IntegratedPest and Disease Management Module in Groundnut (*Arachis hypogaea* L.) at Tiruchirappalli District, Tamil Nadu, India

ABSTRACT

Groundnut (*Arachis hypogaea* L.), is not only an important oilseed crop of India but also an important agricultural export commodity and the second largest producer of groundnut in the world. The groundnut cultivation is often subjected to significant yield losses annually due to biotic and abiotic stresses which are the major limiting factors for attaining high productivity. In recent years, groundnut insect pest and disease management through integrated pest and disease management (IPDM) solutions has gained prominence due to the vulnerable effects of pesticides. A front line demonstration study (2020) was conducted at Trichy district during Kharif season involving IPDM module revealed that thrips and *Spodopteralitura* damage as well as tikka leaf spot was lesser in IPDM module than Farmers Practice (FP) and increased yield by 19 % when compared to FP. From the study it can be concluded that Groundnut under IPDM practices have higher yield than farmer's practice.

Key Words: *Groundnut, Pests, Diseases,Integrated Management,Tiruchirappalli*

1. INTRODUCTION

"Groundnut (*Arachishypogaea* L.), a self-pollinated legume is not only an important oilseed crop of India but also an important agricultural export commodity. Globally Groundnut covers 295 lakh hectares with the production of 487 lakh tonnes with the productivity of 1647 kg per hectare" (FAOSTAT, 2019). "Asia and Africa account for 95% of global groundnut area where it is cultivated under rainfed conditions with low inputs by resource poor farmers. Groundnut is a cash crop providing income and livelihoods to the farmer. It also contributes to nutrition of farm families through consumption of energy- and protein-rich groundnut kernels and provides nutritious fodder (haulms) to livestock. Thus groundnut cultivation contributes to the sustainability to mixed crop-livestock production systems, the most predominant system of the semi-arid areas.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 (Singh et al., 2021; Choudhary and Piploda, 2023). Among the several factorsresponsible 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. More than 100 species of insect and mites are known to attack groundnut. They caused a mean reduction of plant height (22%), primary branches (29.1%) reduction in pods/ plant (54.6%) and reduction of kernels/ plant(44.5%)" (Priyanka *et al.*, 2024). "Among the pests attacking groundnut, thrips, *Spodopteralitura* Fab. and the leaf miner *Aproaeremamodicella* Deventer are more potential in India. Reduced pod yields can be attributed to many biotic stresses, including soilborne and foliar diseases" (Vineela et al., 2018). "All crop growing areas are experiencing severe damage from fungal diseases such collar rot (*Aspergillusniger*), stem rot (*Sclerotiumrolfsii*), and root rot (*Rhizoctoniasolani*)" (Jadon et al., 2015). The two most common soil-borne diseases that cause considerable crop losses each year are collar rot and stem rot. Among thefoliar diseases, leaf spots, rust, and rosette cause substantial losses in yield. Mostly farmers rely on the use of synthetic pesticides and combination ofpesticides for the control of pests and diseases. Repeated application of pesticides causes pesticide resistance. In order to overcome

this problem of pest and disease infestation, it is necessary to adopt integrated pest and disease management strategies for the management of insect pests and diseases. Hence, the present investigation was undertaken to demonstrate the integrated pest and disease management package in groundnut.

2. MATERIALS AND METHODS

The Integrated Pest and Disease Management (IPDM) package in groundnut was demonstrated in 10 locations of Nettavelampatti and Kamatchipatti of Uppiliyapuram and Musiri, respectively during *kharif*, 2020through Krishi Vigyan Kendra, Sirugamani, Trichy under rainfed condition. Each demonstration was conducted in an area of 0.4 ha along with a check plot (farmer practice) of 0.2 ha for comparison.

The texture of the soil was red sandy loam. It had a low to medium level of organic carbon (0.33-0.61%).Soil pH was 6.5 to 8. For all interventions, the typical integrated nutrient management schedule of 17:34:54 Kg NPK was adhered. These modules comprised of cultural, biological and chemical practices for the management of insect-pests and pathogens in groundnut. The percent control of thrips and *Spodopteralitura* over untreated control was calculated as suggested by Rajashekhar et al., (2022). During the crucial stages of the crop growth, the fields were irrigated later the crop was harvested and the yield was recorded.

Technology Interventions

The following technologies viz., seed treatment with *Bacillussubtilis* @10 g/kg and *Trichodermaasperellum* @ 4 g/kg of seeds, soil application of *Bacillussubtilis* and *T. asperellum* at last ploughing and at 20 days after sowing (DAS) each @ 2.5 kg/ha, installation of Blue sticky traps @ 5 No./acre,setting up of pheromone trap @ 5 No./acre, release of *Trichogrammachilonis* at 40,000/acre at 40 DAS and 50 DAS and need based application of Azadirachtin 1.0% were adopted in Demonstration plots and only pesticides were used in farmers field.

Before the conduct of demonstration, training to farmers was imparted with respect to envisagetechnological interventions. Visits of farmers and extension functionaries were organized at demonstration plots todisseminate the technology at large scale. Yield data was collected from farmers practice and demonstration plots.The gross returns, cost of cultivation, net returns and benefit cost ratio (B:C ratio) were calculated by usingprevailing prices of inputs and outputs.

3. RESULTS & DISCUSSION

The results revealed that farmers practice recorded 56 percent *Spodoptera*infestation 18.5percent thrips infestation,and 24.7 per centTikka leaf spot incidence whereas the demo plots recorded only 22 per cent *Spodoptera*infestation, 7.3 percent thrips infestation and 10.3 per cent Tikka leaf spot incidence. Sex pheromones have been utilized in the insect pest control programme through population monitoring, survey, masstrapping, mating disruption and killing the target pest in the trap.Higher yield of 16.225 q/ha was recorded in demo plots whereas farmers practice recorded a yield of13.625q/ha.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). Ahir and co workers (2018) stated that the major insect pests caused significant reduction in 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

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insect pests caused 35.71 per cent loss in yield, equivalent to a loss of 8.05 q/ha.. The demonstration gave increased net return (Rs. 43,350/- /ha) and B: Cratio (1.80) over the farmers practice with the net return of Rs.31, 750/ha and B: C ratio of 1.44.

Table 1. Impact of FLD on pest, disease, yield and Economics in Groundnut

Treatments	Tikka leaf spot incidence (%)	*Spodopteralitura* infestation (%)	Thrips incidence (%)	Yield (q/ha)	Per cent increasein yield over FP	Net returns (Rs./ha)	B:C Ratio
IPDM (BCA, Pheromone, Egg parasitoid, Neem)	10.3	22	7.3	16.225	19	43350	1.80
FP (Pesticides alone)	24.7	56	18.5	13.625	-	31750	1.44

4. CONCLUSION

The results from the present study revealed that demonstration of integrated pest and disease managementpractices would reduce the thrips and *Spodoptera* infestation, Tikka leaf spot incidence and further increased the yield in groundnut. Extracts of neem leaf and datura leaf showed excellent performance in controlling tikka leaf spot and increasing pod yield by 53.61 and 51.91per cent, respectively as compared to control (Hasan *et al*., 2014).

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Details of the AI usage are given below:

1.

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3.

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REFERENCES

Ahir, KC Arti Saini and BS Rana (2018). Estimation of yield losses due to major insect pests of groundnut (Arachis hypogaea L.) Journal of Entomology and Zoology Studies, 6(2): 312-314.

Dabhade PL, Bapodra JG, Jethava DM, Rathod RT, Dabhi MV. (2012). Estimation of yield losses due to major insect-pests of groundnut in Gujarat. Legume Research: An International Journal,35(4):354-356.

FAOSTAT. (2019). Available at: http://faostat.fao.org/

Hasan, M.M.,Rashidul Islam and K.Shirin.(2014). Biological control of leaf spot of groundnut, DOI: 10. 18801/JBAR.010214.08 Corpus ID: 53361984

Jadon KS, Thirumalaisamy PP, Kumar V, Koradia VG, Padavi RD.(2015). Management of soil borne diseases of groundnut through seed dressing fungicides. Crop Protection,78:198-203.

Priyanka, N., Shaila, O., Anuradha, M., Divya Rani, V., & Rajashekhar, M. (2024). Estimation of Yield Losses Due to Major Insect Pests of Groundnut. Indian Journal of Entomology, 1–4. https://doi.org/10.55446/IJE.2024.1949

Rajashekhar M, Prabhakar Reddy T, Chandrashekara KM, Rajashekar B, Jagan Mohan Reddy M, Ramakrishna K.(2022). Evaluation of integrated pest management module for pink bollworm, *Pectinophoragossypiella* (Saunders) and its economic analysis under farmer's field conditions. International Journal of Pest Management, 29:1-9

Vineela DRS, Beura SK, Dhal A, Swain SK. (2018) .Integrated management of soilborne diseases of groundnut in coastal ecosystem of Odisha. Journal of Mycopathological Research, 56(3):189-193.

Singh SK, Jadon KS, Patel N, Sharma AK. Development of a prophylactic integrated pest management module for groundnut (Arachishypogaea L.). International Journal of Pest Management. 2021 Nov 25;68(1):26-34.

CHOUDHARY S, PIPLODA S. Evaluation of IPM modules against major sucking insect pests of groundnut (Arachishypogaea). Indian Journal of Agricultural Sciences. 2023 Apr;93(4):425-31.

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