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Performance of Black Gram (*Vigna mungo* L.) variety IPU 94-1(Uttara) at Farmers' Field of Mandla District of Madhya Pradesh

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Abstract

A field demonstration was conducted to Study the yield gap analysis of black gram variety IPU-94-1 (Uttara) at farmer's field of Mandla district of Madhya Pradesh consecutively for two kharif seasons 2014-15 and 2015-16. The demonstration trials of black gram was carried out in 20 ha area at farmer's field adjacent the farmer's practices. The results revealed that performance of demonstration of black gram yield was found to be higher than farmer's practices. The yield of black gram from demonstrated module (technological interventions) was recorded with the increase of 41.33% to 53.00% over farmer's practices. The cumulative affect of the technological intervention over two years given an average yield of 1154 kg/ha which was 47.17% higher over farmer's practices. The yield attributing character of the variety i.e. number of pods per plant was higher (42 pods/plant) over farmer's practice (28 pods/plant). On the average of two years net return Rs.35953/ha was found from the recommended practice were substantially higher than farmer's practices (Rs.13568/ha). On the basis mean Rs. 22385/ha as additional income is attributed to the technological intervention provided in demonstration plots i.e. recommended practices. The average extension gap, technology gap and technology index was recorded 566 kg/ha, 96.5 kg/ha and 8.05 %, respectively over farmer's practices. The average B:C ratio 3.63 was found under demonstration trial, while in farmer's practices it was 2.28.

Key words: *Extension gap, technology gap, net return and B:C Ratio*

Introduction

Pulses are major source of protein in India out of them Black gram [*Vigna mungo* (L.) Hepper] is one of the most important legume crops. Being a pulse it play vital role in nutritional security and major sources of vegetable proteins in Indian diet. India is the world's largest producer of pulse and imports a large quantity of pulses to meet out the growing domestic needs. It contains about 20-24% protein, which is almost twice to the wheat thrice the rice. The demand of pulses particularly black gram is supplied across the world due to its higher consumption where animal proteins are insufficient and comparatively expensive. It is resistant to adverse climatic conditions and improves the soil fertility by fixing atmospheric nitrogen in soil and contribute in crop produce equivalent to 22.10 kg of N/ha . In Madhya Pradesh, the black gram is cultivated in 1788.80 thousand ha area and production of 1744.35 thousand Mt. with the productivity of 975 kg/ha whereas, in Mandla district, it is cultivated in 2.00 thousand ha area and production of 144 thousand Mt. with the productivity of 718 kg/ha. Soil and climatic conditions play an important role in crop rotation, mixed and inter-cropping, leading soil fertility via nitrogen fixation, release of soil-bound phosphorus ultimately contribute significantly to sustainability of the farming systems. It is therefore, necessary to assess the technological intervention gaps in production and also to know the problems and constraints in adopting

improved variety of black gram production technologies [3, 6]. Availability of quality seed of improved varieties and other inputs is one of the major bottlenecks in increasing the production of legume crops. In this context, Krishi Vigyan Kendra is a grass root level organization meant for catering application of transfer of technology through demonstrations, cluster front line demonstration, On farm testing and famers field training schools, yield assessment, refinements and dissemination of proven technologies under different micro farming situation in the district levels.

Though, a large numbers of high yielding varieties, resistant / tolerant to pests and diseases of black gram have been developed by researchers but availability of such varieties at farmers' field level is very meager. This is due to the lack of knowledge and awareness in the farmers and gap of new transfer of technology, motivational trainings through field demonstrations to build up reliance towards the changing their cropping system. The technology adoption and awareness regarding black gram cultivation, adoption of new practices must be improved to lessen the gaps in the farmer's practices. Certainly, field level demonstrations of new crop varieties is planned to demonstrate their high yield potential at farmers field. Eventually, it will enhance requirement for quality seed of new varieties ultimately towards the adaptation and maximization of black gram production. Thus, keeping the above facts in mind the present study was conducted to performance of black gram variety IPU 94-1 at farmer's field level and gap analysis of variety through demonstration to establish potential production for getting good economic returns.

Materials and Methods

A field demonstration was conducted to know the performance of black gram variety IPU 94-1(Uttara) at farmers' field in Mandla district of Madhya Pradesh consecutively during two *kharif* seasons 2014-15 and 2015-16 . The demonstration trials of black gram were carried out in 20 ha area at farmer's field adjacent the farmer's practices. The soil condition of demonstrated area was light soil having poor to medium fertility status. The demonstration module includes improved variety of black gram (IPU 94-1), seed treatment with Thirum + Bavistin 2:1 @ 2.5g/kg seed, *Trichoderma virdae* @10 g/kg seed, inoculation of microbial organism *Rhizobium* + phosphorus solubilizing bacteria (PSB) @ 20 gm each/kg seed, weed management (one hand weeding at 25-30 DAS), seed rate (20 kg/ha) and line sowing method. The spacing between rows and plants was maintained with 30 x 10 cm in demonstrations. Under plant protection measures, one spray of Quinalphos 25 EC @1.5 liter/ha with 500 liters of water was applied against the incidence of foliage feeder insect pests and proper agronomical practices were maintain under demonstrated plots. The treatments comprised of recommended package of practices *viz;* integrated nutrient management 20:40:20:20 NPKS kg/ha was given as basel dose on the basis of soil testing reports. Other hand, the farmer's practices were included with local seed having higher seed rate (30-40 kg/ha), sowing with broad casting method and one hand weeding at 35-40 DAS. The formers neither adopted any seed treatment with fungicides, nor inoculate bio fertilizers and plant protection measures. The black gram

seed was sown between the periods of 15th July to 20th July. The harvesting of crops was done manually at physical maturity stage and yield data was recorded from demonstrated plots and farmer's practices for workout the extension gap, technology gap, technology index, yield index, percent yield increase, benefit cost (B:C) ratio between demonstrated and traditional farmer's practices was computed[8]. Gap analysis between demonstration practices and farmer's practices are presented in Table 1.

Table 1 Gap analysis between demonstration practices and farmer's practices

S. No.	Practices	Demonstration practice	Farmer's practice	Gap
1.	Land preparation	Two ploughing	Two ploughing	No gap
2.	Variety	IPU 94-1 (Uttara)	Local seed	Full gap
3.	Seed rate (kg/ha)	20 kg/ha	25-30 kg/ha	Higher seed rate
4.	Seed treatment	Thirum+Bavistin 2:1 @ 2.5 g/kg seed and *Trichoderma virdae* @10g/kg of seed	No seed treatment	Full gap
5.	Sowing method and spacing	Line sowing (30 x 10 cm)	No line sowing (Broad casting sowing)	Full gap
6.	Manures and Fertilizers	20 :40:20:20 NPKS kg/ha	No use of fertilizer (Negligible)	Full gap
7.	Weed management	Two hand weeding at 25-30 DAS and40-45 DAS	One hand weeding at 35-40 DAS	Partial gap
8.	Plant protection measure	Need based plant protection measures	No plant protection measures	Full gap

Extension gap = Demonstrated yield – Yield under existing practice

Technology gap = Potential yield– Demonstrated yield

$$\textbf{Increase yield (\%)} = \frac{\text{Demonstration yield – Farmers yield}}{\text{Potential yield}} \times 100$$

$$\textbf{Technology index} = \frac{\text{Technology gap}}{\text{Potential yield}} \times 100$$

$$\textbf{Benefit cost Ratio} = \frac{\text{Grass return}}{\text{Grass cost}}$$

Results and Discussion

Production potential of black gram

The yield production and economic indicators are presented in Table 2. The data revealed that yield of all demonstrated plots of black gram was found to be higher due to high yielding variety IPU 94-1 and recommended practices than that of farmer's practices during two consecutive years in *kharif* seasons 2014-15 and 2015-16. The average yield of black gram under demonstration was recorded 1039 and 1168 kg/ha during 2014-15 and 2015-16

respectively. Besides in farmer's practice the average yield was 543 and 532 kg/ha during 2014-15 and 2015-16 respectively.

The yield enhancement due to technological intervention was higher which ranged from 41.33% to 53.00% higher over farmer's practices. The cumulative effect of the technological intervention over two years revealed that on an average yield of 1154 kg/ha which was 47.17% higher over farmer's practices. The yield attributing characters of the variety like number of pods per plant was higher (42 pods /plant) over FP (23 pods /plant).

Table 2 Productivity, extension gap, technology gap and technology index of black gram as grown under demonstration and existing farmer's practices

Year	Area (ha)	No. of Demons-tration	Variety	Average yield (kg/ha)			Increase yield over F.P. (%)	Extension gap (kg/ha)	Tech. gap (kg/ha)	Tech. Index (%)
				Potential	Demo.	Farmers				
2017-18	20	50	IPU 94-1	1200	1039	543	41.33	496	161	13.42
2018-19	20	50	IPU 94-1	1200	1168	532	53.00	636	32	2.67
Total	40	100	-	-	2307	1075	94.33	1132	193	16.09
Mean	20	50	-	-	1154	538	47.17	566	96.5	8.05

Extension gap

The results revealed that extension gap was 496, and 636 kg/ha recorded during the year 2014-15 and 2015-16 respectively between demonstrations and existing farmer's practices (Table 3). The average extension gap was recorded 566 kg/ha between demonstrations and farmer's practices[1, 5]. Apparently, the extension gap is considered as main constraint which should be minimized by adopting some new technological interventions through demonstrations at farmer's field to change their mind set towards the acceptance of high yielding crop varieties and innovative agricultural technologies.

Table 3 Profitability of black gram grown under demonstration and existing farmer's practices

Year	Average cost of cultivation (Rs./ha)		Average gross return (Rs./ha)		Average net return (Rs./ha)		B:C Ratio	
	Demons tration	Farmers practice	Demons tration	Farmers practice	Demons tration	Farmers practice	Demons tration	Farmers practice
2017-18	13680	10480	46755	24435	33075	13955	3.42	2.33
2018-19	13730	10759	52560	23940	38830	13181	3.83	2.23
Total	27410	21239	99315	48375	71905	27136	7.25	4.56
Average	13705	10620	49658	24188	35953	13568	3.63	2.28

Yield gap and technology index

The yield gap in the demonstration of black gram IPU 94-1 over farmer's yield was recorded higher during the year 2014-15 (496 kg/ha) followed 2015-16 (636 kg/ha) (Table 2). The observed technological gap may be attributed dissimilarity in soil status, rainfall distribution, infestation of insect pests and disease as well as the change in the locations of demonstrated plots in every year. The technology gap in the black gram IPU 94-1 demonstration yield over potential yield was recorded maximum (161 kg/ha) during *kharif* 2014-15, followed by 2015-16 (32 kg/ha). Further, it is revealed that the technology index 13.42 and 2.67during2014-15 and 2015-16 respectively. The lower value of technology index expressed about the more plausible feasibility of the black gram variety IPU 94-1 at the farmer's field. The results revealed that the extension and technology gaps are existed between transfer of technology and technology adoption at existing farmer's field[1,2,6].

Evaluation of economic return

The economic indicators in term of cost of cultivation, gross returns, net returns and benefit cost ratio of demonstration and existing farmer's practices is given in Table 3. The data clearly depicted that the net return from the recommended practices was substantially higher than farmer's practices. The average cost of cultivation from recommended practice was found to be Rs. 13705/ha as compared to farmers practices *i.e.* Rs.10620/ha. Though, the cost of cultivation of demonstration was higher than farmer's practices but the average net return was obtained higher due to all undertaken recommended practices. On an average Rs. 22385/- ha as additional income is attributed to the technological intervention provided in demonstrated module *i.e.* recommended package of practices. Average net returns from recommended practices was found to be Rs. 22385/- ha as compared to farmer's practices *i.e.* Rs.13568/-ha. The average B:C ratio 3.63 was found under demonstration whereas, 2.28 in farmer's practices. The similar findings were also obtained by many others[1,2,4,8]. The present study is concluded that the yield response and economic returns of improved variety of black gram IPU 94-1 was found to be higher than farmer's practices due to the recommended package of practices.

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