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RESEARCH ARTICLE :

Impact of front line demonstration on production of summer moong in Barnala district

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SUMMARY : Pulse crops have been the backbone of agricultural economy of India from time immemorial. The productivity of moong crop in Barnala district of Punjab state is low due to non-adoption of improved package of practices. Therefore, efforts have been made through front line demonstrations (FLD) to demonstrate improved production technologies to increase productivity of moong crops in the district. Twenty front line demonstrations were conducted on summer moong covering an area of 8.0 hectare and latest production and protection technologies were exhibited. Farmers were randomly selected from adopted villages for conducting front line demonstration. A 13.70 % increase in yield of moong under the demonstration plots over farmer's practices was recorded. Improved variety of moong SML 668 gave the highest yield 11.08 q/ha and 11.15 q/ha as compare to the farmers' practiced variety which gave 9.80 q/ha and 9.75 q/ha yield in the year 2016 and 2017, respectively. The mean extension gap, technology gap and technology index were found 1.34 q/ha, 0.14 q/ha and 1.20 %, respectively. Recommended technologies gave higher mean net return of Rs. 35365 per hectare with a benefit cost ratio 3.25 as compared to farmers practice with mean net return of Rs. 29205 per hectare with a benefit cost ratio 2.86.

KEY WORDS :
Moong, Front line demonstration, Cost of cultivation, Net-return, Yield

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BACKGROUND AND OBJECTIVES

Green revolution lead the India to become self sufficient in the production of cereal crops. High yielding varieties of wheat and paddy produce plenty of calories to the Indian population. Post green revolution leads to abolition of wide array of land races, genetic diversity of crops and leads to the deficiency in protein malnutrition. Pulses are rich source of proteins and can play a vital role in fulfilling the requirement of swiftly increasing population.

India is the world's first largest producer (25%) and consumer (27%) of Pulses. During the last year 2016 country has produced 16.47 MT of pulses from the 25.26 M ha area (Anonymous, 2016). Pulses productivity of India is less than world average and our production is not sufficient to fulfill the domestic demand itself. As a result, India is importing moong every year from various countries *viz*., Mayanmar, Canada and Kenya. Moong is an important pulse crop which supplies dietary protein to vegetarian population of India. Besides a rich source of protein, it requires less water, maintains soil fertility by fixation of nitrogen in soil and thus plays a important role in sustainable agriculture (Kannaiyan, 1999).

In the year 1991-92 Indian Government established a "Technology Mission on Pulses" to improve the pulse production and productivity through front line demonstration. The mandate, of the Krishi Vigyan Kendra (KVKs) are application of technology through assessment, refinement and demonstration of proven technologies under different 'micro farming' situations in a district (Das, 2007). The production and productivity of moong is not adequate in the district due to use of poor quality seed, poor production technology, attack of yellow mosaic virus (YMV), and incidence of insect-pests. Therefore, it is necessary to demonstrate production and protection technologies to the farmers which are not adopted by them. Taking into the concentration front line demonstrations were conducted on summer moong (var. SML 668). The major objectives of the study was to demonstrate the performance of recommended high yielding summer moong variety with full recommended package of practices and to compare the yield levels of local check.

Resources and Methods

The present study was conducted with aim to assess the impact of front line demonstrations on production of summer moong. The front line demonstration of summer moong for the year 2016 and 2017 was considered for the studies, which were laid out in adopted villages of district Barnala (Punjab) by Krishi Vigyan Kendra. The soil of the district is generally sandly loam in texture. A total 8.0 ha area was covered under the front line demonstration (4.0 ha in each year). Front line demonstrations were conducted in two adopted villages at field of 20 farmers in the area of 0.4 hectare each. In demonstration fields moong crop was grown according to the package of practices (Anonymous, 2017). Before providing the critical input a training programme was arranged for farmers to educate about recommended technologies to be demonstration. In demonstration quality seeds of improved variety, seed treatment, recommended dose of fertilizers, *Rhizobium* biofertilizers, weed management and plant protection management techniques were demonstrated on the farmer's field through front line demonstration at different locations. The conventional practices were maintained in case of local checks. All the important farm operations were performed under the supervision of KVK scientist by regular visits. At front line demonstration site off campus trainings were organized to extent the technology to other farmers of the area. Opinion of the farmers about technologies used under demonstration was collected for further improvement in research and extension activities. The data were collected from front line demonstration's fields as well as from control field (farmers practices) and finally the technology gap, extension gap, technology index and corrected mortality of pod borer were calculated as formula given by Samui *et al.* (2000) and Henderson and Tilton (1955), respectively. The results were analyzed statistically using analysis of variance (P=0.05) ANOVA (Gomez and Gomez, 1984).

Technology Gap = Potential yield – Demonstration yield.

Extension Gap = Demonstration yield – Farmer's yield.

Additional Return= Demonstration Return- Farmer practices return

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

$$\text{Corrected mortality} = \left[1 - \frac{\text{n in Co before treatment x n in T after treatment}}{\text{n in Co after treatment x n in T before treatment}}\right] \times 100$$

where; n= Insect population, T= Treatment, Co= Control

Observations and Analysis

The results obtained from the present study as well as discussions have been summarized under following heads:

Grain yield:

Technologies undertaken in demonstration fields and practices adopted by farmers in control are presented in Table 1, revealed that farmers were not adopted a single recommended practices in moong crop as moong are considered marginal crop by the farmers. The grain yield of moong under front line demonstration varied from 11.08 q/ha to 11.15 q/ha, however in farmer's practice grain yield varied from 9.75q/ha to 9.80 q/ha. In front line demonstration plots significantly mean higher grain yield 11.11 q/ha was recorded as compared to farmer practices (9.77 q/ha) (Table 2). In front line demonstration plots (recommended practice), there was increase in grain yield of moong 13.06 % and 14.35 % during the year

2016 and 2017, respectively as compared to farmers practices. These results collaborates with findings of Singh *et al*. (2012a); Lalit *et al*. (2015) and Kumar and Kispotta (2017) who also reported that increase in grain yield of moong under front line demonstration plots. The superior grain yield of moong crop obtained under front line demonstration was due to the use of improved variety, recommended seed rate, seed treatment, use of *Rhizobium* biofertilizers, recommended dose of fertilizers, pre-emergence weed management and insect-pest management. Balai *et al*. (2013) and Kaur *et al*. (2014) also reported that use of recommended practices for moong cultivation improve grain yield.

Extension and technology gap:

The extension gap varied from 1.28 q/ha to 1.40 q/ha during the period of study. The average extension gap was observed 1.34 q/ha. The extension gap showed an increasing trend. The technology gap ranged from 0.10 q/ha and 0.17 q/ha during the study period. The average technology gap was observed 0.14 q/ha. Technology index varied from 0.88 to 1.51 % and showed the feasibility of evolved technology at the farmer's field. The lower is the value of technology index, the more is the feasibility of technology demonstrated was also reported by Lalit *et al*. (2015) and Singh *et al*. (2017).

Economics of front line demonstration:

The cost of cultivation, gross return, net return, cost benefit ratio and additional return presented in Table 3, revealed that the cost of cultivation varied from Rs. 15575 to Rs. 15925 per hectare with mean value of Rs. 15750 per ha under front line demonstration, however under farmer's practices cost of cultivation varied from Rs. 15450 to Rs. 16090 per hectare with mean value of Rs. 15770 per ha. The highest net return was obtained under front line demonstration *i.e.* Rs. 39825 and Rs. 30905 per ha as compared to Rs. 33550 and Rs. 24860 per ha under farmers practices during 2016 and 2017, respectively. The average benefit cost ratio of recommended practices was higher (3.25) than farmers practice (2.86). Higher additional return was obtained under demonstration (Rs. 6275) as compare farmer practice (Rs. 6045) with a mean of Rs. 6160 due to adoption of improved production and protection technologies. These results collaborate with the studies of Raj *et al*. (2013) and Kumar *et al*. (2015) who also reported that additional return was increased under front line demonstration plots. Similarly, increase in grain yield of moong under recommended practices also have been

Table 1 : Difference between technological intervention and farmers practices for moong crop

Sr. No.	Particular	Front line demonstration practices	Farmer's practices
1.	Variety	SML 668	Local variety
2.	Seed rate	37.5 kg/ha	30 kg/ha
3.	Seed treatment	Thiram@3g/kg seed	Not applied
4.	*Rhizobium* culture	Seed treated with *Rhizobium* @ one packet	Not treated
5.	Time of sowing	March 20 to April 10	Second fortnight of April
6.	Weed management	Stomp @ 2.5 l/ha	Don't use weedicide
7.	Fertilizer dose	Urea: 27.5kg/ha and SSP: 250 kg/ha (On soil test basis)	Irrational use of nitrogenous fertilizers and non application of DAP
8.	Method of fertilizer application	Fertilizers drilled at the time of sowing	Broadcating
9.	Insect-pest management	Need based spray of insecticide at Economic threshold level (ETL)	Overdoses/ un recommended brands of insecticide

Table 2 : Grain yield and gap analysis of front line demonstration on summer moong

Year	Area (ha)	No. of farmers	Yield Q/ha			% increase over farmer practices	Technology gap (Q/ha)	Extension gap (Q/ha)	Technology index (%)
			Potential	Demonstrated plots	Farmer practices				
2016	4	10	11.25	11.08	9.80	13.06	0.17	1.28	1.51
2017	4	10	11.25	11.15	9.75	14.35	0.10	1.40	0.88
	Average		11.25	11.11	9.77	13.70	0.14	1.34	1.20
			P value=0.04 (2016), P value=0.01(2017)						

Q=Quintal, ha=Hectare

Table 3 : Economics analysis of demonstrated plots and farmer practices

Year	Average cost of cultivation (Rs./ha)		Average gross return (Rs./ha)		Average net return (Rs./ha)		B:C ratio		Additional return
	Demonstrated plots	Farmers practices	Demonstrated plots	Farmers practices	Demonstrated plots	Farmers practices	Demonstrated plots	Farmers practices	Rs. /ha
2016	15575	15450	55400	49000	39825	33550	3.55	3.17	6275
2017	15925	16090	46830	40950	30905	24860	2.94	2.54	6045
Average	15750	15770	51115	44975	35365	29205	3.25	2.86	6160

B: C ratio=Cost benefit ratio, ha=Hectare

Table 4 : Effectiveness of insecticides against pod borer, *Helicoverpa armigera* infesting moong

Sr. No.	Year	Treatments	Pre count 1 DBS	Per cent reduction in population over untreated check (%)			Mean (%)
				3DAS	7DAS	10DAS	
1.	2016	Traces 45 SC @ 150 ml/ha (Recommended technology)	41.2	67.94	73.23	79.98	73.72
		Quinalphos 25 EC@ 2.0 ltr/ha (Farmer's Practices)	42.4	60.47	62.12	71.06	64.55
		Mean		64.20	67.67	75.52	
		Untreated Check	41.4	42.00	42.80	43.20	
		CD (P=0.05): Treatment (A)= 2.94; Days after spray (B)= 3.60					
2.	2017	Traces 45 SC @ 150 ml/ha (Recommended technology)	39.4	69.19	71.88	77.70	72.92
		Quinalphos 25 EC@ 2.0 ltr/ha (Farmer's Practices)	38.2	59.89	63.01	72.00	64.97
		Mean		64.54	67.44	74.85	
		Untreated Check	38.0	38.20	39.80	39.80	
		CD (P=0.05): Treatment (A)= 3.83; Days after spray (B)= 4.69					

DBS=Days before spray; DAS= Days after spray

reported by Singh *et al*. (2012b) and Pagaria (2015).

Insect-pest incidence:

Pod borer (*Helicoverpa armigera*) is a major pest which cause significant yield reduction in moong. Larvae of pod borer varied from 38 to 42 per ten plants before spray. After the application of recommended spray Tracer 45 SC (Spiosad) @ 150 ml per hectare in front line demonstration plot maximum larval population reduction (79.98% and 77.70 %) after 10 DAS was observed, however, in farmers practice's spray of uncommended insecticides, Quinalphos 50 EC @ 2.0 ltr per hectare leads to less reduction of pod borer population (71.06% and 72.00%) during the 2016 and 2017 year, respectively (Table 4). In front line demonstration plots significantly higher mean population reduction (73.72 and 72.92%) was observed as compared to farmer practices (64.55 and 64.97%) during the period of study. The less pod damage per plant after the application of recommended insecticide also reported earlier by Yadav *et al*. (2007) and Roy *et al*. (2006).

It could be concluded from the present study that frontline demonstration was successful in changing the outlook of the farmers towards pulse cultivation. Cultivation of summer moong according to recommended practices has increased the expertise and understanding of the farmers. The farmer were convince for adopting the precise technologies like improve variety, seed treatment, seed inoculation with rhizobium biofertilizers, pre-emergence weed management and plant protection measures were undertaken in a proper way. Front line demonstration also helped in replacement of local unrecommended practices with improved recommended practices. The productivity improvement under front line demonstration over farmer's practices of summer moong cultivation has created better awareness and motivated the other farmers to adopted suitable production technology of summer moong.

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