ASSESSMENT OF YIELD LOSSES DUE TO MAJOR INSECTPESTS OF GROUNDNUT IN KARNATAKA, INDIA

ABSTRACT

Aims: Groundnut is a major crop used for oil seed in India. Significant productivity losses were caused by major pest infestations. Looking towardthe economic significance of the crop, the current study was conducted to determine the influence of key pests on yield loss.
Study design: Paired T test
Place and Duration of Study:AICRP on Groundnut, Main Agricultural Research Station and Department of Agricultural Entomology, Dharwad during *kharif* 2021 between July to October.
Methodology: The experimental crop was set up with three replications, two distinct protected and unprotected, and two treatments (V1: JL-24 and V2: Dh-256). Chemical protection at 25 DAS with thiamethoxam 25 WG @ 0.25g/l and 50 DAS with flubendiamide 20 WG @ 0.5g/l was used in both treatments of protected plots. Before and after the application of pesticides for 7 and 14 days on ten plants in each plot, observations were made regarding the population of pests. At harvest, the pod and haulm yield from every plot were noted, along with an estimate of the yield losses.
Results: The crop that was chemically protected showed lower infestations of thrips, leafhoppers, *Spodopteralitura*, *Thysanoplusiaorichalcea*, and *Marucavitrata* when compared to the crop that was not treated. Under protected conditions, the greatest preventable yield loss of groundnut pod and fodder was 29.72% &17.57 and 35.51 & 22.59% in both kinds. Additionally, the pod yield ascended to 42.30 and 21.31% and the haulm yield to 55.07 and 29.18%.
Conclusion: The current study's findings suggest that groundnut pod and fodder production loss may be prevented by using an efficient pesticide to defend against the main insect pests.

Keywords: Defoliators, Dh-256, Groundnut, Jl-24, Sucking Pests, Yield Losses

1. INTRODUCTION

One of the most important oilseed crops in tropical and subtropical regions of the world is groundnut (*Arachis hypogaea* L.), which is also a major crop in India. Groundnut production spans 327 lakh hectares worldwide, yielding 539 lakh tonnes at a productivity of 1648 kg/hectare. India leads the world in groundnut acreage under cultivation, with an annual all-season coverage of 54.2 lakh hectares. It is also the world's second-largest producer, with 101 lakh tonnes and a productivity of 1863 kg per hectare in 2021–2022 [1]. Despite having the largest groundnut-growing area, India's production pales in comparison to that of the USA, China, Argentina, and Indonesia. Groundnut production is low because of biotic and abiotic stresses that occur during crop growth. The two main biotic pressures on groundnut production are pests and diseases [2]. Approximately ninety different species of insect pests attack groundnut crops. The most common ones are the leaf miner, *Aproaeremamodicella* (Deventer), tobacco caterpillar, *Spodopteralitura* (Fabricius), gram caterpillar, *Helicoverpaarmigera* (Hubner), thrips, *thripspalmi* (Karny), *Scirtothrips dorsalis* (Hood), leafhoppers, *Empoascakerri* (Pruthi), termites, and *Odontotermesobesus* (Rambur) [3]. The amount of damage caused by different insect pests, such as leaf miners, tobacco leaf eating caterpillars, aphids, thrips, and jassids, in groundnut was 24 to 92, 13 to 71, 16 to 42, 17 to 40, and 9 to 22 percent [4] . 48.57 percent in pods and 42.11 percent in fodder were reported as the preventable yield loss from major insect pests of groundnuts [5] [6]. Owing of the crop's economic significance, the current study on yield loss assessment helps people understand the extent of damage caused by insect pests and enables them to take preventive action without negatively affecting the economy.

2. MATERIAL AND METHODS

The studies were undertaken at AICRP on Groundnut, Main Agricultural Research Station and Department of Agricultural Entomology, Dharwad during *kharif* 2021-22.The crop was sown at the spacing of 30 cm x 10 cm having gross plot size was 10 x 10 m^2 with paired plot design with two treatments (V_1: JL-24 and V_2:Dh-256) and three replications as two separate protected and unprotected.In both the treatments of protected plots, chemical protection (first spray was done at 25 DAS with thiamethoxam 25 WG @ 0.25g/l for sucking pests and second spray done at 50 DAS with flubendiamide 20 WG @ 0.5g/l for leaf eating caterpillars) was given with help of manually operated knapsack sprayer after the appearance of the pests while other treatment plots were completely left unsprayed.The observation on the pest population were recorded before and after 7 and 14 days of application of insecticides in both the treatment on ten plants which were selected randomly from each plot and at the end of the experiment mean population of the pest in both the treatment was worked out and further statistical analysis was carried out. Finally, the pod and haulm yields were recorded at harvest from each plot in grams and converted as Kg ha^{-1}. The avoidable yield loss due to pest was worked out by using following formula of [13].

3. RESULTS AND DISCUSSION

Data presented in the Table 1 reveals that, crop protected through chemicals was least infested by pest as compared to crop left unprotected, as mean population of protected plot was significantly less. The population of sucking pests of V_1 of unprotected and protected plots *i.*e., Thrips (1.75&0.99/plant), Leafhoppers (1.22 & 0.63/plant), *S. litura* (1.70&0.96/pl), *T. orichalcea* (0.99&0.68/plant), *M. vitrata* (0.95&0.56/plant). Similarly, pest population of V_2*viz*., Thrips (1.22&0.63/plant), Leafhoppers (1.13 & 0.55/plant), *S. litura* (1.11&0.60/plant), *T. orichalcea* (0.63&0.45/plant), *M. vitrata* (0.76&0.37/plant), respectively in unprotected and unprotected plots. The outcomes correspond with [2], protected plot showed a significant decrease in the following: Leafhoppers (0.44/plant), Thrips (0.47/plant), Whitefly (0.24/plant), defoliators (0.63/plant), and Gram pod borer (0.47/plant) compared to the unprotected plot, which showed higher levels of Leafhoppers (2.39/plant), Thrips (3.66/plant), Whitefly (1.38 /plant), defoliators (3.51/plant), and gram pod borer (4.73/plant). According to [6] the protected plots had a minimum incidence of 1.19 to 1.53 & 1.18 to 1.63 for *E. kerri* and *S. dorsalis*, while the unprotected plots had 3.78 to 5.18 & 3.98 to 4.92 /3 leaves. The incidence of *S. litura* varied from 1.04 to 1.40 in the protected plots compared to the unprotected plots, which had 4.06 to 5.79 larvae/plant.

Table 1 : Incidence of major insect pests on groundnut varieties under protected and unprotected conditions pest in groundnut

Treatments	Unprotected					Protected				
	Thrips	Leafhoppers	*Spodopteralitura*	*Thysanoplusiaorichalcea*	*Marucavitrata*	Thrips	Leafhoppers	*Spodopteralitura*	*Thysanoplusiaorichalcea*	*Marucavitr*
V_1R_1	1.65	1.24	1.68	1.02	0.99	1.02	0.63	0.98	0.62	0.56
V_1R_2	1.78	1.14	1.69	0.85	0.90	0.85	0.64	0.87	0.70	0.57
V_1R_3	1.83	1.28	1.72	1.09	0.97	1.09	0.63	1.03	0.73	0.56
Mean	1.75	1.22	1.70	0.99	0.95	0.99	0.63	0.96	0.68	0.56
V_2R_1	1.24	1.13	1.18	0.66	0.82	0.66	0.46	0.55	0.46	0.37
V_2R_2	1.20	1.15	1.01	0.60	0.78	0.60	0.57	0.61	0.40	0.38
V_2R_3	1.21	1.11	1.13	0.64	0.68	0.64	0.61	0.64	0.49	0.35
Mean	1.22	1.13	1.11	0.63	0.76	0.63	0.55	0.60	0.45	0.37

Table 2 : Estimation of percent yield losses

Variety	JL-24	Increase over	Avoidable yield	Dh-256	Increase over	Avoidable yield

	Unprotected	Protected	unprotected condition (%)	losses	Unprotected	Protected	unprotected condition (%)	losses
Pod yield (Kg ha^{-1})	1,414	2,012	42.30	29.72	2,486	3,016	21.31	17.57
Haulm yield (Kg ha^{-1})	1,204	1,867	55.07	35.51	2,526	3,263	29.18	22.59
$T_{(Cal)}$	7.50		-	-	6.54		-	-
$T_{(Tab)}$ @ 0.05	6.15		-	-	6.15		-	-

3.1 YIELD LOSSES

The data from table 2 indicated that significantly highest pod and haulm yields were recorded from the experimental plots having full protection against major insect pests of groundnut as compared to unprotected plots. protected plots of V_1 documented highest pod (2,012 Kg ha^{-1}) and haulm (1,867 Kg ha^{-1}) yields as compared to unprotected plots 1,414 Kg ha^{-1} and 1,204 Kg ha^{-1} pod and haulm yields respectively.

Similarly, Protected plots of V_2 recorded highest pod and haulm yields of 3,016 and 3,263 Kg ha^{-1}, respectively. Whereas, unprotected plots exhibited 2,486 and 2,526 Kg ha^{-1} pod and halum yields respectively.However, under protected condition 42.30 and 21.31% pod yield as well as 55.07 and 29.18% of haulm yields were increased and maximum avoidable yield loss of groundnut pod and fodder were 29.72% &17.57 and 35.51&22.59% in both the varieties. The findings correspond to those with the findings of [5], the preventable loss in groundnut pods caused by main sucking insect pests was assessed to be 48.57 percent. Pod yield increased by 94.45 percent in protected plots, based on yield data. In the words of [7], aphid, jassid, and thrips cause an avoidable loss of 26.71 percent in groundnut pods. The entire yield loss of groundnuts as a result of insect infestations reached 40.2%. [2], unprotected groundnuts had a notable output drop of 26.74 percent when compared to chemically protected crops. Additionally, unprotected groundnuts yielded 1607 kg/ha versus 2194 kg/ha for chemically protected crops. The insect pests cause a 35.71 percent reduction in yield in both shielded and unprotected plots [8]. The mean avoidable yield losses due to insect pests on castor cultivarsranged from 17.2 to 63.3 per cent during kharif season, while the loss was higher (22.5 to 89.4%) during rabi season [9]. The loss in seed yield, due to mustard aphid and cabbage caterpillar, varied from 6.5 to 26.4 per cent [10]. In soybean, the loss in the yield by semiloopers and *S.litura* varied from 42.20 to 42.68 per cent on JS-335 and JS-95-60 [11], unprotected plot was recorded 14.84 q/ha as compared to protected plots 21.47 q/hadue to insect pest complex of soybean [12].

4. CONCLUSION

By employing an effective pesticide to protect against the primary insect pests, the results of the present investigation imply that losses in groundnut pod and fodder production may be avoided. The maximum avoidable yield loss of groundnut pod and fodder under protected conditions was 29.72% & 17.57 and 35.51 & 22.59% in both varieties. Furthermore, the haulm yield increased to 55.07 and 29.18%, while the pod yield increased to 42.30 and 21.31%.

Disclaimer (Artificial intelligence)

Option 1:

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc) and text-to-image generators have been used during writing or editing of manuscripts.

Option 2:

Author(s) hereby declare that generative AI technologies such as Large Language Models, etc have been used during writing or editing of manuscripts. This explanation will include the name, version, model, and source of the generative AI technology and as well as all input prompts provided to the generative AI technology

Details of the AI usage are given below:

1.

2.

3.

REFERENCES

[1]. FAO. 2021. World Food and Agriculture - Statistical Yearbook 2021. Rome. https://doi.org/10.4060/cb4477en.

[2]. Jayewar, NE, Sonkamble MM, Gosalwad, SS. Estimation of yield losses caused by pest in groundnut. Agric. Update, 2017;12: 58-61.

[3]. Atwal A S, Dhaliwal G S. 2008. Agricultural pests of South Asia and their management. Publ. Rajendernagar, Ludhiana. pp. 274.

[4]. Amin P W. 1987. Insect Pests of groundnut in India and their management. Plant protection in field crops: lead papers of the National Seminar on Plant Protection in Field crop, 29-31 January 1986, CPPTI, Hyderabad.

[5]. Dabhade PL, Bapodra JG, Jethva DM, Rathod RT, Dabhi MV. Estimation of yield losses due to major insect pests of groundnut in Gujarat. Legume Res. Int. J. 2012;35(4):354-356.

[6]. Priyanka N, Shaila O, Anuradha M, Rani VD, Rajashekhar M. Estimation of Yield Losses Due to Major Insect Pests of Groundnut. Indian j. entomol. 2024; 1:1-4.

[7]. Baskaran RK, Rajavel DS. Yield loss by major insect pests in groundnut. Ann. Plant Prot. Sci. 2013;21(1):189- 190.

[8]. Ahir KC, Arti S, Rana BS. Estimation of yield losses due to major insect pests of groundnut (Arachis hypogaea L.). J Entomol. Zool. Stud. 2018;6(2):312-314. 3.

[9]. Duraimurugan P, Lakshminarayana M. Assessment of avoidable yield losses due to insect pests in castor (Ricinus communis L.): J. Oilseeds Re. 2014;31(2): 140-144.

[10]. Singh Kular J, Kumar S. Quantification of avoidable yield losses in oilseed Brassica caused by insect pests. JPPR.1 2011; 51(1): 38-43.

[11].Babu SR, Dudwal R, Meena PK, Rokadia P. Estimation of avoidable lossses due to defoliators (semilooper complex and common cutworm, Spodopteralitura Fab.) in different varieties of soybean. IJCMAS. 2018;7(8):3078-85.

[12]. Ahirwar KC, Marabi RS, Bhowmick AK. Population dynamics of major insect pests and seed yield of soybean. Ann. Plant Sci. 2014; 22(1):56-9.

[13]. Pradhan S. Insect Pests of Crops. National Book Trust, New Delhi, India, 1969; p. 80.