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Impact of FLDs on management of soil borne diseases in groundnut

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ABSTRACT

FLD conducted for management of soil borne diseases in groundnut. A total 20 front line demonstrations were conducted in three years from 2020-2021 to 2022-2023 at major groundnut growing areas of Nellore district of Andhra Pradesh during rabi season. After implementation of FLD treatments, soil borne disease incidence were recorded in demonstration and farmer practicing fields. An average low collar disease incidence was recorded in demonstration plot (6.12%) over farmer practicing field (16.81%). Dry root rot recorded 2.32 per cent and 5.60 per cent in demonstration and farmer practicing fields respectively. Three years' average incidence of stem rot recorded 52.39 per cent low disease in demonstration plot over farmer practice. Farmers are not following integrated disease management practices and due to lack of awareness, they are using fungicide as foliar spray only for soil borne diseases management. Based on the results it was concluded that integrated disease management practices can reduce the soil borne disease incidence.

Key words: *Andhra Pradesh, FLD, Groundnut, Soil borne diseases, Seed treatment, Trichoderma*

Groundnut (*Arachis hypogaea* L.) is an important legume crop cultivating in tropical and sub-tropical areas of the world. Groundnut is called as "King of oil seed crops" because of its kernel contains 48 per cent edible oil and also contain about 26 per cent protein, 20 per cent carbohydrates and 3 per cent fiber andrich in calcium, thiamine and niacin. In association with symbiotic nitrogen-fixing bacteria, groundnut crop fixes nitrogen and enriches the soil with 80-160 kg N/ha per season (Bajaya *et al*., 2022).

The pod yield is effected due to biotic and abiotic factors that affect the growth and development of groundnut crop (Senem *et al.*, 2024). Biotic factors like insect pests and diseases causes the yield losses. Among the fungal diseases, soil borne diseases i.e. collar rot, dry root rot and stem rot diseases cause higher yield losses (Natawat *et al*., 2024). (Collar rot or seedling blight is usually infecting the crop at two stages i.e., pre emergence and post emergence, disease caused pathogen is favored by low and high soil moisture, drought stress, optimum temperatures for pathogens development, soil compactions, continuous mono-cropping and other different factors that contribute stresses to plants) (Bajaya *et al*., 2022). Dry root rot occurs at 30 days after sowing and is common in groundnut crop where crop is cultivated mostly in rain fed and dry conditions (Varshitha *et al*., 2023). Stem rot disease mainly associate with kharif groundnut crop, infection start at 60 days after sowing, high temperature and moisture are ideal for disease causing pathogen growth and survival (Prabhu and Ashok, 2023).

In order to increasing of yield, chemical fungicides play important role for management of diseases but have several problems like development of resistance in pathogens for fungicides, causes environmental pollution (Pinki *et al*., 2023). Farmers are using fungicides for management of soil borne diseases. The use of fungicides for spraying or soil drenching may not control the disease effectively and also effects beneficial microorganisms presented in soil (Varshitha *et al*., 2023). Different biological agents, botanicals and chemicals are used for management of soil borne diseases (Lora and Begum, 2022; Paramasivan *et al*., 2022; Rajeswari *et al*., 2020 and Rakesh *et al*., 2016). Seed treatment with fungicides also used for management soil borne diseases. Integrated management approach is best

practice than individual practices for management of soil borne diseases. Hence, the present study was conducted on demonstration of disease management practice for soil borne disease management in groundnut.

MATERIAL AND METHODS

KVK, Nellore conducted Front Line Demonstration (FLD) in 20 locations under irrigated conditions from 2020-2021 to 2022-2023 during rabi season at different locations of different mandals, Nellore district, Andhra Pradesh, India. FLD was conducted with two treatments i.e., demonstration plot (TO1) along with farmer practicing plot (TO2) to find out the impact of integrated disease management practices in groundnut. Each demonstration is conducted in 0.4 ha area for demonstration plot and 0.4 ha area for farmers practicing plot. The FLDs neighboring plot acted as farmers practice plot. The FLD treatment TO1 designed with following practice

- Seed treatment with Tebuconazole 2DS@ 1 gm/ Kg of seed
- *Trichoderma asperellum* application @ 2kg with 90 Kg FYM and 8 Kg Neem cake before Sowing
- Need based chemical spraying with Hexaconozole 2 ml/lit of water

In treatment TO2, farmers are used repeated spraying of fungicides after noticing the diseases.

After implementing treatment, the disease data was recorded in one square meter area of crop and total 5 square meter area of field from TO1 as well as TO2 treatments and percent disease incidence was calculated using below mentioned formula (Vijay Kumar Naik *et al*., 2024).

$$\text{Per cent Diseases Incidence (PDI)} = \frac{\text{Total Number of infected Plants per sq. m}}{\text{Total number of plants per sq. m}} \times 100$$

The average yield, extension gap, technology index, cost of cultivation, gross returns, net returns, and benefit-cost ratio (Yadav *et al*., 2004) were calculated using following formula's as given below. Gross income was calculated based on local market prices of groundnut

$$Extension\ gap = Demonstration\ yield - Farmer\ practice\ yield$$

$$Technology\ gap = Potential\ yield - Demonstration\ yield$$

$$Technology\ index\ (\%) = Potential\ yield - \frac{Demonstration\ yield}{Potential\ yield} \times 100$$

$$B:C\ ratio = \frac{Gross\ returns}{Cost\ of\ cultivation}$$

RESULTS AND DISCUSSION

In Nellore district, groundnut is traich cultivatedin sandy soils under irrigation conditions only. Groundnut is cultivating as mono-cropping in rabi and kharif seasons. The major variety is TAG24, therefore and TAG24 demonstration plots and farmers practicing fields in all three years/seasons, were eveluated for the data.

Percent disease incidence (PDI)

The disease incidence from integrated disease management practice (TO1) and farmer practices (TO2) mentioned in Table 1. The average highest collar rot disease incidence was observed in farmer practice (16.81%) over demonstrated practice (6.12%). Recorded low dry root rot (2.32%), stem rot (4.49%) incidence were recorded in demonstrated plot. It shows that all the FLD farmers followed IDM practice in demonstrated plots and they found the difference between demonstrated practice and their own followed practice for management of soil borne diseases. An average percentage reduction of collar rot, dry root rot and stem rot disease incidence in demonstrated practice over farmer practice was 62.87, 49.15 and 52.39 per cent respectively. In previous research studies, Veena *et al*., 2019 recorded 14.55, 13.45 and 7.1 per cent collar rot, stem rot and dry root rot disease incidence in Nellore district during their survey conducted in kharif, 2014. In our study more or less similar disease incidence was recorded in farmer practiced plots. The field experiment was conducted for management of collar rot disease at S.K.N. College of Agriculture, Jobner, using different fungicides for seed treatment and *Trichoderma viridae* application, they found that the seed treated

Table 1: The percent disease incidence of soil borne diseases from both demonstrated plot (TO1) and farmer practice plot (TO2) were recorded and calculated percent of disease redution in TO1 over TO2 treatment.

Year	Percent Disease Incidence								
	Collar rot		% of reduction over TO2	Dry root rot		% of reduction over TO2	Stem rot		% of reduction over TO2
	TO1	TO2		TO1	TO2		TO1	TO2	
2020-2021	6.44	22.33	71.15	2.72	8.23	66.95	5.23	10.23	48.87
2021-2022	10.44	24.33	57.09	1.72	6.23	72.39	7.23	12.23	40.88
2022-2023	1.49	3.76	60.37	2.53	2.34	8.12	1.02	3.13	67.41
Average	6.12	16.81	62.87	2.32	5.6	49.15	4.49	8.53	52.39

Table 2: Yield, economics of demonstrated(TO1) and farmer practiced (TO2)plots

Year	Yield (q/ha)		Cost of cultivation (Rs/ha)		Gross return (Rs/ha)		Net return (Rs/ha)		B:C ratio	
	TO1	TO2	TO1	TO2	TO1	TO2	TO1	TO2	TO1	TO2
2020-2021	46.97	41.25	102500	105600	281820	247500	179320	141900	2.75	2.34
2021-2022	42.61	35.9	103459	107627	251220	209520	147761	101893	2.43	1.95
2022-2023	46	42.9	150000	155000	322000	300300	172000	145300	2.15	1.94
Average	45.19	40.02	118653	122742	285013	252440	166360	129698	2.44	2.08

Table 3: Increased yield, extension gap, technology gap and technology index were calculated in integrated disease management under FLD

Year	Yield (q/ha)			% of increased yield	Extension gap (q/ha)	Technology gap(q/ha)	Technology index
	Potential Yield	TO1	TO2				
2020-2021	47.5	46.97	41.25	13.87	5.72	0.53	1.12
2021-2022	47.5	42.61	35.9	18.69	6.71	4.89	10.29
2022-2023	47.5	46	42.9	7.23	3.1	1.5	3.16
Average	47.5	45.19	40.02	13.26	5.18	2.31	4.86

with tebuconazole+application of *Trichoderma aviridae* effectively controlled the collar rot disease (Pinki *et al*., 2023).

Different studies were conducted on evolution of botanical extracts (Rajeswari *et al*., 2020), organic amendments (Rajeswari et al., 2018), seed treatment with different fungicides (Prabhu *et al*., 2023; Gowdar *et al*., 2024), seed & soil biocontrol agent's application (Karthikeyan *et al*., 2006; Rani *et al*., 2023) for management of soil borne diseases in groundnut. Also integrated management practices used (Babu and Deepika, 2023; Jadan *et al*., 2017; Nathawath *et al*., 2024), concluded that integrated approach can be control disease effectively than individually (Rakesh *et al*., 2016).

Economic parameter:

The pod yield was recorded from both treatments in three years, an average yield was calculated and mentioned in table 2. An average of three years' yield recorded 45.19 q/ha in demonstrated plot and 40.02 q/ha in farmer practiced plot. The high gross and net returns, benefit cost ratio, low cost of cultivation were recorded from demonstrated plot than farmer practiced plot. Vijay Kumar Naik et al. (2024) recorded higher yield in demonstrated plot (42.17q/ha) over farmer practiced plot (39.99 q/ha) from experiment on foliar disease management in groundnut. The study was conducted on transfer of groundnut production technology for

livelihood improvement of oilseed farmers and recorded higher yield, gross & net returns, B:C ratio in demonstrated plot on integrated nutrient management over farmer practiced plot (Madhusekhar *et al*., 2022).

Extension gap

The FLD was conducted on integrated management of soil borne diseases in groundnut and found the 5.72, 6.71, 3.1 q/ha of extension gap during 2020-21, 2021-22 and 2022-23 respectively. An average extension gap of three years was recorded 5.18 q/ha (Table 3). Not only influence the IDM practices on disease reduction but also helpful in increasing the yield in demonstrated plot over farmer practiced plot. Need to educate the farmers on integrated disease and pest management practices to reduce the extension gap. Reddy *et al*. (2023) recorded 215 kg/ha of extension gap in blackgram under cluster front line programme conducted for three years from 2020-21 to 2022-23 at Nellore district.

Technology gap and technology index

The technology gap i.e., difference between potential yield and demonstrated yield was calculated and it was recorded 0.53 q/ha, 4.89 q/ha during 2020-21,2021-22 and it was 1.5 q/ha during 2022-23 year. An average of three years recorded 2.31 q/ha technology gap (Table 3). Ramesh *et al*. (2023) recorded 10.2 q/ha technology gap in groundnut under cluster front line demonstration programme. The recorded technological gap may be the soil fertility, crop production and protection practices, variable weather patterns that occurred over the crop season at various places. The technology index varied from 1.12 to 10.29 per cent (Table 3). On an average technology index of FLD was observed 4.86 per cent during the three years. It indicates that the IDM practices are practically suitable for farmers' field situations for management of soil borne diseases in groundnut. Awareness programmes, field days, group discussions, documentation of success stories, and farmers' feedback helpful in the horizontal spread of the technology (Ramesh *et al*., 2023). In our research, made efforts to study the impact of FLD's on integrated disease management practices for soil borne diseases in groundnut. FLD's organized area helped to decrease the disease incidence and increase in term of yield and net returns.

CONCLUSION

The front line demonstration was helpful in decreasing of soil borne diseases using IDM practices and recording higher yield. On an average of three years, recorded 13.26 percent increased yield in demonstrated plot over farmer practice plot. The benefit cost ratio, gross & net returns were recorded higher in demonstrated plot than farmer practiced plot. Based on our results and other research studies concluded that integration of cultural, biological and chemical disease management practices showed better performance in controlling the disease as well as in increasing the yield than imposing individually.

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