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Impact of improved production technologies in greengram through frontline demonstrations

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Abstract
Greengram may be seen as one of the alternative crop to rice in *kharif* season in the pursuit of diversification and sustainability of rice-wheat cropping system in Punjab. Therefore, there is perceptible need to demonstrate the farmers latest improved technologies related to greengram production. The present study was conducted by Krishi Vigyan Kendra, S.A.S. Nagar during *kharif* season in 2017 with fifty three frontline demonstrations across twenty three villages of Mohali district. Improved and latest technology *viz*. Yellow Vein Mosaic (YVM) resistance varieties i.e.ML 2056 and MH 421, seed treatment with bio-fertilizer and fungicide, recommended seed rate, proper dose of fertilizers, herbicide application and plant protection measures were demonstrated. The results of demonstrations showed that farmers could increase the Greengram productivity notably by switching over to improved varieties and adoption of improved production technologies. Both the varieties (ML 2056 and MH 421) recorded higher yield (12.2 q/acre and 13.4 q/acre, respectively) than the farmer adopted variety (10.1 q/acre). The increase in the demonstration yield over farmer's practices was 20.8 per cent (ML 2056) and 32.6 per cent (MH 421). Net return and B: C ratio of demonstration plots were also higher than farmers practice.

Keywords: Greengram, cluster frontline demonstrations**,** improved technologies, yield, B: C ratio

Introduction
Pulses are important for diversification and intensification of agriculture across the globe because of their intrinsic values such as nitrogen fixing ability (15-35 kg N/ha), high protein content and ability to survive in less endowed environment. The per capita availability of pulses is dwindling fast from 70 g in 1959 to 31.6 g/capita/day in 2011 as against the minimum requirement of 84 g/capita/day prescribed by Indian Council of Medical Research, which is causing malnutrition among the growing population. Greengram [*Vigna radiata* (L.) *Wilczek*], also known as mungbean, is an excellent source of protein (24.5%) with high quality of lysine (460 mg/g) and tryptophan (60 mg/g). India has the distinction of being the top producer of greengram in the world (Ali and Kumar, 2006) [1]. It occupies 29.36 lakh hectare area and contributes 13.90 lakh tonnes in pulse production in the country (Anonymous, 2015-16) [2].
Greengram is primarily a rainy season crop but with the development of early maturing varieties, it has also proved to be an ideal crop for spring and summer season. After picking of pods, greengram plants may be used as green fodder or green manure. India has imported 379.69 thousand tons of moon in the year 2014-15 (DES, DAC and DOC 2015) [3]. Since there is little scope for horizontal growth in acreage, the only alternative left is to achieve vertical growth through increasing the existing level of production. Being a short duration crop, it suits well in various multiple and intercropping systems. It occupies a unique position in every farming system *viz*., main, catch, cover, green manure, intercrop and mix crop. Its cultivation during summer season has received wider acceptance from farming community. But, very few attentions is paid to kharif season greengram which has the potential to act as substitute for rice crop requiring much more irrigation water.
Greengram crop is generally cultivated on marginal lands having low soil fertility and under rainfed conditions.

Moreover, poor agronomic practice with respect to selection of suitable variety, nutrient management, weed management and plant protection measures etc. are responsible for low productivity of greengram crop in India. The available agricultural technology does not serve the very purpose until it reaches and adopted by its ultimate users the farmers. The extent of adoption of improved agricultural technologies is a crucial aspect under innovation diffusion process and the most important for enhancing agricultural production at a faster rate. The gap between recommendations made by the scientists and actual use by farmers is frequently encountered. Frontline demonstration is an important tool for transfer of latest package of practices in totality to farmers and the main objective of this programme is to demonstrate newly released crop production and protection technologies and management practices at the farmers' field under the real farming situation. Through this practice, the newly improved innovative technology having higher production potential under the specific cropping system can be popularized and simultaneously feedback from the farmers may be generated on the demonstrated technology. Keeping this in view, frontline demonstrations (on farmer's fields) on greengram crop were conducted to demonstrate the production potential and economic benefits of newly released varieties and latest improved technologies to the farmers.

Materials and Methods

Fifty three frontline demonstrations to demonstrate the effect of high yielding varieties and latest technology on productivity of pulse crops were conducted on farmers' fields across twenty three villages of Mohali district (Punjab) under "Cluster Frontline Demonstration on Pulses" project during kharif 2017. District S.A.S. Nagar (Mohali) of Punjab falls under submountainous zone (30.69°N latitude, 76.72°E longitude having an average altitude of 316 m from the sea level).The fields had a history of rice-wheat rotation for more than 3 years. The climate of this area can be classified as subtropical monsoon type. The average rainfall is 600-700 mm, out of which about 70% rainfall is received during the period from July to September. The soils of the farmer fields were sandy loam to silty clay loam in texture, neutral to slightly alkaline in reaction with low to medium soil organic carbon and medium to high in phosphorus and potassium. The technologies selected for FLDs were yellow vein mosaic (YVM) resistance varieties, seed treatment with bio-fertilizer and fungicide, recommended seed rate, proper dose of fertilizers, herbicide application and plant protection measures (Table 1).

The list of the innovative farmers was made and scrutinized according to their level of knowledge and finally selected for demonstrations. The selected farmers were given training on cultivation methods of greengram production including integrated pest and disease management. Besides this, the farmers were also guided for marketing of moong at appropriate time on the basis of marketing advisories given by PAU. The grain yield from each plot was calculated separately as the harvesting was done under the supervision of Krishi Vigyan Kendra's scientists. Each demonstration was of 0.2 to 0.4 ha area and the critical inputs were applied as per the package of practices for Rabi crops recommended by the Punjab Agricultural University, Ludhiana. The quality seed of greengram variety ML 2056 and MH 421 were made available to the farmers for conducting front line demonstrations, whereas, only those farmers were considered for farmers' practice who also cultivated local greengram varieties at farmers' fields. The sowing period of crop was mid-June to last week of July under assured irrigation conditions and harvested during second fortnight of October. The demonstrated plots as well as the farmer's fields were also regularly monitored by the scientists of KVK Mohali right from sowing up to harvesting. The grain yield of both demonstration plots as well as of farmers' field was calculated separately for economic analysis. The primary data were collected from the respondent farmers with the help of structured interview schedule. The data were interpreted and presented in terms of percentage, the qualitative data were converted into quantitative form by using different statistical methods and expressed in terms of per cent increase yield.

Table 1: Package of practices followed for demonstrations and control (farmers' practice) plots in greengram crop

Practices	Control (Farmers' practice)	Demonstration
Variety	Local/Non-descript varieties	Improved varieties(ML 2056 and MH 421)
Seed Treatment	Not applied	Chlorpyrifos 20 E C + Not applied Captan @ 3g/kg seed + Rhizobium culture
Weed control	One hoeing	Pre-emergence spray of pendimethalin @ 2.5 litre/ha
Fertilizer dose	Irrational use of nitrogenous fertilizer and non-application of SSP	Urea @ 32.5 kg/ha and SSP @ 125 kg/ha (On soil test basis)
Method of fertilizer application	Broadcasting	Fertilizers drilled at the time of sowing
Plant protection measures	On ET level of insects	Over dose/ un recommended brands of insecticides and fungicides

Results and Discussion

Constraints in greengram production: The availability of suitable high yielding variety (HYV) seed (75%) was given the top most rank followed by low technical knowledge (71%), germination/crop stand, and uncertainty of monsoon rains/drought (52%) were the major constraints to greengram production. Other constraints such as insect infestation and post-harvest management were also found to reduce greengram production (Table 2).

Table 2: Ranks given by farmers for different constraints (n=100)

Constraints percentage ranks	Percentage	Rank
Availability of suitable HYV seed	75	I
low technical knowledge	68	II
Low germination/crop stand and uncertainty of monsoon rains/drought	52	III
Insect infestation	46	IV
Post-harvest management	33	V

Effect of Fld Programme on Production Performance of Green gram

Data of yield and economic parameters are presented in table 3. The results revealed that the yield of greengram was considerably more under demonstration plots as compared to local check. The productivity of ML 2056 variety ranged between 11.6 to 12.8 q ha^{-1} with a mean yield 12.2 q ha^{-1}, while that of MH 421 variety ranged between 12.7 to 14.1 q ha^{-1} with mean value of 13.4 q ha^{-1} in comparison to the productivity of 10.1 q ha^{-1}, respectively for local variety (Table 3). Improvement in productivity was mainly due to better nutrient management in the FLDs as the basal nitrogen application helps in crop establishment. Similar enhancement in productivity of different crops in front line demonstration has been documented by Mishra *et al*. (2009); Katare *et al*. (2011) [4]; Meena *et al*. (2014) [5] and Singh *et al*. (2014) [7]. The increase in the demonstration yield over farmer's practices was 20.8 per cent (ML 2056) and 32.6 per cent (MH 421). The results indicated that farmers were motivated by HYVs and improved technologies demonstrated in the FLDs which has resulted in adoption of these improved technologies. Numerous extension activities like method demonstration, kisan gosthi, trainings, field days and field visits were carried out by KVK scientists.

The results revealed that the net returns from the demonstrated plots were received more than control plot. The net return from the demonstration plot was recorded Rs 47,100/ha (MH 421) and Rs 41,100/ha (ML 20156) as compared to control plot i.e. Rs 30,600/ha. The additional income of Rs 16500/ha (MH 421) and Rs 10500/ha (ML 20156) was due to the technological interventions in demonstration plots. FLDs recorded higher B:C ratio 3.37 (MH 421) and 3.03 (ML 20156) in comparison to farmers' practice (2.54). The higher returns obtained under demonstrations could be due to improved technologies, timely operations of crop cultivation, non-monetary factors and scientific monitoring. The results confirm the findings of front line demonstrations on pulse crops by Yadav *et al*. (2004) [10] and Lathwal (2010) [11].

Table 3: Influence of FLDs on seed yield and economic parameters of green gram

Technology (Improved varieties)	Yield (q ha^{-1})				Net Returns (Rs ha^{-1})		B:C ratio	
	Improved technology (IT)*	Farmer practice (FP)	Extension gap	% increase in yield over Farmer practice	Improved technology	Farmer practice	Improved technology	Farmer practice
ML 2056	12.2	10.1	2.1	20.8	41100	30600	3.07	2.54
MH 421	13.4	10.1	3.3	32.6	47100	30600	3.37	2.54

Conclusion

The results from the present study clearly brought out the potential of improved production technologies in enhancing greengram production and economic gains. The frontline demonstrations conducted on greengram at the farmers' fields revealed that the adoption of improved production technologies significantly increased the yield and net returns to the farmers. So, there is need to effectively disseminate these improved technologies among the farmers that may be achieved by various extensions activities like training programme, field day, exposure visit organized in CFLDs programmes in the farmer's fields.

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