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Front Line Demonstration on Performance of Chickpea in Malwa Region of Madhya Pradesh

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ABSTRACT

Background: The concerned scientists of KVK, Ratlam (Madhya Pradesh) had organized front line demonstrations (FLDs) on chickpea production during *rabi* season of 2017-18 and 2019-20.

Methods: During 2017-18 and 2019-20 in *rabi* season, one hundred seventy five cluster front line demonstrations were conducted on chickpea crop by KVK covering whole Ratlam district at Jaora, Sailana, Alote and Piploda blocks using chickpea variety JAKI 9218 and JG 14. Besides, demonstrations were conducted ensuring timely sowing with recommended seed rate and spacing, balanced use of fertilizers and integrated pest management practices.

Result: The results revealed that 26.44 per cent yield increment was observed in the demonstration plots as compared to existing farming practices of chickpea due to adoption of improved package of practices.

Key words: Chickpea, Cluster front line demonstration, Pulses, Yield.

INTRODUCTION

Pulses are good source of protein and commonly called the poor man's meat by Reddy *et al*. (2007). Chickpea (*Cicer arietinum* L.) is a major legume crop of Fabaceae family. It is also known as gram and sometimes known as Egyptian or Kabuli chana particularly in northern India. India is the major chickpea producing country contributing over 75% of total world chickpea production. Pulses improve soil fertility through biological nitrogen fixation, require less water than cereals and their rotations with cereals help in controlling diseases and pests. It is also one of the major pulse crop cultivated during *rabi* season in the Ratlam district. Chickpea accounts about 45% of total pulses production. Chickpea is a high value legume crop suitable as protein complement for human being and animal. It is very important nutritious crop and its production in India is about 70 lakh tonnes. It is a good source of protein (18-22%), carbohydrate (52-70%), fat (4-10%), minerals (calcium, phosphorus, iron) and vitamins by Singh *et al*. (2014). Madhya Pradesh is the largest producer of chickpea in India which contributes about 39 per cent in production of gram followed by Maharashtra (14%) and Rajasthan (14%) by Kumar *et al*. (2011). The pulses are suitable for intercropping and mixed cropping and hence having multidimensional scope in all type of climatic conditions of our country. Chickpea alone accounts about 50 per cent of the total pulses production in India (Yadav, 2009). Legume crops are the gift of nature which play very important role in nitrogen fixation, soil fertility management, biomass enhancement, soil conservation and also helpful in improving the organic matter of soils grown as sole crop or intercrop by Singh *et al.* (2016). The average productivity of chickpea in India is about 841 kg/ha against the average global productivity of 1023 kg/ha (Anonymous, 2017-18). Front line demonstration programmes are effective in changing attitude and increasing knowledge about improved practices of chickpea including adoption. Further, FLDs also help to improve the relationship between farmers and scientists and build confidence among them. Kirar *et al*. (2004) reported that on partial and full adoption condition 17.50 and 7.50 per cent farmers increased in adopter condition over non adopter condition, respectively.

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MATERIALS AND METHODS

The concerned scientists of KVK, Ratlam (Madhya Pradesh) organized front line demonstrations (FLDs) on chickpea during 2017-18 and 2019-20 in *rabi* season. One hundred seventy five front line demonstrations on chickpea were conducted at farmers' field to assess chickpea yield performance during *rabi* seasons. The FLDs were conducted in four locations covering the whole Ratlam district at Jaora, Sailana, Alote and Piploda blocks. An extensive survey and group discussion were made before conducting the FLDs need assessment and farmer selection. Innovative farmers were selected through group meeting in each respective

year. The demonstrations were carried out on improved varieties of chickpea such as JAKI 9218 and JG 14, with recommended seed rate of 80kg/ha adopting line sowing by seed drill. Seed treatment was done with carbendazim 12% + mancozeb 63% WP @ 2 g/kg seed. Regular field visits made by the scientists ensured proper guidance in timely application of inputs and crop management. The relevant extension activities like field days and training at the demonstration sites were organized regularly to keep farmers motivated and aware of demonstrated technology and its performance at the farmer's fields. The yield data were collected from all demonstration units. Along with the farmers feedback and opinion for further improvement facilitating technology adoption.

Per cent increase over farmers practices =

$$\frac{\text{Improved practices - Farmers practices}}{\text{Farmers practices}} \times 100$$

Physico-chemical properties of Ratlam district soil are given in Table 1.

RESULTS AND DISCUSSION

Technological intervention on cluster basis

KVK and farmers made efforts in collaborative manner for enhancing production and productivity of chickpea. The recommended packages of practices were followed to conduct the FLDs at the farmers' fields. Improved chickpea variety *viz.,* JAKI 9218, JG 14 was demonstrated at farmers' fields. The technological interventions were seed treatment, line sowing, weeding, need based plant protection and balanced nutrient management. The difference between demonstrated practices and farmers practices is given in Table 2. Use of improved varieties, seed treatment, line sowing, timely sowing, balanced use of fertilizers, integrated pest management as suggested by Chattopadhyay *et al*. (2003) were used as technological interventions.

Performance of seed yield

The data (Table 3) showed that the seed yield of chickpea fluctuated successively over the years in demonstration plots. During 2017-18, maximum and minimum yield of variety JAKI 9218 was recorded 18.00 and 16.20 q/ha, respectively. Moreover, maximum and minimum yield of variety JG 14 during 2019-20 was 19.54 and 16.65 q/ha, respectively.

Table 1: Physico-chemical properties of ratlam district soil.

Particular	Soil depth (0-15 cm)
Chemical properties	
Soil pH (1:2.5)	6.95-7.90
Organic carbon (%)	0.32-0.65
Available nitrogen (kg ha^{-1})	150-230
Available P_2O_5 (kg ha^{-1})	12-21
Available K_2O (kg ha^{-1})	300-450

The average yield of two years under demonstration and farmers' practice was 17.60 and 13.92 q/ha, respectively. The yield increment was 2.90 and 4.47 q/ha during 2017-18 and 2019-20, respectively with an average (two years) of 3.68 q/ha over the farmers practice. The yield of varieties JAKI 9218 and JG 14 increased by 20.42% and 32.80% during the year 2017-18 and 2019-20, respectively with an average increase of 26.44% over the farmers' practices. The yield enhancement under the technology demonstration was due to the need based use of improved and disease resistant varieties, balanced use of nutrients, efficient weed management and insect pest management practices. The results were in conformity with the findings of (Narwale *et al*., 2009) who reported higher yield under FLD as compared to farmers practice in demonstration studies.

Economic performance of chickpea cultivation

Data pertaining to cultivation costs incurred in demonstration and famers' practice, net return and benefit cost ratio is presented in Table 4. The economics of chickpea cultivation and its feasibility in demonstration was calculated considering the existing prices of inputs and production costs over farmers' practice. The cost of production with the improved variety JAKI 9218 was Rs. 20450/ha in 2017-18 with an average cultivation cost of Rs. 22306/ha as compared to Rs. 19550/ha under farmers practice. The additional cost incurred with JAKI 9218 was Rs.900/ha during 2017-18 with the average (two years) of Rs. 507/ha over farmer practice. Under JG 14 variety demonstration, the cultivation cost was Rs. 24163/ha during 2019-20 and additional cultivation cost was Rs. 113/ha as compared to the farmer practice (Rs. 24050/ha). The additional cost incurred in the demonstration practice was mainly due to cost involved in fertilizers for balanced nutrient application and herbicide for weed management. The net return in chickpea cultivation was noticed to be remarkably higher under demonstration practice in variety JG 14 was Rs. 75868/ha as compared to farmers practice Rs.38898/ha with the additional of Rs. 36971/ha. Similarly the net return under demonstration practices in variety JAKI 9218 was Rs. 42370/ha with the additional Rs. 10820/ha as compared to the farmers practice of Rs. 31550. The results were in agreement with the findings of (Chandra *et al*., 2012; Mahadik and Talathi, 2016; Meena and Dudi, 2012; Rathore *et al*., 2016 and Sreelakshmi *et al*., 2012) who reported FLD farmers had more benefit as compared to existing practices in pulse crops like gram, moong, pigeonpea and cluster bean in different areas. Further, results revealed that additional net return of Rs.10820/ha generated with variety JAKI 9218 was less as compared to Rs. 36971/ha with variety JG 14 over the farmers practices. Similarly, variety JG 14 gave higher net return as compared to JAKI 9218 over the farmers' practice. Besides, FLD resulted in higher benefit cost ratio for JAKI 9218 and G 14 over the farmers practice. An average incremental B: C ratio of 1.03 was noticed over the farmers practice.

Table 2: Difference between farmers and demonstration practices.

Intervention	Farmer's practices	Demonstration practices
Seed rate	100 kg/ha	80 kg/ha
Spacing/ depth	Row × Row: 30 cm Plant × Plant: 10 cm Depth: 6-8 cm	Row × Row: 45 cm Plant × Plant: 20 cm Depth: 8-10 cm
Farming situation	Irrigated/rainfed	Irrigated/rainfed
Variety	Ujjain 21	JAKI 9218 and JG 14
Seed treatment	Seed treatment not done	(Carbendazim 12%+Mancozeb 63% WP) @ 2 g/Kg seed
Seed inoculation	No seed inoculation	*Rhizobium* and PSB culture @10 ml/kg seed
Sowing	1-10, October	1-10, October
Method of sowing	Line sowing	Line sowing at recommended spacing with seed drill
Fertilizer doses	Use of imbalance fertilizers	Balance dose of fertilizers:20: 40:20 kg/ha (NPK)
Weed control	No weeding	Two mechanical weeding

Table 3: Seed yield of chickpea in demonstration and farmers practices.

Years	Variety	No. of Farmer (Demo.)	Area (acre)	Yield (q/ha)					
				Demonstration			Farmer practice	Additional over farmer practice	% Increase over farmer practice
				Max.	Min.	Average			
2017-18	JAKI 9218	75	75	18.00	16.20	17.10	14.20	2.90	20.42
2019-20	JG14	100	100	19.54	16.65	18.10	13.63	4.47	32.80
	Average			18.77	16.43	17.60	13.92	3.68	26.44

Table 4: Economics of chickpea cultivation in demonstration and farmers' practices.

Years	Variety	Cost of cultivation (Rs/ha)			Net return (Rs/ha)			B-C ratio		
		DP	FP	Additional over FP	DP	FP	Additiona over FP	DP	FP	Incremental over FP
2017-18	JAKI 9218	20450	19550	900	42370	31550	10820	2.07	1.61	0.46
2019-20	JG 14	24163	24050	113	75868	38898	36971	2.14	1.62	0.52
	Average	22306	21800	507	59119	35224	23895	2065	1.62	1.03

CONCLUSION

Study was under taken at farmers' fields in Ratlam district of Madhya Pradesh in central India. Madhya Pradesh is the largest producer of pulses but there is gap between actual farmer yield and potential yield of pulse crops due to traditional cultivation practices. The yield performance of chickpea was studied through front line demonstration during 2017-18 and 2019-20. The existing farmers' practice was compared against improved varieties of chickpea (JG 14, JAKI 9218) managed with soil test based nutrient application and integrated crop management practices. The study revealed that an average yield of chickpea under demonstration plots were obtained 17.60 q/ha over farmers' practice which was 13.92 q/ha. Yield increased by 26.44 per cent over farmers' practice.

Conflict of interest

All authors declared that there is no conflict of interest.

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