The Pharma Innovation Journal 2021; 10(6): 1293-1297

www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277- 7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2021; 10(6): 1293-1297

www.thepharmajournal.com
Received: 07-04-2021
Accepted: 18-05-2021

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# Impact of frontline demonstrations on popularization and productivity enhancement of blackgram (*Vigna mungo*) at tribal farmer's fields in Dhar district of Madhya Pradesh

**GS Gathiye, KS Kirad, SS Chauhan and Vishal Verma**

**Abstract**
The present study was carried out by Krishi Vigyan Kendra, Dhar, Madhya Pradesh to study the impact of frontline demonstrations on popularization and productivity enhancement of blackgram (*Vigna mungo*) at tribal farmer's fields. The maximum yield of blackgram in FLDs under rainfed conditions ranged from 697 and 925 kg/ha whereas the minimum yield (474 and 659 kg/ha) was recorded in farmers' practice during both the years (2015-16 and 2016-17) of study, respectively. The per cent increase in yield with recommended practices (RP) over FP was recorded in the range of 40.22 to 47.15. The extension gap was ranging between 223 -265 kg/ha and technological index (41.92 and 26.08%) was found during both the years of study, respectively. The trend of technology gap reflected the farmer's cooperation in carrying out demonstrations with encouraging results in subsequent years. The maximum gross monetary return (Rs. 34850 and Rs. 55440/ha) was recorded in recommended practice while minimum gross monetary return (Rs. 21330 and Rs. 36231/ha) was observed in farmer's practice during both the years, respectively. Moreover, the maximum net monetary returns recorded in recommended practice (Rs. 24775 and Rs. 40720/ha) and minimum net monetary return observed in farmer's practice (Rs. 13227 and Rs. 23528/ha), respectively. Similar trend was found in case of Benefit-Cost ratio as highest B:C ratio was found in recommended practice (3.45 and 3.77) as compared to farmers existing practice (2.63 and 2.85) during both the years of study, respectively.

**Keywords:** Extension gap, technology transfer, yield, front line demonstrations, technology index and economics

## Introduction

Black gram is one of the important pulse crops grown throughout India. It is consumed in the form of 'dal' (whole or split, husked and un-husked) or perched. It is used as nutritive fodder especially for milch animals. It is also green manuring crop. High values of lysine make urdbean an excellent complement to rice in terms of balanced human nutrition. In Madhya Pradesh, Blackgram occupies a major position in terms of area, production and productivity among the pulses. Blackgram (Urad), the 3rd important crop group, was cultivated over an area of 5.44 Mha (kharif + rabi) and recorded a production of 3.56 Mt at a productivity level of 655 kg/ha in India (Anonymous, 2018) [1]. Major contributing states have been MP, Rajasthan, AP, UP, Tamil Nadu, Maharashtra, Jharkhand and Gujarat. In Madhya Pradesh, blackgram is cultivated in 9.32 lakh hectares with an average production of 5.15 lakh tones and productivity of 553 kg/ha.

Black gram is an important *kharif* pulse crop for livelihood of tribal farmers in Dhar district of Madhya Pradesh but due to unavailability of improved variety and non adoption of improved cultivation practices in the district, productivity (500 kg/ha) of Blackgram is far below the average national productivity (655 kg/ha) and state average of 553 kg/ha. *Kharif* blackgram is mostly sown in July-August and harvested in October-November. Indian government imports large quantity of pulses to fulfill domestic requirement of pulses. In this regard, to sustain this production and consumption system, the Indian Institute of Pulse Research, Kanpur had sanctioned the project "Frontline Demonstrations on *kharif* pulses under Tribal sub Plan from 2015-16'' to ICAR-ATARI, Zone-IX, Jabalpur. The basic strategy of the Mission is to promote and extend improved technologies, *i.e.*, seed, balance use of fertilizers, soil amendments, integrated pest management, farm machinery and implements, irrigation devices along with capacity building of farmers. This project was implemented by Krishi Vigyan

Kendra, Dhar in district with main objective to boost the production and productivity of pulses through FLDs with latest and specific technologies at tribal farmers' fields.

**Materials and Methods**

The study was carried out during *kharif* season from 2015-16 to 2016-17 (2 consecutive years) by the KVK Dhar, of Madhya Pradesh. The demonstrations were conducted in tribal farmer's fields of 6 and 2 different tribal villages of Dhar district where as a total of 25 and 20 numbers of beneficiaries were selected during the year 2015-16 and 2016-17, respectively for the project.

Farmers were trained to follow the package and practices for black gram cultivation as recommended by the Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya, Gwalior (M.P.) and need based inputs were provided to the beneficiaries (Table 2). The farmers followed the full package of practices like soil testing, seed treatment with bio-fertilizer, fertilizer application, weed management, integrated pest management (IPM) practices etc. In case of local check, the traditional practices were followed by using existing varieties. An area of 10 and 8 hectares was covered with plot size 0.4 ha under front line demonstration with active participation of tribal farmers. Two varieties namely IPU 94-1 (duration 85 days) and PU-31 (duration 75 days) having bold seeded, Yellow Mosaic Virus (YMV) tolerant and depending on the environmental conditions were selected. Before conducting FLDs, a list of farmers was prepared from group meeting and specific skill training was imparted to the selected farmers.

In general, the soil of the experimental sites were sandy loam in texture, neutral in reaction (pH 7.04-7.58), medium in organic carbon (0.50-0.62%) and low in available nitrogen (202.7-238.8 kg N/ha), medium in available phosphorus (12.4-14.8 kg $P_2O_5$ kg/ha) and high in available potassium (289.2-400.5 kg $K_2O$/ha).

In demonstration plots, use of quality seeds of improved varieties (IPU 94-1 and PU 31), line sowing and timely herbicide application, need based pesticide as well as balanced fertilizer were emphasized and comparison has been made with the existing practices. Visit of farmers and the extension functionaries was organized at demonstration plots to disseminate the message at large scale. The beneficiaries under the programme were facilitated by KVK scientists in performing field operations like sowing, spraying, weeding, harvesting etc. during the course of training and visits. The traditional practices were maintained in case of local checks. The data were collected from both FLD plots as well as control plots and finally the extension gap, technology gap, technology index along with the benefit cost ratio were worked out (Samui *et al.*, 2000) [10] as given below.

Technology gap= Potential yield - Demonstration yield

Extension gap= Demonstration yield - Farmer's yield

$$\text{Technology index (\%)} = \frac{\text{Potential yield} - \text{Demo.yield}}{\text{Potential yield}} \times 100$$

**Results and Discussion**

Results of front line demonstrations conducted during 2015-16 to 2016-17 in different tribal villages of Nalcha block of Dhar district indicated that the cultivation practices comprised under FLD *viz.* use of improved variety (IPU 94-1 and PU-31), line sowing, balanced application of fertilizers and control of pest through insecticide at economic threshold level (Table 1). The maximum number of branches (4.3 and 4.5) and pods per plant (32 and 40) were recorded in demonstrations as compared to farmer's practice (branches 3.4 and 3.5) and pods (17 and 27) during both the years of study, respectively (Table 5). Yield parameters enhanced by the improved package of practices over existing farmers practice are shown in Table 3. It is evident from results that under the demonstrated plots, performance of blackgram (yield) was comparatively much higher than the farmer's practice. The average increase in yield comparing to local variety was recorded highest (697.0 and 924.0 kg/ha) and lowest (474.0 and 659.0 kg/ha) during 2015-16 and 2016-17, respectively. On two year data basis, the average maximum yield (810.5 kg/ha) was recorded in recommended practice while minimum yield (566.50) observed in farmer's practice during the course of study. The demonstration plot produced on an average of 43.68% more yield of blackgram as compared to local practices. The data revealed that the yield of blackgram fluctuated significantly over the years in demonstration plot due to climatic factors and management practices. Similarly, yield enhancement in different crops in front line demonstrations were documented by Hiremath *et al.*, (2007) [5]; Mishra *et al.*, (2009); Kumar *e. al.*, (2010) [6]; Surywanshi and Prakash (1993); Dhaka *et al.*, (2010) [3] and Dhaka *et al.*, (2015) [4]. The increase in percent of yield was ranged from 40.22 to 47.15 during both years of study. The results clearly indicated the positive effects of FLDs over the existing practices toward enhancing the productivity of blackgram in tribal villages of Dhar district with its positive effect on yield attributes (Table 3).

The extension gap showed an increasing trend. The extension gap ranging between 223-265 kg/ha during the period of study emphasizes the need to educate the farmer through various means for adoption of improved agricultural production to reverse the trend of wide extension gap. The yield of the front line demonstrations and potential yield of the crop was compared to estimate the yield gaps which were further categorized into technology index and technology gap. The trend of technology gap (ranging between 326-503 kg/ha) reflects the farmer's cooperation in carrying out such demonstrations with encouraging results in subsequent years. Data revealed that the performance of the technology demonstrated was found to be better than the farmers practice under same environment conditions. The farmers were motivated by seeing the results in terms of productivity and they are now adopting the blackgram varieties *i.e.* IPU 94-1 and PU 31 with improved package and practices. The technology index showed the feasibility of evolved technology at the farmer's fields. The lower value of technology index showed that there is more feasibility of technology. As such fluctuation in technology index (ranging between 41.92-26.08%) during the study period in certain region may be attributed to the dissimilarity in soil fertility status, weather conditions, non-availability of water and insect pest attack in the crop.

The maximum gross monetary return (Rs. 34850 and Rs. 55440/ha) was recorded in recommended practice while minimum gross monetary return (Rs. 21330 and Rs. 36231/ha) was observed in farmer's practice during both the years, respectively. Moreover, the maximum net monetary returns wad recorded in recommended practice (Rs. 24775 and Rs. 40720/ha) and minimum net monetary return registered in farmer's practice (Rs. 13227 and Rs. 23528/ha). Similar trend was found in case of Benefit-Cost ratio as highest B:C ratio was found in recommended practice (3.45 and 3.77) as compared to farmers existing practice (2.63 and 2.85) during both the years of study, respectively. Similar results were found by Saikia *et al.*, (2018) [9]. Data clearly showed higher benefit cost ratio of recommended practices than control plot in all the years of study. Hence, favorable benefit cost ratios proved the economic viability of the interventions and convinced the farmers on the utility of interventions.

## Conclusion

It is concluded from the above findings of FLDs on blackgram *var.* IPU 94-1 and PU 31, that the technology gap can be reduced to a considerable extent by adopting scientific methods of blackgram cultivation thus leading to increase productivity of blackgram in the district. It was observed that potential yield can be achieved by imparting scientific knowledge to the farmers, providing the quality need based inputs and their proper utilization. Horizontal expansion of improved technologies may be achieved by implementation of various extension activities like training programme, field days, exposure visit *etc.* organized in FLD programmes at the farmer's fields. Moreover, Krishi Vigyan Kendra in the district need to play the lead role in providing proper technical support to the farmers through different educational and extension activities to reduce the extension gap for better pulse production and productivity in the district.

**Table 1:** Comparison between demonstration package and existing practices under FLD (black gram)

| Particulars | Blackgram | |
|---|---|---|
| | **Demonstration** | **Farmers Practice** |
| Farming situation | Rainfed | Rainfed |
| Variety | IPU 94-1 & PU-31 | Local |
| Time of sowing | Mid July to mid August | Mid July to mid August |
| Method of sowing | Line sowing | Line sowing |
| Seed rate | 20 kg/ha | 30 kg/ha |
| Fertilizer as per STV | NPK 20:60:20 kg/ha | NPK 18:46:00 kg/ha |
| Seed treatment and inoculation | With Carboxin 17.5 + Thiram 17.5 @ 2.5 ml/kg of seed and inoculation with Rhizobium and PSB @ 5 g/kg of seed | Nil |
| Weed management | Pre-emergence herbicide (Pendimethalin) | No weeding |
| Plant protection | Need based application of insecticide | Nil |
| Time of harvesting | September till first week of October | September till first week of October |

**Table 2:** Details of need based critical inputs/technological packages distributed in front line demonstrations of Blackgram

| Year | No. of demonstrations | Variety | Technology demonstrated | Need based input distributed |
|---|---|---|---|---|
| 2015-16 | 25 | IPU 94-1 | Improved variety, seed treatment, inoculation, NM, WM and IPM | Improved seed (20 kg/ha), soil testing, seed treatment with Carboxin 17.5 + Thiram 17.5 @ 2.5 ml/kg of seed and inoculation with Rhizobium and PSB @ 5 g/kg of seed, pendimethalin, profenofos+cypermethrin, copper oxychloride, on and off campus trainings, field day and exposure visits |
| 2016-17 | 20 | PU-31 | Improved variety, seed treatment, inoculation, NM, WM and IPM | Improved seed (20 kg/ha), soil testing, seed treatment with Carboxin 17.5 + Thiram 17.5 @ 2.5 ml/kg of seed and inoculation with Rhizobium and PSB @ 5 g/kg of seed, pendimethalin, profenofos+cypermethrin, copper oxychloride, on and off campus trainings, field day and exposure visits |

**Table 3:** Productivity, technology gap, extension gap and technology index under FLDs and farmer practices in blackgram

| Year | Sample Area (ha) | Sample No. of farmers | Seed yield (kg/ha) | | | % increase over control | Tech. gap (kg/ha) | Extension gap (kg/ha) | Technical index (%) |
|---|---|---|---|---|---|---|---|---|---|
| | | | Potential | FLD | FP | | | | FLD |
| 2015-16 | 10 | 25 | 1200 | 697 | 474 | 47.15 | 503 | 223 | 41.92 |
| 2016-17 | 08 | 20 | 1250 | 924 | 659 | 40.22 | 326 | 265 | 26.08 |
| Average | - | - | 1225 | 810.5 | 566.5 | 43.68 | 414.5 | 244 | - |

**Table 4:** Economics of Demonstrations

| S. No | Village covered | No. of Farmers | Area (ha) | Cost of Cultivation (Rs./ha) | | Gross Monetary Return (Rs./ha) | | Net Return (Rs.) | | B:C ratio | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Demo. | FP | Demo. | FP | Demo. | FP | Demo. | FP |
| 1 | Advi, Miyapura, Kachlia, Chaubara, Amlia, Ambapada | 25 | 10 | 10105 | 8103 | 34850 | 21330 | 24775 | 13227 | 3.45 | 2.63 |
| 2 | Sodpur, Kothi sodpur | 20 | 08 | 14705 | 12703 | 55440 | 36231 | 40720 | 23528 | 3.77 | 2.85 |

* Rate of black gram during October 2015-16 and 2016-17 in the Mandi of Dhar was Rs 5000/q and Rs 6000/q, respectively

**Table 5:** Yield attributing data of crop

| S. No. | Crop | Yield attributing characters | | | | | |
|---|---|---|---|---|---|---|---|
| | | Av. no of pods/plant | | No of Branches /Plant | | Test weight (1000 grain wt.) | |
| | | Demo. | FP | Demo | FP | Demo | FP |
| 1 | Blackgram- (IPU 94-1) | 32 | 17 | 3.2 to 4.3 | 3 to 3.4 | 45 | 32 |
| 2 | Blackgram- PU 31 | 40 | 27 | 3.5 to 4.5 | 3 to 3.5 | 46 | 33 |

**Field Day under TSP**

**On campus Training**


**Demo. Plots of Black Gram (TSP) during 2015-16**


**Demo. Plots of Black gram (TSP) during 2016-17**

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