Archives Vol. 26, Supplement 1, 2026 pp. 427-430 e-ISSN:2581-6063 (online), ISSN:0972-5210

Plant Archives

Journal homepage: http://www.plantarchives.org
DOI Url : https://doi.org/10.51470/PLANTARCHIVES.2026.v26.supplement-1.056

QUANTIFYING YIELD LOSSES IN GROUNDNUT (*ARACHIS HYPOGAEA* L.) DUE TO INSECT-PEST COMPLEX

Buts Kumar Gourav[1], Devendra Kumar Yadav[2], Akhileshwar Vishwakarma[3*], Pratiksha Dwivedi[2] and Ajeet Kumar Singh[2]

[1]Sai Nath University, Ormanjhi, Ranchi 835219, Jharkhand, India
[2]Baba Raghav Das Post Graduate College, Deoria 274001, Uttar Pradesh, India
[3]ICAR-National Research Centre for Makhana, Darbhanga 845006, Bihar, India
*Corresponding author E-mail: iakrdeos@gmail.com
(Date of Receiving : 30-08-2025; Date of Acceptance : 31-10-2025)

ABSTRACT

The study related to losses due to insect pest complex of groundnut crop has been conducted at BRDPG College, Deoria, Uttar Pradesh under the large plot techniques experimental design. The groundnut variety 'Deepika' has been sown during Kharif 2022. Evaluation of yield losses under protected conditions by application of granular insecticides and unprotected field conditions has been compared. The result revealed that the higher groundnut yields (10.33 q/ha and 9.83 q/ha) was recorded from protected plots due to application of Carbofuran 3G and Fipronil 0.3 G, respectively. A significantly reduced yield of 5.33 q/ha was recorded from unprotected plots. Total avoidable loss in yield was calculated as 48.40% in case of Carbofuran 3G treatment while 45.77% in case of Fipronil 0.3G treatment. The Pod damage percentage was also assessed, and it was found that there is significant reduction in pod damage in the plot treated with insecticides Carbofuran 3G and Fipronil 0.3 GR with respect to the control plot.

***Keywords*:** yield loss, insecticides, insect-pest, groundnut, carbofuran, fipronil

Introduction

Groundnut (*Arachis hypogaea* L.), an annual legume belonging to the family Fabaceae, is widely recognized as the "king of oilseeds" commonly known as peanut, earthnut, or monkey-nut, it serves as one of the most important sources of edible oil globally. It ranks 14th among the world's food crops and holds fourth position among major oilseed crops (Ahmed *et al.,* 2016). Groundnut is cultivated extensively in tropical and subtropical regions and, to a lesser extent, in temperate zones. The kernels are highly nutritious, comprising 30-50% oil/fat, 20-30% protein, and 10-30% carbohydrates, making them an important component of both human diets and livestock feed (Olayinka *et al.,* 2023; Abdullahi *et al.,* 2021; Alhassan *et al.,* 2017). Among the various factors limiting groundnut productivity, insect pest infestation poses the most serious threat. Groundnut is highly vulnerable to a wide range of insect pests that cause significant yield losses (Bharghavi *et al.,* 2024; Dabhade *et al.,* 2025; Gawade *et al.,* 2025; Sireesha *et al.,* 2024). The major pests include the leaf miner (*Aproaerema modicella* Deventer), tobacco caterpillar (*Spodoptera litura* Fab.), aphid (*Aphis craccivora* Koch), thrips [*Thrips palmi* Karny, *Scirtothrips dorsalis* Hood, *Caliothrips indicus*], jassids (*Empoasca kerri* Pruthi), and whitefly (*Bemisia tabaci* Genn.). Reported yield losses caused by these pests vary considerably, with leaf miner accounting for 24–92%, tobacco caterpillar 13–71%, aphids 16–42%, thrips 17–40%, and jassids 9–22% (Amin, 1987). The avoidable yield losses caused by major insect pests of groundnut have been estimated at approximately 48.57% in pod yield and 42.11% in fodder yield (Dabhade *et al.,* 2012). In view of the economic significance of groundnut, the present study on yield loss assessment provides valuable insights into the extent of damage caused by insect pests. Such knowledge enables stakeholders to adopt

preventive measures that protect productivity without causing adverse effects on the agricultural economy.

Materials and Methods

A field experiment was conducted at the Agricultural Research Farm of BRD PG College, Deoria, during the Kharif season of 2022 (sown on 27 June 2022) to estimate yield losses in groundnut caused by the insect pest complex. The experiment was laid out using the large plot technique with three treatments and three replications. Each plot measured 10 m × 2 m, with a spacing of 30 cm × 15 cm and the variety 'Deepika' was used for sowing. The experiment consisted of three treatments. In the first protected treatment (Plot 1), the crop was safeguarded against insect pests by applying a traditional insecticide, Carbofuran 3G, at the rate of 200 g mixed with 2 kg of sand, applied at 10-day intervals. In the second protected treatment (Plot 2), a newer molecule insecticide, Fipronil 0.3G, was applied at the rate of 100 g mixed with 2 kg of sand at 10-day intervals. The third treatment (Plot 3) was unprotected, where the crop received no insecticide application and was exposed to natural infestation by groundnut insect pests. The yield of groundnut from both protected and unprotected plots was recorded at harvest and subsequently analyzed statistically. Before analysis, yields from the protected and unprotected plots were converted to a per-hectare basis. The treated plots (Plot 1 and Plot 2) and the untreated control plot (Plot 3) were each measured in kilograms per plot (10 × 2 m). Yield increase in protected plots over the unprotected control was calculated, and the avoidable yield loss was determined using the formula proposed by **Pradhan (1964)**:

$$Yield\ increased\ (\%) = \left(100 \times \frac{T - C}{C}\right)$$

$$Avoidable\ yield\ loss\ (\%) = \left(100 \times \frac{T - C}{T}\right)$$

where T is the yield from treated (protected) plots (q/ha) and C is the yield from control (unprotected) plots (q/ha). Granular insecticides were applied by side dressing at a distance of 5 cm apart from the plant (Kumar and Pandey, 2022). The required concentration of insecticide and sand, as per treatment, was freshly prepared at the experimental site prior to each application. A buffer zone of 1 m between replications was maintained. The amount of granular insecticide was calculated using the formula:

$$Amount\ of\ insecticide = \frac{recommonded\ rate(kg\ a.i./ha) \times area\ to\ be\ treated(ha)}{\%\ a.i.in\ formulation} \times 100$$

The data was subjected to one way ANOVA with IBM SPSS version 26.0 statistical software.

Results and Discussion

Yield Loss: The data on yield loss in groundnut due to pest complex is represented in Table-1, revealed that the significantly higher groundnut yield 10.33 q/ha and 9.83 q/ha was recorded from protected plots due to application of Carbofuran 3G and Fipronil 0.3 GR, respectively (depicted in Fig. 1). A significantly reduced yield of 5.33 q/ha was recorded from unprotected plots. The yield increased in protected plots (Carbofuran 3G and Fipronil 0.3G) were 5.00q/ha and 4.50 q/ha, respectively over untreated plots. It showed 93.80% and 84.42% yield increased over untreated check in carbofuran and fipronil treated plots, respectively. Total avoidable loss in yield was calculated as 48.40% in case of Carbofuran 3G treatment while 45.77% in case of Fipronil 0.3G treatment.

Per cent Pod Damage: It is revealed from the data depicted in Fig-2 that the pod damage percentage was significantly minimum in the plot treated with Carbofuran 3G with an extent of 4.11%, followed by Fipronil 0.3 GR (4.72%) while it recorded maximum damage (8.07%) in untreated check.

Our findings are justified by Jayewar *et al.* (2017) who assessed the damage caused by key members of groundnut crops left unprotected, which was highly infested by pests and recorded significant yield reduction to the extent of 26.74% as composed to crop protected through chemicals. These findings are also supported by Singh Kan (2002) who reported that the estimated yield loss in green gram during *Kharif* season was observed up to the extent of 48.11 per cent. Similarly, the loss estimation by pod borers and seed weevil on green gram was 55.56 per cent for pod and 62.20 per cent food seed (Deshmukh *et al.,* 2007). Dinesh *et al.,* (2017) reported avoidable quantitative loss was 29.93 and 31.28 per cent due to *Helicoverpa armigera* in chickpea variety GNG 1581 during 2013-14 and 2014-15, respectively. Assessment of quantitative losses caused by insect pests of black gram studied by Jat *et al.* (2017) revealed the difference obtained in net yield between protected and unprotected plots, the avoidable quantitative loss was 27.10 per cent in the first year and 23.49 per cent in the second year of experimentation. Ali *et al.* (2009) estimated the unavoidable yield loss in chickpea field, pea and lentil due to infestation of root knot nematode at IIPR Kanpur. Carbofuran and phorate @ 2kg a.i./ha were used to check the root-knot nematode. Results indicated that the root knot nematode had incurred

unavoidable yield loss to the tune of 25.6% in chickpea and 15% each in pea and lentil. Vikrant *et al.* (2015) reported the estimated avoidable loss due to insect pest infestation in black gram was 55.20 per cent when the sole crop of black gram was exposed to insect infestation. Hossian *et al.* (2006) reported that the avoidable yield loss due to aphid infestation in lentil was from 0.90% to 6.78%. The yield was increased by 0.91% to 7.27% and 2.72% to 9.89% in first and second year, respectively due to protection measured taken against aphids. The present findings are also in line with Mutkule *et al.* (2018) who stated that all the insecticides were found to be significantly superior over untreated control in reducing the population of groundnut insect pests.

Table 1: Assessment of yield loss due to insect-pests of groundnut

Treatments	Yield (q/ha)	Pod damage (%)	Increase in yield over control (%)	Avoidable loss (%)	Yield loss over T_1 (q/ha)	Yield loss over T_2 (q/ha)
Carbofuran (T1)	10.33	4.11	93.80	48.40	5.00	4.50
Fipronil (T2)	9.83	4.72	84.42	45.77	-	-
Untreated	5.33	8.07	-	-	-	-
SEM±	0.86	-	-	-	-	-

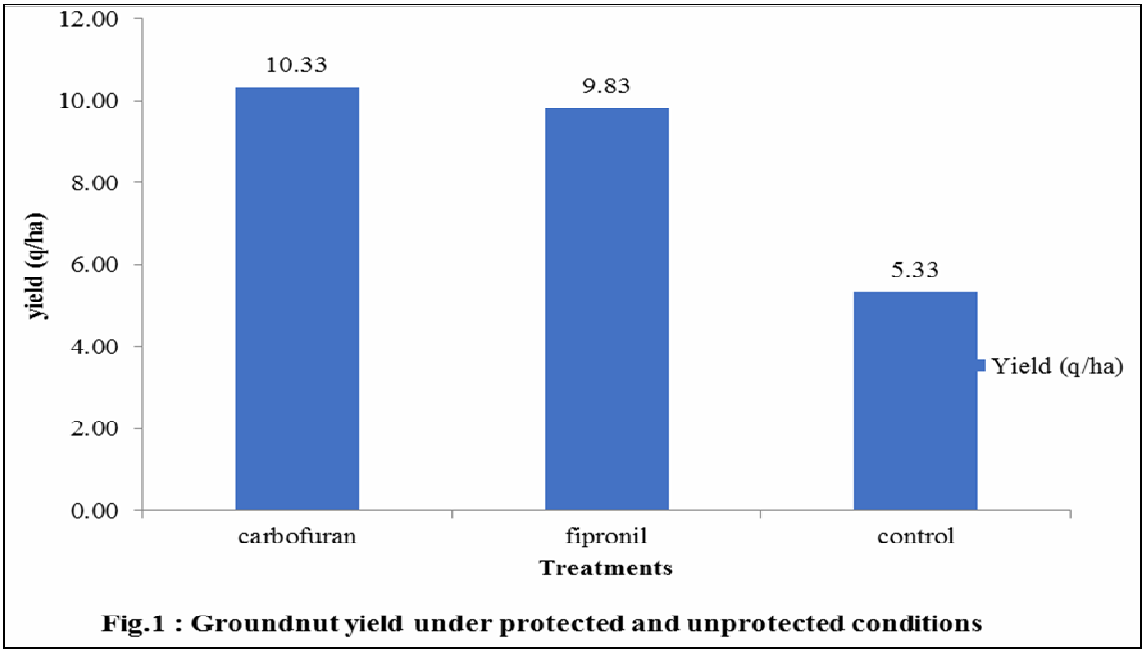

Fig.1 : Groundnut yield under protected and unprotected conditions

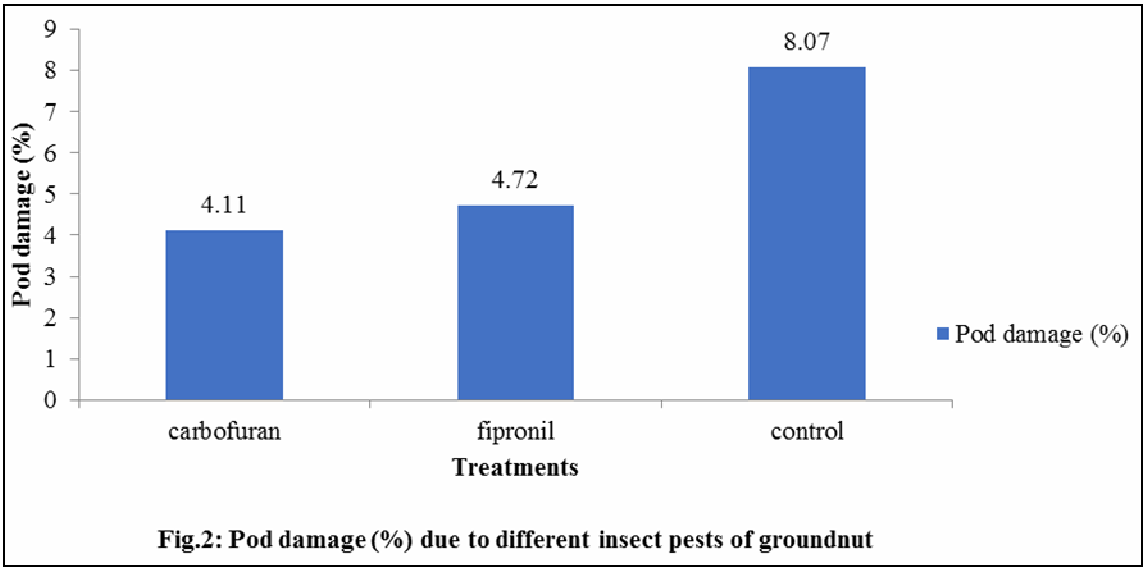

Fig.2: Pod damage (%) due to different insect pests of groundnut

Acknowledgement

This research was carried out with the support of the Department of Entomology, B.R.D.P.G. College, Deoria (U.P.), which kindly provided the necessary facilities throughout the experimental period. The authors sincerely acknowledge the valuable guidance and encouragement received from Dr. Rajnish Kumar, Dr. Amrendra Pratap Singh, Dr. Sushil Kumar, and Dr. Sania Tyagi.

Conflicts of Interest

There is not any conflict of interest among the authors.

References

Abdullahi, Y.M., Baba, I., Garba, H., Salihu, M.N., Lawal, M.M., Umar, M.D., Muhammad, F. (2021). Study on proximate composition of four genotypes of *Arachis hypogea* L. (groundnut). *Int J Sci Rep.,* **7**,369–373. https,//doi.org/10.18203/issn.2454-2156.IntJSciRep 20212831

Ahmed, M.H., Mesfin, H.M., Abady, S., Mesfin, W., Amare, K. (2016). Adoption of improved groundnut seed and its impact on rural households' welfare in eastern Ethiopia. *Cogent Econ Finance,* **4**,1–18.

Alhassan, K., Agbenorhevi, J.K., Asibuo, J.Y., Sampson, G.O. (2017). Proximate composition and functional properties of some new groundnut accessions. *J Food Sec.,* **5**, 9–12.

Ali, S.S. (2009). Estimation of unavoidable yield losses in certain Rabi pulse crops due to the root knot nematode. *Trends Biosci.,* **2**,48–49.

Amin, P.W. (1987). Insect-pests of groundnut in India and their management. Lead papers of the national seminar on plant protection in field crops, 29–31 January 1986, CPPTI, pp 219–231.

Bharghavi, K., Sugandi, R., Yenagi, B.S., Channakeshava, R., Madhuri, B. (2024). Assessment of yield losses due to major insect pests of groundnut in Karnataka, India. *J Adv Biol Biotechnol.*, **27**,1177–1181. https,//doi.org/10.9734 /jabb/2024/v27i81240

Dabhade, P.L., Bapodra, J.G., Jethva, D.M., Rathod, R.T., Dabhi, M.V. (2025). Estimation of yield losses due to major insect pests of groundnut in Gujarat. *Legume Res.,* **35**, 354–356.

Deshmukh, S.S., Goud, K.B., Girradi, R.S. (2007). Seasonal incidence and crop loss estimation of pod weevil, *Apion ampulum* (Faust) on greengram, *Vigna radiata* (L.) Wilczek. *Karnataka J Agric Sci.*, **20**,855–856.

Dinesh, K., Anusha, S., Singh, B.R., Dangai, N.L. (2017). Estimation of avoidable yield losses caused by *Helicoverpa armigera* (Hubner) on chickpea. *J Entomol Zool Stud.,* **5**,1476–1478.

Gawade, S.B., Deshmukh, G.P., Dighule, S.B., Dahat, D.V. (2025). Management of major insect pests and diseases in groundnut through IPDM modules. *Asian Res J Agric,* **18**,86–93. https,//doi.org/10.9734/arja/2025/v18i2683

Hossain, M.A., Ferdous, J., Salim, M.M.R. (2006). Relative abundance and yield loss assessment of Lentil aphid, *Aphis craccivora* Koch in relation to different sowing dates. *J Agric Rural Dev Gazipur,* **4**,101–106.

Jat, S.K., Lakha, Rana, B.S. (2017). Assessment of quantitative losses due to insect pests of blackgram. *Plant Arch*., **17**, 488–490.

Jayewar, E.N., Sonakamble, M.M., Gosalwad, S.S. (2017). Estimation of yield losses caused by pest in groundnut. *Agric Update* **12**,58–61.

Kumar, S., Pandey, A. (2022). Bio-efficacy of various insecticides against white grubs (Coleoptera, Scarabaeidae) infesting sugarcane. *Int J Trop Insect Sci.,* **42**, https,//doi.org/10.1007/s42690-022-00820-8

Mutkule, D.S., Patil, P.B., Jayewar, N.E. (2018). Management of major sucking pests of groundnut through some newer insecticides. *Int J Curr Microbiol Appl Sci.,* **6**,281–288.

Olayinka, B.U., Abdulbaki, A.S., Alsamadany, H., Alzahrani, Y., Omorinoye, O.A., Olagunju, G.R., Sulyman, A. (2023). Proximate composition, amino acid and fatty acid profiles of eight cultivars of groundnut grown in Nigeria. *Legume Res.,* **46**,95–99.

Pradhan, S. (1964). Insect pests of crops. National Book Trust, New Delhi, India, p 80.

Singh K (2002) Estimation of losses, management of insect pests of mung bean *Vigna radiata* (L.) Wilczek and determination of economic threshold level against the lycaenid borer (*Lampides boeticus* L.). PhD thesis, MPUAT, Udaipur.

Sireesha, E., Mallikarjun, M., Harani, M., Yugandhar, V., Balaji Naik, K., Radha, K.C. (2024). A front-line demonstration of integrated pest and disease management module in groundnut (*Arachis hypogaea* L.) at Anantapur district. *Int J Res Agron.,* **7**,501–504. https,//doi.org/ 10.33545/2618060X.2024.v7.i7Sg.1124

Vikrant, R., Kumar, S.A., Singh, D. (2015). Estimation of losses caused by major insect pests of black gram at different stages of crop growth. *J Exp Zool India,* **18**,665–668.