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Research Article

Performances of Green Gram and Black Gram under FLD Programmes in lateritic Soil of West Bengal, India

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ABSTRACT

Demand- Supply gap of pulses in West Bengal was 1.27 million tons in the year 2010-11. Besides the demand-supply scenario, from the nutritional perspective, the requirement of grain legumes/ pulses is ideally 14.6 kg/ person/ year whereas, the availability of grown pulses in 2010-11 was 0.0017 kg / person/ year in West Bengal. Considering the same situation in Birbhum District to bridge the gap, Front Line Demonstration (FLD) programmes on summer

Green Gram and summer Black Gram were conducted during the years 2013 and 2014 in the adopted villages of the Rathindra Krishi Vigyan Kendra, Institute of Agriculture, Visva-Bharati, Sriniketan, Birbhum, West Bengal, India. The demonstrations were conducted in the irrigated medium land situation and sandy loam soil with low pH (6.1- 6.3), organic carbon (0.40 - 0.47 %) and available phosphate (17.5-8.8 kg P_2O_5/ ha) content. The varieties PDM-84-139 of Green Gram and WBU- 108 of Black Gram were demonstrated as improved technologies against the local check variety B -105 and B -76 respectively. In the case of Green Gram, 65 numbers of demonstrations in 5.0 ha area during summer 2014 were conducted. Due to intervention of new improved variety the average yield of Green Gram was increased by 24.5 % with better B: C ratio of 2.99 as compared to 2.6 in the local check variety. In the case of Black Gram, 43 and 37 numbers of demonstrations in 5.0 ha and 4.0 ha area during summer 2013 and 2014 respectively were conducted. The average yield of Black Gram was increased by 20.3 & 29.4% with higher B: C ratio of 2.71 & 2.48 in comparison to 2.3 & 1.94 in the local check variety respectively during 2013 & 2014. The cultivation of short duration varieties of Green Gram and Black Gram were found acceptable to the farmers resulting in rapid horizontal spread of Green Gram var. PDM- 84- 139 in 84 ha of land whereas the horizontal spread of Black Gram var. WBU-108 was in an area of 140 ha within 2 years. Improved variety of Black Gram was found more acceptable by the farmers may be due to easier harvesting of Black Gram though Green Gram fetched slightly higher B: C ratio due to higher price in market.

Key word: FLD, green gram, black gram, PDM-84-139, WBU-108, variety, yield, B: C ratio, horizontal spread

INTRODUCTION

India is one of the major pulse producing countries contributing about 33 per cent of world area and 25 per cent of world production of pulses. Pulses are also an important component of Indian agricultural economy next to food grains and oilseeds in terms of acreage, production and economic value [1]. There is a sharp decline in the availability of pulses in the country from 69 g/capita/day in 1961 to 33 g/ capita/day in 2009-10 (ICMR recommends 65 g/day/capita) [2]. To overcome the problem of protein energy malnutrition, a minimum of 50 g pulses/capita/day should be available in addition to other sources of protein. To make the national pulse production sufficient, the average yield level has to

increase substantially up to 1200 kg/ha by 2020 [3, 4]. Due to the mismatch between supply and demand of pulses, prices of pulse crops have increased exorbitantly. To meet the demand for pulses, India has been importing a large quantity of pulses in recent years. The country is importing pulses to the tune of 2.5-3.5 million tonnes every year for meeting the demand of the growing population. The import of pulse crops increased from 0.38 Mt in 1993 to 2.8 Mt in 2008 (about 16 per cent of the domestic consumption). Though, all these factors are positive for pulse production, still the Pulses are least preferred by the farmers due to high production risks and uncertain returns as compared to rice, wheat and other cereals. In India, the irrigated area under pulses was only 12 per cent, while under wheat and paddy; it was more than 60 per cent of the total area [5, 6]. There is a need for varietal and seed replacement and application of best practices in farmer's field for getting higher production. It is felt that there is shortage of quality seeds of newer varieties of pulses. So, Krishi Vigyan Kendra (KVKs), a vast network of ICAR in the country, can play an important role in demonstrating the improved crop production technologies in farmer's fields and multiplication of seeds. Under this scenario, the Front Line Demonstration Programme on Improved Varieties of Lentil was undertaken by the Rathindra KVK, Birbhum, West Bengal with the following objectives:

- To minimise the problem of low yield of Summer Pulses like Green gram and Black gram
- To increase the area, production and productivity of Summer Pulses like Green gram and Black gram in the district
- To spread the technology of new improved variety throughout the district instead of local variety
- To increase the benefits of the farmers in the same time and same unit of land.

MATERIALS AND METHODS

Front Line Demonstrations (FLD) on Black gram and Green gram using improved varieties WBU-108 and PDM 84-139 were conducted during summer season of the year 2013 and 2014 respectively in the adopted villages. The demonstrations were carried out in 43 and 37 farmers' fields of 5 ha and 4 ha area of Blackgram during 2013 and 2014 respectively and 65 farmers' fields of 5 ha area of Green gram during the year 2014. FLDs were conducted in irrigated medium land situation under lateritic soils with sandy loam in texture having low in pH (6.1-6.3), O.C (0.40-0.47 %), avail. Phosphate (17.5-18.8 kg P_2O_5/ha) and medium in N and K content. The problem of low productivity of Black gram and Green

gram was analyzed through using Participatory Rural Appraisal (PRA) techniques like Focus Group Discussion and Group Discussion. Among the bio-physical constraints, the lack of good quality seed of new improved varieties was ranked first. In this context, the new improved varieties viz. WBU-108 of Black gram and PDM 84-139 of Green gram were selected for FLD. Farmers' fields were selected according to the potentiality and willingness of the probable partner farmers of different villages in different Community Development Blocks of Birbhum district of West Bengal. On Campus farmers' training were conducted to aware and impart knowledge about the new improved variety selected for demonstration in the partner farmers' plots. Local Check Variety was found B-76 for Black gram and B-105 for Green gram. The seed of the improved varieties of both the crops were distributed @ 30 kg / ha. The sowing in all the demonstration plots of both the crops were completed within the 20th February in both the years. The crops were totally managed by farmers. They shared all the inputs except the only critical inputs i.e. seeds of the improved variety which was shared by KVK. After harvesting and threshing, the yield data were obtained from individual partner farmers plots. Then weighted mean of the yield was calculated to obtain the average yield. Then total cost of cultivation was calculated on the basis of discussion with farmers. The price of the crop in the local market was used for calculation of gross return.

RESULTS AND DISCUSSION

From the Table -1, it was noted that 43 and 37 numbers of Front Line Demonstrations (FLDs) on improved Black gram varieties i.e. WBU -108 were implemented in 5 ha and 4 ha area during the year 2013 and 2014 respectively whereas, 65 numbers of FLDs on improved Green gram varieties i.e. PDM 84-139 were conducted in 5 ha area during the year 2014 considering the thematic area of varietal replacement. The perusal of the data (Table - 2) on the performance of the FLDs clearly indicated that average yield of the crop black gram was increased by 20.3 and 29.4 per cent respectively in the year 2013 and 2014. In both the years, the average yields of the demonstration of the variety WBU-108 of black gram were found 9.5 and 9.2 q / ha which were satisfactorily higher than those of the local check plots having the variety B-76 (7.9 and 7.1 q / ha) respectively. Thus it minimised the yield gap by 64 and 75 per cent in the two years respectively with reference to the potential yield of the improved variety i.e. 12 q / ha.Similarly, the average demonstration yield of green gram variety PDM 84-139 was found 11.7 q / ha which was remarkably higher than those of the local check yield of the variety B-105 i.e. 9.4 q / ha. The yield gap with reference to potential yield of the variety PDM 84-139 (14 q/ha) was reduced by

87 per cent using the technology of improved variety. It was revealed that (Table-3) the demonstration of improved variety of black gram fetched higher B:C ratio of 2.71 and 2.48 in comparison to 2.3 and 1.94 as reported in the local check during 2013 and 2014 respectively obviously due to more root ramification and better nodulation of the crop. Improved variety of green gram exhibited higher B:C ratio of 3.0 in comparison to 2.6 in local check during the year 2014. The FLD on improved variety of green gram fetched higher benefit cost ratio than black gram, not only due to higher yield but also due to higher price of green gram. Additional net returns of Rs. 5611.00- 10,211.00 /ha in black gram and Rs. 20,611.00 /ha in green gram were obtained due to higher yield potential of the improved variety. This might be due to suitability of those varieties to the micro-climatic situation and soil condition of Birbhum district. The study on soil analysis before and after the crops under FLDs revealed (Table-4) that the decaying of large number of roots and nodules improved the soil pH, organic Carbon and thus available Nitrogen content after the harvest of the crop and thus maintained the soil health and sustainability due to use of improved varieties of black gram and green gram during the year 2013 and 2014. Among the crops Green gram performed better in improving soil in reference to all the parameters under study. It might be due to higher nodulation and more extensive deep rooted system in green gram than black gram by nature. The similar type of result was obtained other scientists [7, 8]. Thus the short duration varieties of Black gram and Green gram were found acceptable to the farmers resulting in rapid horizontal spread of both the crops within 2 years. It might be due to higher net return and improved soil health obtained by the farmers after the crops under FLDs. Beside that black gram is more expanded horizontally because of its easy harvesting in comparison to green gram where picking and shattering of seeds are found.

CONCLUSION

The improved varieties of Black gram and Green gram were found successful to minimise the yield gap and to increase the area, production and productivity of pulses in the Birbhum District of West Bengal. Further it may also be noted that replacement of old local variety of Black gram and Green gram may successfully be adopted by using the improved varieties of WBL- 108 and PDM 84-139 respectively. Beside the vertical improvement of the productivity of Black gram and Green gram, horizontal spread of the technology is also ensured due to improvement of economics of production of black gram and green gram in specific and pulse in general.

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LIST OF TABLES

Table no.1: Implementation of FLD Programmes on Green gram and Black gram by the Rathindra KVK, Birbhum

Year	Crop	Variety	Thematic Area	Technology Demonstrated	Area (ha)	No. of Farmers / Demonstration

2013	Black gram	WBU-108	Varietal replacement	Improved Variety	5	43
2014	Black gram	WBU-108	Varietal replacement	Improved Variety	4	37
2014	Green gram	PDM 84-139	Varietal replacement	Improved variety	5	65

Table no. 2: Performance of the Front Line Demonstrations on Green gram and Black gram conducted by the Rathindra KVK, Birbhum

Year	Crop	Improved Variety	Local Check Variety	Average Demonstration Yield (q / ha)	Local Check Yield (q / ha)	Increase in Yield (%)	Potential Yield of Improved Variety (q / ha)	Yield gap minimised with reference to potential yield
2013	Black gram	WBU-108	B-76	9.5	7.9	20.3	12.0	64 %
2014	Black gram	WBU-108	B-76	9.2	7.1	29.4	12.0	75%
2014	Green gram	PDM 84-139	B-105	11.7	9.4	24.5	14.0	87%

Table no.3: Economics of the FLDs on green gram and black gram organized by the Rathindra KVK, Birbhum

Year	Crop	Farmers' Existing Plots (Local Check)				Demonstration Plots (Improved Variety)			
		Gross Cost (Rs./ha)	Gross Return (Rs. / ha)	Net Return (Rs./ ha)	B:C Ratio	Gross Cost (Rs./ha)	Gross Return (Rs./ ha)	Net Return (Rs./ ha)	B:C Ratio
2013	Black Gram	13225	31600	18375	2.3	14014	38000	23986	2.71
2014	Black Gra	18225	35500	17275	1.94	18514	46000	27486	2.48

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2014	Green gram	18000	47000	18375	2.6	19514	58500	38986	3.0

Table no. 4: Soil fertility status after Front Line Demonstrations on green gram and black gram organized by the Rathindra KVK, Birbhum

Year	Crop	Before FLD			After FLD		
		pH	O.C (%)	Avl. P_2O_5 (kg/ha)	pH	O.C (%)	Avl. P_2O_5 (kg/ha)
2013	Black gram	6.1	0.42	17.9	6.6	0.61	18.1
2014	Black gram	6.1	0.40	17.5	6.5	0.55	18.0
2014	Green gram	6.3	0.47	18.8	6.8	0.72	20.1

Table no. 5: Horizontal spread improved varieties of Green gram and Black gram after 2 years

Year	Crop	Variety	Technology Demonstrated	Area expanded (ha)	No. of Farmers
2016	Black gram	WBU-108	Improved Variety	140	212
2016	Green gram	PDM 84-139	Improved variety	84	139