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Impact of Tribal Sub Plan (TSP) Intervention on Yield and Economics of Chickpea Cultivation in Kurnool District of Andhra Pradesh

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ABSTRACT

To promote improved chickpea varieties along with profitable crop management technologies, Regional Agricultural Research Station (RARS), Nandyal organized demonstrations on chickpea improved varieties along with crop package of practices in 210 tribal farmer's fields (84 ha) under Tribal Sub Plan during 2018-2021 in Kurnool district of Andhra Pradesh. The technology interventions included improved varieties (Nandyal Gram 49 and Nandyal Gram 119), seed treatment with vitavax power (1.5 g/kg seed), basal application of zinc sulphate, erection of pheromone traps @ 10/ha, prophylactic spray of neem oil and use of need based plant protection chemicals. The average yield of demonstration field with improved desi variety Nandyal Gram 49 (14.36 q/ha) was 19 per cent higher than the existing farmers practice (12.05 q/ha) and the average yield of 13.16 q/ha was recorded with improved kabuli variety Nandyal Gram 119 which resulted in 7.78 per cent yield increase over farmers practice (JG11/Vihar) (12.21 q/ha). These demonstrations resulted not only in higher yield, but the higher net returns and cost benefits indicated the worth of improved varieties and scope for further spread of other technological interventions in farmers' holdings.

INTRODUCTION

Andhra Pradesh's Scheduled Tribes (STs) represent 6.75 per cent of India's tribal population and 6.59 per cent of the state's population and predominant tribes in Kurnool district of Andhra Pradesh are Sugali and chenchu (Reddy & Kumar, 2010). The Kurnool district is categorized under scare rainfall zone of Andhra Pradesh due its scanty and uneven rainfall during crop season. In these conditions, the tribal farmers are totally dependent on agriculture and are facing problem with fluctuating yields. Hence, there is a need to improve/stabilize the crop yields by introducing crop specific interventions which can be achieved by implementation of Tribal Sub Plan (TSP) area approach.

Chickpea is the major rabi pulse crop cultivated in an area of 1.5 to 2 lakh ha in Kurnool district alone and the average yield obtained by the tribal chickpea farmers was 800-900 kg/ha which was 30-40 per cent lower than potential yield of the state (1211 kg/ha) (Directorate of Economics and Statistics, Planning Department, Andhra Pradesh, 2019-20). To maximize economic returns of tribal farmers, Regional Agricultural Research Station, Nandyal, a lead research station in scarce rainfall zone of Andhra Pradesh implemented Tribal Sub Plan (TSP) under All India Co-ordinated Research Project (AICRP) on Chickpea in 18 villages in different mandals of Kurnool district in a systematic manner to demonstrate the importance of newly released varieties and proven crop management technologies.

METHODOLOGY

Demonstrations under Tribal Sub Plan (TSP) were implemented in 210 farmers' fields during 2018-2021. Eighty five demonstrations were organized with Nandyal Gram 49 during the

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year 2018-19 and 2020-21 covering 12 villages; where one twenty five demonstrations were conducted with Nandyal Gram 119 variety during the year 2019-20 and 2020-21 covering 16 villages in Kurnool district. The technology interventions of these demonstrations under TSP were cultivation of improved varieties, seed treatment with vitavax power (1.5 g/kg of seed) and *Trichoderma viridi* (8-10 g/kg of seed) as a prophylactic measure against soil borne diseases, basal application of $ZnSO_4$ along with recommended application of N and P fertilizers, erection of pheromone traps (10 traps /ha) for managing *Helicoverpa armigera* and *Spodoptera exigua*, prophylactic application of neem oil and ETL based application of chlorantriniliprole to keep the pest level below the economic threshold level. The critical inputs supplied to the beneficiary farmers under TSP were high yielding chickpea varieties *i.e.* Nandyal Gram 49 (*desi*), Nandyal Gram 119 (*kabuli*), power sprayers, $ZnSo_4$, seed treatment and plant protection chemicals.

The extension gap, technology gap and technology index (Samui et al., 2000) were calculated using the standard methodology. Total 209 chickpea growing tribal farmers from different villages of Kurnool district were selected to measure the extent of adoption of recommended practices in chickpea cultivation. The data was collected by conducting personal interview with selected 209 respondents. The data was analyzed and interpreted.

RESULTS AND DISCUSSION

Yield and economic analysis

During 2018-19, an average yield of 1032.7 kg ha^{-1} was recorded with Nandyal Gram 49 and it was 35.2 per cent higher than farmer's practice-JG11 (763.4 kg ha^{-1}). In the year 2020-21, an average yield of 1839 kg ha^{-1} was recorded which was 11.73 per cent higher than farmers practice. The improved chickpea varieties released from RARS, Nandyal established the yield advantage of more than 10 per cent over popular varieties of the tract (Jayalakshmi *et al.,* 2017). In this study also, Nandyal Gram 49 variety has clearly showed its superior performance in both the years owing to intrinsic high yield potential of the variety compared with better wilt resistance (Table 1). Nandyal Gram 49 variety performed well under rainfed conditions and recorded higher yield (Deva *et al.,* 2019). The yield advantage of 9-10 per cent with Nandyal Gram 49 and 13-18 per cent with Nandyal Gram 119 varieties was demonstrated in selected districts of Andhra Pradesh during 2018 to 2020 (Palakurthi *et al.,* 2021).

The production and productivity of chickpea was improved with the introduction of improved chickpea varieties (Kassa *et al.,* 2021). Differences in yield of different varieties across sites were possible due to variation in weather conditions, soil fertility status and location specific management practices (Dudhade *et al.,* 2009 & Singh *et al.,* 2017). The average gross income of Rs. 81498/ha and net income of Rs. 67558/ha was recorded in demonstrated fields under TSP with cost benefit ratio of 1:2.62. Adoption of integrated pest management practices resulted in less cost of cultivation in demonstration plot compared to farmers practice which resulted in high C:B ratio. Maximization of chickpea productivity with improved crop management was also reported by Tomar (2010).

The farmers obtained an average yield of 1316 kg ha^{-1} with Nandyal Gram 119 and it was 7.79 per cent higher than farmer's practice Vihar (1221 kg ha^{-1}) during the years 2019-20 and 2020-21. The average gross income of Rs. 74898/ha and net income of Rs. 69597/ha was recorded in demonstrated fields with cost benefit ratio of 1:2.48. Increased returns due to demonstrations in farmers' holdings were reported by Kumbhare et al., (2014); Nain et al., (2014); Singh et al., 2019; Singh et al., (2019); Gireesh et al., (2019) & Singh et al., (2020).

An average technology gap under two years of demonstration was 5.64 q/ha with Nandyal Gram 49 (Table 2) and it was 6.85 q/ha with Nandyal Gram 119 (Table 2). The technology gap observed among various demonstrations may be attributed to dissimilarity in the soil fertility status, agricultural practices adopted by tribal farmers coupled with variation in local climatic situations of farm holdings. Extension gap of 2.31 and 0.95 q/ha was observed during 2018-19 and 2020-21 respectively with Nandyal Gram 49. This indicates the need to educate the tribal farmers for better adoption of improved technology. The extension gap of 1.07 and 0.83 q/ha was observed during 2019-20 and 2020-21 respectively with Nandyal Gram 119 kabuli variety. On an average extension gap of 1.63 and 0.95 q/ha was observed with Nandyal Gram 49 and Nandyal Gram 119 respectively.

An average of 28.21 per cent of technology index was observed with Nandyal Gram 49 variety and 33.23 per cent was observed with Nandyal Gram 119 variety during the two years of FLD programmes. The value of technology index shows the feasibility of spreading of improved technology at the farmer's field and the lower the value of technology index indicates the feasibility of technology is more (Nain et al., 2015; Kothyari et al., 2018; Singh et al., 2018).

Adoption of recommended package of practices by tribal farmers

Among the beneficiary farmers, majority of tribal farmers (60.29%) fully adopted the need based application of insecticides followed by recommended seed rate (55.02%), recommended improved varieties (51.20%) and seed treatment (49.28%).

Table 1. Economics of improved varieties along with full package demonstrations in chickpea

Year	No. of Demos	Variety	Yield		Gross Returns		Cost of Cultivation		Net Returns		B:C ratio	
			Demo	FP	Demo	FP	Demo	FP	Demo	FP	Demo	FP
2018-19	50	Nandyal Gram 49	1032.7	763.4	69191	51148	25970	26550	43221	24598	2.66	1.93
2020-21	35		1839	1646	93804	83968	36271	41357	57533	42611	2.6	2.03
Total	85		1435.85	1204.7	81497.5	67558	31120.5	33953.5	50377	33604.5	2.62	1.99
2019-20	100	Nandyal Gram 119	1306	1199	63670	58463	24437	26755	39233	31708	2.6	2.2
2020-21	25		1325	1242	86125	80730	35920	41050	50205	36980	2.4	1.97
Total	125		1315.5	1220.5	74897.5	69596.5	30178.5	33902.5	44719	34344	2.48	2.05

Table 2. Technology gap, Extension gap and Technological index of demonstration on chickpea

Year	Variety	No of demos	Area	Technology gap (q/ha)	Extension gap (q/ha)	Technology index (%)
2018-19	Nandyal Gram 49	50	20	9.67	2.31	48.37
2020-21		35	14	1.61	0.95	8.05
Total/Average		85	34	5.64	1.63	28.21
2019-20	Nandyal Gram 119	100	40	6.94	1.07	34.70
2020-21		25	10	6.75	0.83	33.75
Total/Average		125	50	6.85	0.95	33.23

Table 3. Practice wise adoption percentage of recommended practices chickpea cultivation by selected respondents

S.No.	Details of the Practice	Extent of Adoption		
		Non Adoption (%)	Partial Adoption (%)	Full Adoption (%)
1.	Recommended improved varieties	22.49	26.32	51.20
2.	Seed treatment	5.74	44.98	49.28
3.	Recommended seed rate	10.53	34.45	55.02
4.	Recommended Fertilizer application	26.79	37.80	35.41
5.	Basal application of zinc sulphate	64.59	23.92	11.48
6.	Integrated pest management Practices			
A)	Pheromone traps	55.50	30.62	13.88
B)	Neem oil	38.76	27.75	33.49
C)	Need based application of insecticides	8.61	31.10	60.29
D)	Need based application of fungicides	44.02	25.84	30.14

Comparatively lesser adoption was observed with respect to recommended fertilizer application (35.41%), usage of neem oil (33.49%) and need based application of fungicides (30.14%). The least adoption was for usage of pheromone traps (13.88%) and basal application of zinc sulphate (11.48%) (Table 3). Though low level of adoption (less than 15%) was found in practices like usage of pheromone traps and basal application of zinc sulphate, they have definite role in reducing cost of cultivation and in increasing seed yield. Similar findings were also reported by Nain et al., (2015); Kumar et al., (2016); Kumar & Kumawat (2019). The implementation of various extension activities should require for better adoption of these practices to get higher production in chickpea cultivation.

CONCLUSION

The demonstrations conducted with new improved varieties of chickpea were successful in changing farmer's perception and improving knowledge on recommended chickpea farming practices which resulted in higher yields. The beneficiary farmers also gained knowledge on quality seed production and obtained additional income from the quality seed of Nandyal Gram 49 and Nandyal Gram 119 supplied to the neighbouring farmers. Over all the interventions in selected villages improved net returns on account of adoption of new varieties with reduced cost of cultivation.

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