International Journal of Research in Agronomy

E-ISSN: 2618-0618
P-ISSN: 2618-060X

www.agronomyjournals.com
2024; SP-7(7): 501-504
Received: 17-05-2024
Accepted: 21-06-2024

E Sireesha
Krishi Vigyan Kendra, Kalyandurg, Andhra Pradesh, India

M Mallikarjun
Krishi Vigyan Kendra, Kalyandurg, Andhra Pradesh, India

M Harani
Krishi Vigyan Kendra, Kalyandurg, Andhra Pradesh, India

V Yugandhar
Krishi Vigyan Kendra, Kalyandurg, Andhra Pradesh, India

K Balaji Naik
Krishi Vigyan Kendra, Kalyandurg, Andhra Pradesh, India

C Radha Kumari
Krishi Vigyan Kendra, Kalyandurg, Andhra Pradesh, India

Corresponding Author:
E Sireesha
Krishi Vigyan Kendra, Kalyandurg, Andhra Pradesh, India

A front-line demonstration of integrated pest and disease management module in groundnut (*Arachis hypogea* L.) at Anantapur district

E Sireesha, M Mallikarjun, M Harani, V Yugandhar, K Balaji Naik and C Radha Kumari

DOI: https://doi.org/10.33545/2618060X.2024.v7.i7Sg.1124

Abstract
Groundnut is known as the "King of Oilseeds" in India. India is the second largest producer of groundnuts in the world. The groundnut cultivation is often subjected to significant yield losses annually due to biotic and abiotic stresses and are the major limiting factors for attaining high productivity in India. In recent years, groundnut insect pest management through integrated pest management (IPM) solutions has gained prominence due to the negative effects of insecticides. A two years front line demonstration study (2019-21) was conducted at Anantapur district during Kharif season and the percent control of leaf hoppers, thrips and *Spodoptera litura* over untreated control was recorded and the results were in IPM fields, less leaf miner incidence was noticed than in FP fields with a pooled mean of 6.3% in IPM fields 8.7%, respectively in FP fields whereas Thrips incidence was found significantly inferior in IPM fields with a mean of 9.7% as compare to farmer's fields of 19.0%, respectively. PBNV incidence of 4.6% was recorded in IPM practice whereas 10.2% mean incidence in FP. The data on collar rot incidence was also recorded with mean of 3.8% in IPM practice whereas 7.6% incidence in FP. With Combined two years data of IPM execution shows increased yield by 11.6% when compared to FP. From the study it can be concluded that Groundnut under IPDM practices have higher yields than farmer's practice. The IPDM module from tillage to harvesting increased yield, input use efficiency and economic benefits.

Keywords: IPM, leaf hoppers, thrips incidence, groundnut

Introduction
Groundnut are known by many other local names such as earthnuts, Peanut, goober peas, monkey nuts, pygmy nuts and pig nuts. It is also known as 'Indian Almond' and eaten as roasted or boiled. India is the second largest producer of groundnuts in the world. Major groundnut growing states in India – Andhra Pradesh, Gujarat, Karnataka, Maharashtra, Rajasthan and Tamil Nadu. In India groundnut is cultivated in an area of 4.73 million ha with a production of 6.72 million tonnes and productivity of 1422 kg/ha. Productivity of groundnut is very low (1422 kg/ha) in India when compared to the productivity of world 1647.4 kg/ha www.indiaagristat.com (2021). The groundnut cultivation is often subjected to significant yield losses annually due to biotic and abiotic stresses and are the major limiting factors for attaining high productivity in India. Among the several factor responsible for low productivity in groundnut, the biggest threat to groundnut cultivation is the vulnerable and wide spread attacking by insect pests and soil borne diseases are the major ones. More than 100 species of insect and mites are known to attack groundnut. The avoidable yield loss due to major insect pests of groundnut was recorded to the tune of 48.57 percent in pod and 42.11 percent in fodder Dabhade *et al.*, (2012) [2]. Four thrips species, *Frankliniella schultzei*, *Thrips palmi*, *Scirtothrips dorsalis*, and *Caliothrips indicus*, have been identified as the main sucking insect pests in groundnuts. These plant-eating insects feed on the sap of plants by sucking on the undersides of leaves, young shoots, and floral sections. It has been noted that farmers who apply excessive amounts of nitrogenous fertilizers exacerbate the prevalence of sucking insect pests and increase production loss.

Reduced pod yields can be attributed to many biotic stressors, including soilborne and foliar diseases (Vineela *et al.*, 2018) [11]. All crop growing areas are experiencing severe damage from fungal diseases such collar rot (*Aspergillus niger*), stem rot (*Sclerotium rolfsii*), and root rot (*Rhizoctonia solani*) (Jadon *et al.*, 2015) [4]. The two most common soil-borne diseases that cause considerable crop losses each year are collar rot and stem rot. Survey in Telangana and Andhra Pradesh states indicated that the disease incidence of collar rot and stem rot was high 16.82% and 10.06% in Andhra Pradesh because groundnut is grown as sole crop under irrigated conditions. Collar rot disease is usually seen during the early stages of crop growth, and often results in seedling mortality at higher rates and manifested as a pre-and post- emergence damping-off of the affected seedlings. The pathogen having adaptability even under higher temperatures and causes considerable yield losses in groundnut crop (Kumari and Singh, 2016) [6].

The creation of IPM modules, which entail the synergistic integration of IPM components, is required in light of the growing issues brought on by the ongoing use of pesticides and the inability of individual IPM components to control the insect population. Farmers continue to view the application of chemical pesticides as the most effective method of controlling pests, and their careless use can have detrimental effects on beneficial insects, people's health, and the environment (Harish, *et al.* 2015). Because of the emergence of pesticide resistance, some insecticides are not providing the appropriate amount of protection against sucking insect pests. In recent years, groundnut insect pest management through integrated pest management (IPM) solutions has gained prominence due to the negative effects of insecticides. Research is being done to find new pest management strategies since sucking insects are becoming more resistant to traditional insecticides. With the aforementioned viewpoint in mind, the current study aimed to combine five distinct IPM modules, evaluate the best module on farmers' fields, and compare it with farmers' practices.

Materials and Methods

The study was conducted at Krishi Vigyan Kendra (KVK) Kalyandurg in Anantapur district of Andhra Pradesh state in farmers' fields during 2019-20 and 2020-21. Ten Front Line Demonstrations (FLDs) conducted in farmer's field of Dasampalli and Boyalpalli villages of KVK operational area. The soils were red sandy loam soils with medium fertility levels, uniformly aged plants spaced at 30 x 15 cm were selected during Kharif season (July-October) of 2019-20 and 2020-21. The detailed description of the IPDM module is given in Table 1. These modules comprised of cultural, biological and chemical practices for the management of insect-pests and pathogens in groundnut. The percent control of leaf hoppers, thrips and *Spodoptera litura* over untreated control was calculated as suggested by Rajashekhar *et al.*, (2022) [12].

Table 1: Details of the IPDM technology Demonstrated

IPDM module includes
• Deep summer Ploughing
• Application of Trichoderma mixed well and developed in well decomposed Farm Yard Manure.
• Seed treatment with Imidacloprid 600 FS @ 2ml in 4ml water per kg seed + Tebuconazole 2DS @ 1 gm per kg seed
• Sowing of sorghum or Bajra as a trap crop around the field for the management of Thrips and Spodoptera
• Mixing of Monocrotophos 320 ml+ Neem oil 1.0+ 1kg soap powder in 200 liters of water and spraying twice within 10-15 DAS for the control of Thrips.
• Installation of Blue sticky traps @ 4/acre for control of Thrips
• Installation of Pheromone Traps @ 4/acre after 20-30 DAS at a distance of 50m for Spodoptera Management.
• Spraying of Neem oil (3000 ppm) @ 3ml/lit of water at an early stage of Spodoptera larvae.
• Need based application of Thiacloprid 24 SC @ 50 ml or Thiamethoxam 25 WG @ 40g or Fipronil 5 EC@ 200 ml or Novaluron 10 EC @ 0.75 ml or Quinalphos 25 EC @ 2ml/lit acre in 200 liters of water. (ANGRAU-2019)

Data on Leaf miner incidence, Thrips incidence, PBNV and Collar rot incidence were recorded during crop growth. Yield data for the improved practice and farmers practice were recorded at the time of harvests and the % yield gain in demonstrations over farmers practice were done using Microsoft Excel 2021 version.

Results and Discussion

The availability of efficient IPM components is demonstrated by the fact that IPM fields recorded significantly less insect and disease damage than fields of FP (Table 2). In IPM fields, less leaf miner incidence was noticed than in FP fields during the years 2019 and 2020 (5.0%, 7.5%, with a mean of 6.3% in IPM fields versus 11.0% and 13.2% with a mean of 8.7%, respectively in FP fields). Thrips incidence was found significantly inferior in IPM fields (8.0%, 11.3%) with a mean of 9.7% as compare to farmer's fields (17.0, 21.0%) with a pooled mean of 19.0% during 2019 and 2020, respectively. PBNV incidence of 3.0% and 6.2% was recorded in IPM practice with a mean of 4.6% whereas 7.8% and 12.5% with a mean of 10.2% incidence in FP during 2019 and 2020, respectively. Seed treatments with imidacloprid @ 2.0 to 5.0 g a. i. kg-1 were found most effective in reducing the thrips and leafhopper population in groundnut. However, seed treatment with imidacloprid @ 2.0 g a. i. kg-1 may be included in integrated pest management (IPM) package for groundnut from environmental safety point (Nataraja *et al.*, 2016) [8]. Mondal *et al.*, (2017) [7] found IPM consisting of deep ploughing, Sticky traps@ 100/ ha, Imidacloprid 17.8 SL @0.05 percent was most effective against sucking pests of French bean. Similar results were reported by Kandakoor (2012) [5]; Roshan *et al.* (2016) [9] and Seetharamu *et al.* (2020) [10] who disclosed that imidacloprid 17.8 SL was effective in reducing of thrips, aphids and leaf hoppers.

The data on collar rot incidence was also recorded with 5.0% and 2.5% with a pooled mean of 3.8% in IPM practice whereas 11.0% and 4.1% with a mean of 7.6% in FP during 2019 and 2020, respectively.

Yield of about 854 kg/ha and 925kg/ha with a mean yield of 890 kg/ha in IPM practice whereas 720kg/ha and 813kg/ha with a mean of 767kg/ha during 2019 and 2020, respectively. With Combined two years data of IPM execution shows increased yield by 11.6% when compared to FP (Table 1). The main reason for the increase in yield in IPM fields was good agricultural practices that aided in maintaining plant vigor under insect pressure, thereby assisting plant to compensate for the damage done by the pests.

Economic indicators that are, cost of cultivation, gross returns, net returns and Benefit: Cost (B:C) ratio of demonstrated IPDM practices are presented in Table 3. The cost of cultivation was slightly higher in farmers practice when compared with the demo practice in both years. From the Table (3), farmers adopting IPDM practices could save a production cost of Rs. 1,555/- and Rs. 1,897/- during the year 2019-20 and 2020-21, respectively. Year-to-year variability in cultivation costs can be explained by differences in the local social and economic conditions. The higher cost of production in farmers practice might be due to indiscriminate use of chemical fertilizers and pesticides. Similar observation of cost saving through IPDM practices was also observed by Singh 2017. The gross return calculated was presented in the Table 3. The study demonstrated that IPDM practices registered higher gross returns during the second year as compared to first year. This might be attributed to high yield during second year of study. The average gross returns from the pooled data recorded was Rs. 50,617/ha as compared to Rs. 43,750 in farmer's practice. Thus, the IPDM practices registered an increase of 13.6% gross returns over farmer's practice. The pooled data on net returns also showed that IPDM practices were more economically viable than farmer's practice. The study also demonstrated that net returns recorded under IPDM practices (Rs.24,645/-) were 34.2% higher than farmer's practice. Economic analysis of the yield performance revealed that the observed benefit cost ratio of demonstration plots was higher than the control plot i.e., farmer practice. The cumulative effect of technological interventions over two years, revealed an average benefit cost ratio of 1.96 in demonstration plots compared to 1.59 in control plots. Thus, this study demonstrated the economic benefit of adopting IPDM practices. This corroborated studies by Rathod *et al.* (16) and Choudhary *et al.* (17) who found similar results.

Table 2: Comparative incidence of Pest and Disease damage of Groundnut IPDM and FP fields over two consecutive years (2019-20 and 2020-21).

Data Parameters	2019-20		2020-21		Pooled Mean (2019-21)	
	IPM	FP	IPM	FP	IPM	FP
Leaf Miner Incidence (%)	5.0	11.0	7.5	13.2	6.3	8.7
Thrips Incidence (%)	8.0	17.0	11.3	21.0	9.7	19.0
PBNV (%)	3.0	7.8	6.2	12.5	4.6	10.2
Collar rot Incidence (%)	5.0	11.0	2.5	4.1	3.8	7.6
Yield(kg/ha)	854	720	925	813	890	767
%increase over FP	9.4	-	13.8	-	11.6	

Table 3: Economics of Groundnut Cultivation in IPDM module

Economic Parameters	2019-20		2020-21		Pooled Mean (2019-2021)	
	IPM	FP	IPM	FP	IPM	FP
Cost of Cultivation (Rs/ha)	23750	25305	28175	30,072	25963	27689
Gross returns (Rs/ha)	49898	42378	51337	45122	50617	43750
Net returns (Rs/ha)	26148	17073	23162	15050	24655	16062
B:C Ratio	2.1	1.67	1.82	1.50	1.96	1.59

Conclusion

From the study it can be concluded that Groundnut under IPDM practices have higher yields than farmer's practice. The IPDM module from tillage to harvesting increased yield, input use efficiency and economic benefits. It can be concluded that, under present circumstances adopting IPDM practices in groundnut cultivation could achieve higher economic benefit than farmer's practice. This should influence more farmers to adopt IPDM practices in groundnut in Anantapur districts of Andhra Pradesh.

References

1. AGRISTAT; c2019. Available from: https://www.indiaagristat.com.
2. Dabhade PL, Bapodra JG, Jethava DM, Rathod RT, Dabhi MV. Estimation of yield losses due to major insect-pests of groundnut in Gujarat. Legume Research: An International Journal. 2012;35(4):354-356.
3. Harish G, Nataraja MV, Jasrotia P, Holajjer P, Savaliya SD, Gajera M, *et al*. Impact of weather on the occurrence pattern of insect pests on groundnut. Legume Research: An International Journal. 2015;38(4):524-535.
4. Jadon KS, Thirumalaisamy PP, Kumar V, Koradia VG, Padavi RD. Management of soil borne diseases of groundnut through seed dressing fungicides. Crop Protection. 2015;78:198-203.
5. Kandakoor SB, Khan HK, Gowda GB, Chakravarthy AK, Kumar CA, Venkataravana P, *et al*. The incidence and abundance of sucking insect pests on groundnut. Current Biotica. 2012;6(3):342-348.
6. Kumari M, Singh M. Morphological and pathogenic variabilities among Aspergillus niger isolates associated with groundnut (*Arachis hypogea* L.). Annals of Plant Protection Sciences. 2016;24(2):364-368.
7. Mondal A, Shankar U, Abrol DP, Singh I, Norboo T. Evaluation of pest management strategies against sucking insect-pests for the safety of beneficial insects in vegetable french bean (*Phaseolus vulgaris* L.). International Journal of Current Microbiology and Applied Sciences. 2017;6:1441-1448.
8. Nataraja MV, Harish G, Holajjer P, Savaliya SD. Efficacy of imidacloprid seed treatment for the control of leafhoppers and thrips in groundnut. Legume Research: An International Journal. 2016;39:305-309.
9. Roshan DR, Raju SVS, Singh KN. Relative efficacy of acetamiprid+ fipronil combination formulation against BPH (*Nilaparvata lugens*) and GLH (*Nephotettix virscens*) in rice. Journal of Pure and Applied Microbiology. 2016;10(4):2773-2783.
10. Seetharamu P, Swathi K, Dhurua S, Suresh M, Govindarao S, Sreesandhya N, *et al*. Bioefficacy of chemical insecticides against major sucking insect-pests on grain legumes in India - A review. Legume Research: An International Journal. 2020;43(1):1-7.
11. Vineela DRS, Beura SK, Dhal A, Swain SK. Integrated management of soilborne diseases of groundnut in coastal

ecosystem of Odisha. Journal of Mycopathological Research. 2018;56(3):189-193.
12. Rajashekhar M, Prabhakar Reddy T, Chandrashekara KM, Rajashekar B, Jagan Mohan Reddy M, Ramakrishna K, *et al*. Evaluation of integrated pest management module for pink bollworm, *Pectinophora gossypiella* (Saunders) and its economic analysis under farmer's field conditions. International Journal of Pest Management. 2022;29:1-9.
13. Rathod A, Bindhu KG, Vanishree S, Ahamed Z, Ambrish KV, Umesh Babu DS, *et al*. Integrated crop management practices to rate the performance of tomato under the major tomato growing areas of Lingasugur Taluk. The Pharma Innovation Journal. 2022;11(3):1460-2.
14. Choudhary AK, Varatharajan T, Rohullar R, Bana RS, Pooniya V, Dass A, *et al*. Integrated crop management technology for enhanced productivity, resource-use efficiency and soil health in legumes - A review. The Indian Journal of Agricultural Sciences. 2020;90(10):1839-1849.