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Study on productivity and profitability of redgram var. LRG-105 through front line demonstration under rainfed conditions of Prakasam district, Andhra Pradesh

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Abstract
To establish the production potential of redgram crop, Front Line Demonstrations (FLDs) is an appropriate tool. The Participatory seed production of redgram var. LRG-105 was carried out by the District Agricultural Advisory and Transfer of Technology centre (DAATTC), Ongole, Prakasam district Andhra Pradesh in *kharif* seasons at farmer's field in *Prakasam* district during 2021-22 & 2022-23. The basic strategy of the project was to promote and extend improved technologies. The improved technologies consisting use of modern variety, seed treatment with *Rhizobium leguminosarum* @ 5 ml/kg seed, balanced fertilizer application (NPKS @ 20:40:0:20 kg/ha) and integrated pest management. Impact assessment recorded higher yield as well as higher economic return as compared to the farmer's local practices. The demonstration of technologies gave higher yield of 12.5 q/ha in an average with 38.9% increase in average yield over farmer's local practices. The study also registered improved technology gives higher gross return (Rs. 62937/ha.), net return (Rs. 30687/ha.) with higher benefit cost ratio (1.81:1) as compared to farmer's local practices (1.33:1).

Keywords: Productivity, economics, redgram var. LRG-105, front line demonstration

Introduction

Redgram is the major pulse crop grown in India, predominantly, during kharif season both as a sole crop and as an intercrop, though found in wide range of agro-ecological situations. Its deep rooting and drought tolerant characters makes it a successful crop in the areas of low and uncertain rainfall. The plants owe a large measure of its popularity to the fact that it possesses valuable properties as restorative of nitrogen to the soil and adds lot of organic matter to the soil through enormous leaf shedding and thus, redgram finds a promising place in crop rotation and crop mixtures. Its deep rooting system helps in extracting the nutrient and moisture from deeper soil layers, thus making it suitable for rainfed conditions. In India, it is grown in an area of 3.86 m ha with an annual production of 2.90 m tonnes and productivity is 751 kg ha-1 (Anon., 2011) [1]. India accounts for 90 percent of the redgram area and production of the world. It is mainly grown in states of Maharashtra, Uttar Pradesh, Madhya Pradesh, Gujarat, Andhra Pradesh, Karnataka and Tamil Nadu and these states constitute about 90 percent of the cultivated area in India. In dry farming areas of Andhra Pradesh, rainfall is not only scanty but also erratic. Thus soil moisture becomes the most limiting factor in production of redgram. The area and production of redgram in Andhra Pradesh is 2.46 lakh acres in Andhra Pradesh state with 1.2 lakh MT production. The average productivity of red gram is 504 kg/ha. 2.46 lakh acres in Andhra Pradesh state with 1.2 lakh MT production. The average productivity of red gram is 504 kg/ha. (Ministry of Agriculture, 2020). Sowing time determines the time available for vegetative growth before the onset of flower in g which is mainly influenced by photoperiod. Most of the varieties of pigeonpea are sensitive to photoperiod. Sowing time has a prominent influence on both vegetative and reproductive growth phages and determines the plant height, number of branches, height at which branching starts, flowering and pod bearing habits. The yield of redgram is limited by a number of factors such as agronomic, pathogenic, entomological, and genetic and also their interaction with the environment. Prakasm District is such that it does not get the full benefit of either of the monsoons. The district is in the rain shadow area and the normal rainfall is 545 mm. Around 85 thousands ha area is under sole redgram. Only two varieties of redgram seeds, LRG 52 and LRG 105, were distributed by the agricultural department till today.

The main reason for the poor performance of redgram crop dryland regions is cultivating the local varieties.

Varieties cultivated by the farmers are low yielding and susceptible to one or the other biotic and abiotic stresses. The higher redgram yield per unit area per unit time can be enhanced by introducing newly evolved redgram variety LRG-105 with high yielding potential. The information on the comparative performance of newly developed varieties is lacking in order to recommend to the farmers. Keeping these facts in view, the present experiment was conducted during to study the performance of redgram varieties in alfisols under rainfed situations.

Materials and Methods

The present experiment was conducted by the DAATT Centre, Prakasm during the Kharif season from the years 2020-21 to 2021-22 in the farmers fields of different 5 villages thus a making of total 10 demonstrations. A total of five farmers were selected based on their innovativeness, progressive and activeness in adoption of latest technologies with the help of department officials, DLCC members and direct observation while during field visits and other interactive meetings. All 10 demonstrations were conducted for three consecutive years in the farmer fields with a main objective of study was carried out to demonstrate the production and economic benefit of adopting improved redgram variety in each of the 5 farmer's field covering an area of 8 ha. The high yielding redgram variety LRG – 105 was used as a demo and LRG – 41 used as control. Mundlamuru, Talluru, Gundlaplalli, Umamaheshapuram and Dosakayalapadu villages of Prakasm district were selected as experimental units during years 2020-21 and 2021-22. The treatment comprised of improved technologies *vs* farmer's practice. An entire dose of N and P_2O_5 were given as basal through Urea, Single Super Phosphate (SSP) respectively. Farmer's practice constituted growing with LRG-52, which is local cultivated variety. Before conduct the demonstration training to farmers of respective villages was imparted with respect to envisaged technological interventions. Yield data was collected from farmers practice and demonstration plots; cost of cultivation, net income and benefit cost ratio were analyzed. For the study, technology gap, extension gap and technology index were calculated as suggested by Samui *et al*., (2000) [6]

$$\text{Percent increase yield} = \frac{\text{Demonstration yield} - \text{Farmers yield}}{\text{Farmers yield}} \times 100$$

Technology gap = Potential yield – Demonstration yield

Extension gap = Demonstration yield-farmer's practice yield

$$\text{Technology index} = \frac{\text{Potential yield} - \text{Demonstration yield}}{\text{Potential yield}} \times 100$$

Results and Discussion

Grain yield

The yield performance and economic indicators are presented in Table 2. The data revealed that under demonstration plot, the performance of redgram yield was found to be higher than that under FP during two consecutive years of demonstrations (2021-22 & 2022-23). The yield of redgram under demonstration recorded was 11.25 and 12.50 q/ha during 2021-22 and 2022-23, respectively. The yield enhancement due to technological intervention was to the tune of 32.4% to 38.9% over FP. The cumulative effect of the technological intervention over two years, revealed on average yield of 11.87 q/ha, 35.7% higher over FP. The year to year fluctuations in yield and cost of cultivation can be explained on the basis of variations in prevailing social, economical and prevailing microclimatic condition. The above findings were accordance with Ganga Devi *et al.,* (2017) [2]. Maheshwaran *et al.,* (2019) [3] have also reported that depending on identification and use of farming situation, specific intervention may have greater implications in enhancing systems productivity of redgram.

Technology Gap

The technology gap means the differences between potential yield and yield of demonstration plot. The technology gap of demonstration plots were 3.75 and 2.50 q/ha during 2021-22 and 2022-23 (Table-2), respectively. On an average technology gap under two year FLD programme was 3.13 q/ha. The technology gap observed may be attributed to dissimilarity in the soil fertility status, crop production, protection practices and local climatic situation. Hence, variety wise location specific recommendation appears to be necessary to minimize the technology gap for yield level in different situations.

Extension Gap

Extension gap means the differences between demonstration plot yield and farmers yield. Extension gap of 2.75 and 3.50 q/ha was noticed during 2021-22 and 2022-23 (Table-2), respectively. On an average extension gap under two years FLD programme was 3.13 q/ha which emphasized the need to educate the farmers through various extension programs i.e. front line demonstration for adoption of improved production and protection technologies, to revert the trend of wide extension gap. More and more use of latest production technologies with high yielding varieties will subsequently change this alarming trend of galloping extension gap.

Technology Index

Technology Index indicates the feasibility of the evolved technology in the farmers' fields. Lower the value of technology index, higher is the feasibility of the improved technology. The technology index varied from 25.0 to 16.7 percent (Table-2). On an average technology index was observed 20.9 percent during the two years of FLD programme, which shows the efficacy of good performance of technical interventions. This will accelerate the adoption of demonstrated technical intervention to increase the yield performance of redgram.

Economics

Economic indicators i.e. cost cultivation, gross returns, net returns and B: C ratio of front line demonstration is presented in Table 3. The data clearly revealed that the net return from the recommended practice were substantially higher than farmers practice plot during 2021-22 & 2022-23. Average net returns from recommended practice were observed to be Rs. 30687 /ha in comparison to farmers practice plot i.e. Rs 11750/ha. On an average Rs. 18937/ha as additional income is attributed to the technological intervention provided in demonstration plots i.e. recommended practices. Economic analysis of the yield performance revealed that benefit cost ratio of demonstration plots were observed higher than farmers practice plots. The benefit cost ratio of demonstration and farmers practice plots were 1.76 and 2.15 during 2021-2, 2022-23 respectively. Hence favorable benefit cost ratios proved the economic viability of the intervention made under demonstration and convinced the farmers on the utility of intervention. The data clearly revealed that the maximum increase in yield and benefit cost ratio observed was 12.5 and 2.15, respectively during 2022-23. The variation in benefit cost ratio during all the years may mainly on account of yield performance and input output cost in that particular years. The higher net returns and B: C ratio in redgram demonstration might be due to the higher grain yield and better pricing of the produce in the market. These results in accordance with the findings of Suresh *et al.*, (2016) [5], Maheshwaran *et al.*, (2019) [3] and Muragan *et al.*, (2020) [4]. Recommended practice (FLD's) proved beneficial in respect of yield and economics of redgram in Prakasam District.

Table 1: Characteristics of Red gram varieties selected for experiment

Treatments	Variety release year	Duration	Characteristics
LRG – 41	2006	175-180 Days	• Yield 23-25 Q/ha Selection from local land race in Chilakaluripet of Guntur district • Tolerant to Helicoverpa
LRG-105	2020	160-170 days	• Yield: 23-25 q/ha, • Tolerant to wilt and SMD

Table 2: Seed yield, technology gap, extension gap, technology index and B: C ratio of redgram under FLD

Year	Seed yield (q/ha)			% increase over control	Technology gap (q/ha)	Extension gap (q/ha)	Technology index (%)	B:C ratio	
	Potential	Demo	Control					Demo	Check
2021-22	15.0	11.25	8.50	32.4	3.75	2.75	25.0	1.76	1.24
2022-23	15.0	12.50	9.00	38.9	2.50	3.50	16.7	2.15	1.44
Mean	15.0	11.87	8.75	35.7	3.13	3.13	20.9	1.81	1.33

Table 3: Economic analysis of the frontline demonstrations on redgram

Year	Cost of cultivation cost (Rs.ha-1)		Gross returns (Rs.ha-1)		Net return (Rs.ha-1)		Additional return (Rs.ha-1) FLD's	B:C ratio	
	Recommended Practice (RP)	Farmer's Practice (FP)	Recommended Practice (RP)	Farmer's Practice (FP)	Recommended Practice (RP)	Farmer's Practice (FP)		Recommended Practice (RP)	Farmer's Practice (FP)
2021-22	33750	36250	59625	45050	25875	8800	17075	1.76	1.24
2022-23	30750	33000	66250	47700	35500	14700	20800	2.15	1.44
Mean	32250	34625	62937	46375	30687	11750	18937	1.81	1.33

Conclusion

Redgram is a potential *kharif* pulse crop in Prakasam district of Andhra Pradesh but its productivity is very meagre due to unavailability of improved technology in the district. It is found from the study that there exists a wide gap between the potential and demonstration yields in redgram mainly due to technology and extension gaps and also due to the lack of awareness about new technology in redgram cultivation in Prakasam district of Andhra Pradesh. The higher average yield was recorded in demonstration plots over the years compared to local check due to increased knowledge and adoption of full package of practices. Hence, it is concluded that the FLDs programme is a successful tool in improving the production and productivity of redgram crops through FLDs with latest and specific technologies.

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