



Research Note

Eco-friendly pest and disease management practices in groundnut

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ABSTRACT: Eco-friendly pest and disease control is a cost effective and environmentally safe practice to follow. In order to address farmer's problem and promote eco-friendly approaches in management of pests like tobacco caterpillar, leaf miner, aphids, thrips, root rot and leaf spot diseases in Groundnut, Front Line Demonstration (FLD) was conducted. The trial showed that seed treatment with *Trichoderma* and soil application with *Pseudomonas* effectively managed root rot incidence compared to farmer's practice where no such treatment was made which resulted in root rot incidence (5%). Installation of light traps and sticky traps effectively monitored the sucking pests. By the use of pheromone traps, the farmers completely avoided application of chemical pesticides to control tobacco caterpillar (*Spodoptera litura*), where adult moths of nearly 25 nos/week were trapped. This resulted in saving of INR 3500/- and an yield of 28q/ha was obtained compared to farmer's practice (26 q/ha).

KEY WORDS: Groundnut, *Pseudomonas*, pheromone traps, root rot, tobacco caterpillar, *Trichoderma*

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Groundnut is one of the important oil seed crop grown in Kancheepuram district of Tamil Nadu, India. The crop is mainly grown in Rabi season. During cropping season the farmers are facing problems of yield loss due to pest and disease attack. The major pest includes tobacco caterpillar, leaf miner, aphids and thrips. Due to lack of awareness on diagnosis of pest and diseases, excess usage of chemicals are being used thereby increasing the cost of cultivation. Pathogens, weeds and insect pests cause losses valued at 2380 million rupees per annum (Balasubramanian, 1986). The major pests in groundnut includes the leaf miner (*Approaerema modicella* Dev., Gelechiidae), the red hairy caterpillar (*Amsacta albistriga* Wlk and *A.moorei* Butl., Arctiidae), Bihar hairy caterpillar (*Spilosoma obliqua* Hb., Arctiidae, tobacco caterpillar (*Spodoptera litura* (F.), Notcuidae) and gram pod borer (*Helicoverpa armigera* Hb., Noctuidae). The symptomatology of the damage caused by various insects was given by Amin (1988). The populations of many pests including *S. litura* have developed resistance to many commercially available pesticides as observed by Gowda (1999).

Among the diseases, root rots and leaf spots are the

main problem in Kancheepuram district resulting in 30% yield losses. The leaf spots commonly called as tikka disease occur wherever the groundnut crop is grown. The pathogens may survive from season to season on volunteer groundnut plants and infected crop debris. Long distance distribution of the pathogens may be by airborne conidia, by movement of the infected crop debris, or by movement of pods or seeds that are surface-contaminated with conidia. Early and late leaf spot pathogens are also soil-borne (Nolt and Reddy, 1984). Though chemical pesticides and fungicides are in use to control the pests and diseases, strategies in approaching eco-friendly practices are the need of the hour for sustainable agriculture. Ghewande and Nandagopal (1997) have reviewed IPM practices to control pest and diseases in groundnut. In eco-friendly management practices, a series of steps are to be adopted to monitor the pest population and reduce the disease incidence.

Most of the existing biocontrol agents for management of soil-borne diseases were isolated from the rhizosphere. There is a possibility to explore antagonists from other habitats as potent biocontrol agents (Manjula *et al.*, 2002). Some

species of the genus *Trichoderma* have been used as effective biocontrol agents against soil-borne, foliar and postharvest phytopathogenic fungal pathogens (Kubicek *et al.*, 2001; Sharma *et al.*, 2005; Sharma and Sain, 2005) including groundnut (Podile and Kishore, 2002). These fungi may also promote plant growth (Inbar *et al.*, 1994) and have the ability to colonize root surfaces and the cortex (Kleifeld and Chet, 1992; Yedidia *et al.*, 1999). *Trichoderma* spp. was found to colonize the root epidermis and outer cortical layer and release bioactive molecules that cause walling off of the *Trichoderma thallus*.

The current programme was conducted to establish the cost effective and environmentally sound management approaches to the pests and diseases attacking groundnut. The information would be useful in sensitizing farmers and formulating management strategies for those causing significant damage and yield losses.

Under ICAR sanctioned Front Line Demonstration Programme entitled “Demonstration of Eco-friendly pest and disease management practices in groundnut” was conducted in Thirukalukundram block of Kancheepuram district in Tamil Nadu, India. The District lies between 12°14'00"N to 13°02'00"N Latitude, 79° 31'30"E to 80° 15' 30"E Longitude and has an area extent of 4307 sq km. The total cultivated area in groundnut is 9633.827 ha. Soil type is sandy coastal alluvium. The actual rainfall of the area is 992.30 mm. The groundnut growing farmers face problems of pest and diseases during the growing period resulting in yield loss and high cost of cultivation involving chemical application. To find a solution to this situation, eco-friendly approaches in pest and disease control was taken up in three villages Angamampatu, Sooradimangalam and Nerumbur comprising 15 farmers.

The problem of pest and disease occurrence was identified based on field surveys, Farmers-Scientist interaction meetings and yield losses assessed. The checklists prepared along with Agriculture department staffs on the information of farmers' knowledge of the various pests and diseases associated with their groundnut crop, their perception of the damage caused as well as the control measures along with the cost of cultivation. Training programmes and demonstrations were organized to create awareness on the excessive usage of chemicals to control pests and diseases. Recommendation on soil applications and seed treatment with bioagents and use of traps were demonstrated in the farmer's field. Powder based formulations of *Trichoderma viride* were procured from Tamil Nadu Cooperative Sugar Federation Limited - Unit: Main Biocontrol Research Laboratory, Chengalpattu and *Pseudomonas* was procured

from M/s Sun agro Biotech Research Centre, Chennai. The pheromone traps with Spodo lures were procured from PCI, Pest Control Private Limited, Shawallace building, 4th floor, Old no. 154, Parrys, Chennai. Critical inputs such as *T. viride* was used as seed treatment @10g/Kg of seed, *Pseudomonas* as soil application @ 1Kg/acre) by mixing with Farmyard Manure. Pheromone traps with Spodo lures (10 nos./acre) for tobacco caterpillar control, Sticky traps (10 nos./acre) for sucking pest management, Light traps (1 No./acre), SNPV (250ml LE) were supplied to the farmers during the programme. Traps were installed at a height of one foot from the crop canopy. The lures were changed once in a month.

During periodic field visits, crop was assessed for pest and disease incidences by observing pests trapped in traps and disease attack in the fields. Data was collected on the identity and relative abundance of pests and diseases as well as the nature and extent of damage in the field. Pest and disease infestation rates were recorded in both recommended practices and also in the farmer's method of chemical applications. Yield of the recommended and farmers practice was recorded taking into consideration the cost of cultivation in the both the methods. Cost of production was calculated by taking into consideration the expenditure incurred on cost for field preparation, fertilizer application, hoeing and weeding, pesticide application, material cost like seed, pesticides, bio control agents, IPM inputs, fertilizers, and irrigation. The data on yield (Kg/ha), cost of production (INR/ha) including all inputs and cost of plant protection (INR/ha) and total return (INR/ha) were used to determine the cost benefit ratio.

$$\text{Percent Pest Incidence} = \frac{\text{Number of infected plants}}{\text{Total number of plants/leaves observed}} \times 100$$

Seed treatment with *Trichoderma* (4g/Kg of seeds) and soil application of *Pseudomonas* (1Kg/acre) effectively managed root rot incidence compared to farmer's practice where no such treatment was made which resulted in root rot incidence (5%). Similarly *T. viride* along with *P. fluorescens* increased the biocontrol activity against stem rot of groundnut caused by *Sclerotium rolfsii* (Manjula *et al.*, 2004). Application of *T. viride* and *T. harzianum* in a pot culture study reduced the collar rot incidence in groundnut caused by *A. Niger* (Gajera *et al.*, 2011). By use of light trap (1 no./acre), sticky traps (10 nos./acre), pheromone traps with spodo lures (10 nos./acre) along with SNPV spray based on pest population, the farmers completely avoided application of chemical pesticides to control sucking pests and tobacco caterpillar (*Spodoptera*) which resulted in saving of INR 3500/- in cost of cultivation (Fig 1). Adult *Spodoptera* moths 25 nos./trap/week were noticed in the pheromone traps (Table 1) and (Fig. 1). Moreover, yield increase of 8% was observed.

Farmers were able to identify pest and diseases this made them to adopt timely recommended practices. Sreenivasalu *et al.* (2002) have worked on IPM practices in groundnut against *S. litura* and other sucking pests Yambhatnal *et al.* (2011) revealed IPM module consisting of GPBD-4 variety of groundnut resistant to late leaf spot and rust, seed treatment with *Trichoderma* @ 4g/Kg, foxtail millet as intercrop (7:1), installation of pheromone traps @ 2 traps/acre for monitoring of *S. litura*, spray of emamectin benzoate 5 SG @ 0.2g/l at 45

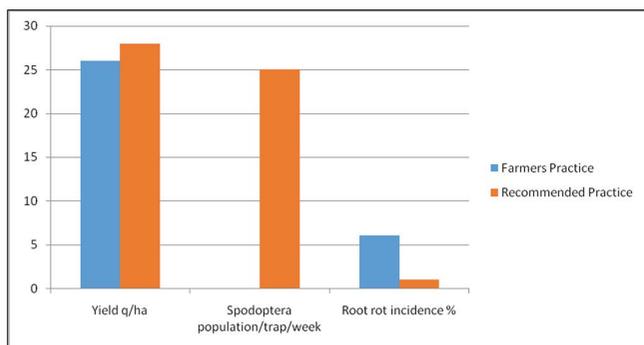


Fig. 1. Yield with pest population and disease incidence

Table 1. Yield with pest affected plants

Trial No.	Farmer's method of control (Chemical application)		FLD recommendation		
	Yield (q/ha)	Pest affected plants %	Yield (q/ha)	Pest affected plants %	No. of adult moths/trap/week
1	25	5	27	1	30
2	25.5	6	28	0	28
3	27	4	30	0	29
4	25.5	7	28	0	25
5	26.5	5	28	1	24
6	25	6	27	0	25
7	25	8	27	1	26
8	26	5	28.5	1	24
9	27	7	29	1	23
10	24.5	6	26.5	0	24
11	25.5	7	27.5	1	28
12	25.5	8	28	0	25
13	26.5	5	29	2	26
14	26	6	28.5	1	18
15	25.5	6	28	0	20
Average	25.733	6.07	28	0.6	25

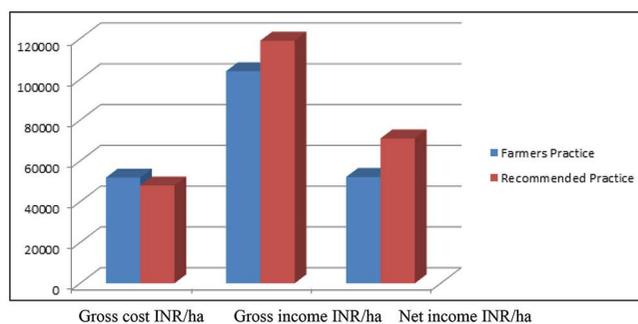


Fig. 2. Cost of cultivation and net income

and 60 days after sowing was an effective module in obtaining higher yield of groundnut (39.95 q/ha) and cost effective with cost benefit ratio 1:5 in comparison to module-I and module-III (Farmer's practice). Karthikeyan *et al.* (2006) have reported that organic amendments effectively managed the root rot in groundnut. The increase in yield of groundnut was found similar to the findings of Sallam *et al.* (2008) where the formulation of *Trichoderma* spp. treatments enhanced green yield of bean plants compared to infected control. Pratibha *et al.* (2012) have reported the biological control of root rot in farmer's field. Anjaiah *et al.* (2006) evaluated bacteria and *Trichoderma* for biocontrol of pre-harvest seed infection by *Aspergillus flavus* in groundnut. Yang *et al.* (2009) has reported the use of sex pheromone for control of *S. litura* in crops. Renuka and Mahabaleshwar (2016) reported the use of *SINPV* @ 100 LE/acre against *Spodoptera* in groundnut.

Farmers were able to identify pest and diseases and thereby adapted effective control measures. Usage of biological control agents for seed treatment and soil application was effectively followed by the farmers. Castor as border crop, cultivation of flowering crops to increase population of pest defenders was advised to the farmers while taking up the ground nut crop. Awareness on the identification of disease symptoms and pests were found among the farmers. Success story of this programme was recorded in All India radio, Chennai, by progressive groundnut seed farmer, Mr. J. Rajendiran of Sooradimanglam.

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