ACTA BOTANICA (G)
Journal of biodiversity and ecological sciences

Acta Botanica (G) : 61–65 (2021)
http://www.actabotanica.org/

RESEARCH ARTICLE

Impact Of Cluster Frontline Demonstrations On Blackgram Productivity

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Received 17 March 2021 | Revised 27 July 2021 | Accepted 27 September 2021 | Available Online 18 October 2021

Citation: Pradeep Manyam, Tulasi Lakshmi Thentu, G. Lalitha Siva Jyothi And G. Narayana Swamy (2021). Impact Of Cluster Frontline Demonstrations On Blackgram Productivity. *Acta Botanica (G).* v09i3, 61-65 https://dx.doi.org/10.3897/ACTA2021.V09.174

ABSTRACT

Black gram is one of the major pulse crops grown under rainfed conditions in Nellore district of Andhra Pradesh. District's Blackgram productivity (710 kg/ha) is far below the average national productivity (970 kg/ha) and state productivity (637 kg/ha) due to cultivation of YMV susceptible Blackgram varieties and non-adoption of improved cultivation practices. In the present study, Krishi Vigyan Kendra, Nellore, Andhra Pradesh demonstrated YMV resistant variety TBG-104 and improved package of practices in Blackgram cultivation under cluster frontline demonstration (CFLD) to study the yield gaps between demonstrated plot and farmer's practice (FP). The study found that the yield of Blackgram in CFLD under rainfed conditions able to reduce yield gap by an average by 2.6 q/ha over farmer practice over three years of study. The per cent increase in yield with CFLD over FP was recorded at 42.70 percent. The extension gap and technological indices were ranged between 2.19 -3.13 q/ha and 28.07-48.92 per cent respectively. TBG-104 variety showed complete resistance to YMV in comparison to susceptible local check. The trend of lower yields in demonstrations (8.87 q/ha) in contrast to potential yield (14 q/ha) attributed to the other factors viz., monsoon distribution and intensity during cropping period and volatile marketing prices of harvested product. But, the trend of extension gap minimization reflects the potentiality of performance improved varieties and improved package of practices and role of extension technology transfer. Therefore, the results clearly indicate that CFLD programme is effective in increasing productivity of Blackgram by means of extension approaches and adoption of improved practices.

Keywords: *cluster front line demonstrations, Blackgram, technology index, extension gap, yield, TBG-104.*

INTRODUCTION

Black gram is one of the important pulse crops grown in tropical and sub-tropical regions of India. It is consumed in the form of dal to supplement dietary protein. The harvested biomass used as nutritive fodder for milch animals. Crop is also being cultivated as Green manuring crop in some areas. Under favourable weather conditions of 27- 30 ^{0}C, adequate rainfall and loamy soils, crop completes life cycle in 90-120 days. According to the annual report 2018-19 of GoI, Ministry of agriculture & Farmers Welfare (Department of Agriculture, Cooperation & Farmers Welfare) Urad (Blackgram), 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. Major contributing states have been MP, Rajasthan, AP, UP, Tamil Nadu, Maharashtra, Jharkhand and Gujarat [1-3].

In Andhra Pradesh, Blackgram is extensively cultivated in rice fallows during rabi and to a limited extent in kharif. It is grown in an area of 4.03 lakh ha with 3.68 lakh t production and 933 kg ha-1. In Nellore, it was grown in 20 thousand hectares with a production of 10,000 tons (Directorate of Economics and Statistics, Government of A.P, 2017-18). Majority the crop grown under rainfed conditions during rabi season and highly dependent on NE Monsoons.

Although, a number of improved varieties and innovative production technologies have been developed in Pulses cultivation, but full potential of these varieties and technologies could not be achieved due to low rate of adoption and pulse cultivation in limited resource conditions. Thus, extensive extension programmes are being implemented to overcome the factors limiting the productivity. Hence, in order to sustain pulse production and growing demand from consumption system, the Department of Agriculture, Cooperation and Farmers Welfare had introduced National Food Security Mission. Under this Mission, "Cluster Frontline Demonstrations on pulses" (CFLD) programme being organized by ICAR-ATARI, through India-wide KVK's under their jurisdiction. The project aims to promote and extend improved technologies, *i.e.,* improved seed, integrated nutrient management, soil amendments, integrated pest and disease management, use of farm machinery and implements *etc.* along with capacity building of farmers [4-5].

MATERIALS AND METHODS

Demonstrations were carried out during rabi season in various pulse growing areas of Nellore district from 2016-17, 2017-18 and 2018-2019 (3 consecutive years) by the KVK, Nellore (Acharya NG Ranga Agricultural University) of Andhra Pradesh. Field level demonstration with technological inputs were organized in 20 ha (27 farmers) in two different villages in the year 2016-17, 30 ha (39 farmers) in two villages during 2017-18 and 50 (125 farmers) in two villages during 2018-19 of Nellore district.

Before conducting CFLDs, a list of interested farmers to take up demonstrations was prepared from group meetings conducted in selected adopted villages and Pulse growing regions of Nellore district. Subsequently, selected farmers were given with pre-season skill training programme to follow the improved package and practices in Blackgram cultivation as per the recommendations of Acharya N.G. Ranga Agricultural University (Table 1). The farmers were prepared to follow the full package of practices like soil testing, seed treatment with bio-fertilizer and insecticides, fertilizer application, weed management, Integrated Pest and Disease Management (IPDM) practices, Post harvest management *etc.* In addition, need based inputs were provided to the beneficiaries (Table 2).

Table 1: Comparison between demonstration package and existing practices under CFLD blackgram

Particulars	**Blackgram**	
Farming situation	**Demonstration Rainfed medium land**	**Farmers Practice Rainfed medium land**
Variety	TBG-104	LBG-752
Time of sowing	Mid September to Mid October	Mid September to Mid October
Method of sowing Line	Line sowing	Broadcasting
Seed rate	20 kg/ha	26.5 kg/ha
Fertilizer recommendation	Soil test Based recommendation	Nil
Seed treatment	Imidacloprid @ 5g/Kg seed followed by rhizobium treatment	Nil
Weed management	Iris patela @ 1.25 ml/ L after 20 DAS	Nil
Plant Protection	Yellow sticky traps @ 8 per acre Pheromone traps @ 4 per acre to monitor spodoptera adults 5 DAS: At flower initiation, NSKE 5% or Neem oil @ 5 ml/l as a prophylactic spray, 40 DAS: Chlorpyriphos 2.5 ml/l **Need based plant protection measures** 50 DAS: Flubendiamide 0.2 ml/l or Rynaxypyr 0.3 ml/l based on pest activity. Carbendazim @ 2gm/l for disease management	Need based application of Plant protection measures

Table 2: Details of Need Based Input Given on CFLD of Blackgram

Year	Variety	Technology Demonstrated	Inputs provided
2016-17	TBG-104	Improved variety, ICM and IPDM	Improved Seed, Soil testing, Rhizobium spp., Iris, Neem oil (450 ppm), Chloropyriphos, Yellow stick traps, pheromone traps and lures, Carbendazim, Group meetings and Trainings
2017-18	TBG-104	Improved variety, ICM and IPDM	Improved Seed, Soil testing, Rhizobium spp., Iris, Neem oil (450 ppm), Chloropyriphos, Yellow stick traps, pheromone traps and lures, Carbendazim, Group meetings and Trainings
2018-19	TBG-104	Improved variety, ICM and IPDM	Improved Seed, Soil testing, Rhizobium spp., Iris, Neem oil (450 ppm), Chloropyriphos, Yellow stick traps, pheromone traps and lures, Carbendazim, Group meetings and Trainings

In demonstration plots, use of quality seeds of improved variety TBG-104 (Parentage : PU 19 X LBG 623) released from Regional Agricultural Research station, Tirupati was supplied. TBG-104 variety is characteristically photo-insensitive, medium in duration (75-80 days), high yielding and resistant to Yellow Mosaic Viral disease transmitted by white fly. Cultural operations like line sowing and timely weeding, need based pesticide as well as balanced fertilizer application were emphasized and comparison has been made with the existing practices. Exposure visit of farmers and the local extension functionaries was organized at demonstration plots to disseminate the technology at a large scale. The traditional practices of YMV susceptible LBG-752 variety and other agronomic practices were maintained in case of local checks. The data collected from both CFLD 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) as given below.

- Technology gap= Potential yield - Demonstration yield
- Extension gap= Demonstration yield - Farmer's yield
- Technology index = (Potential Yield – Demo Yield)/Potential Yield

RESULTS AND DISCUSSION

Cluster Front Line Demonstrations conducted over three consecutive years (2016-17 to 2018-19) in major pulse growing of Nellore district indicated that the variety was popularized from less than 100 ha of cultivation during the year 2016-17 to more than 6000 ha of cultivation by 2018-19. Technology adoption under CFLD programme *viz.,* use line sowing, balanced application of fertilizers and integrated management of pest and diseases resulted under the demonstrated plots, yield performance of Blackgram was comparatively much higher than the local check variety over the three years. The Blackgram demonstration plot produced on an average of 42.74 % more yield as compared to local practices. The average increase in yield comparing to local variety was recorded highest (3.13 qtls/ha) in 2018-19 and lowest (2.19 qtls/ha) in 2017-18. The fluctuations in yield data between three years was mainly due to the north east monsoon rainfall pattern during rabi season. It is also to be noted that pulses are grown chiefly under rainfed condition in Nellore District and paddy in irrigated conditions. The lower yields obtained during 2016-17 was due to failure of monsoon in September and October months (Deficit of -86.8% and -91.54% resp.)

Similarly, yield enhancement in different crops in cluster front line demonstrations were documented by Surywanshi and Prakash (1993) in Oil seeds, Jayalakshmi *et al.* (2018) in pulses and Nabadeep *et al.* (2018) in Blackgram. The increase in percent of yield was ranged from 30.55 to 52.45 during the three years of study. The results were in conformity with the findings of Katare *et al.* (2011), Meena *et al.* (2012) and Tomar *et al.* (2003). The results clearly indicate the positive effects of CFLDs over the existing practices towards enhancing the yield of Blackgram in rainfed cultivation in Nellore with its positive effect on yield attributes (Table 3). Benefit-Cost ratio was also recorded higher under demonstration against control in all the years of study.

The extension gap showed an increasing trend with ease of access to framers through training programmes, continuous monitoring by KVK Scientists and timely supply of inputs. The extension gap ranging between 2.19-3.13 q/ha during the period of study necessitates the importance of farmer education in adoption of

Table 3: Productivity, technology gap, extension gap, technology index and benefit-cost ratio of Blackgram grown under FLDs and existing package of practices.

Year	Area in Ha	No.of Farm-ers	Avg. Seed yield (Kg/ha)			% increase over con-trol	Tech. Gap (Kg/ ha)	Extn. gap (Kg/ha)	Technical Index (%)	B:C Ratio	
			Potential	CFLD	Farmer's Practice					Demo	FP
2016-17	20	27	1400	715	469	52.45	685	246	48.92	1.48	0.83
2017-18	30	39	1400	940	721	30.55	460	219	32.85	2.38	1.74
2018-19	50	125	1400	1007	694	45.10	393	313	28.07	1.62	1.09
Average			1400	887.33	628	42.7	512.67	259.34			

improved agricultural practices. The yield of the cluster 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 3.93-6.85 q/ha) reflects the farmer's cooperation in carrying out such demonstrations with encouraging results in subsequent years. But, there is large technological gap still exists attributed to weather factors as the most of cultivation is under rainfed conditions on highly depend on distribution of rainfall during cropping period. Other influencing factors are dissimilarity in soil fertility status and insect pest attack in the crop. From these results, it is evident 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 YMV tolerant Blackgram varieties TBG-104 and GBG-1 (recently released variety) with improved package and practices [6-9].

The lower value of technology index, the more is the feasibility of technology for adoption. From the reducing trend in technology index from 48.92% to 28.07% indicates that the farmers widely accepted and followed improved practices upon achieving higher yields in previous years of demonstrations. The benefit cost ratio of CFLD is better than the farmers practice all the years of study. But, CFLDs also showed less profit margin to farmers due to rainfed crop and realizing good market price. Nevertheless, sizeable benefit cost ratios obtained during demonstrations proved the economic viability of the technology and convinced the farmers to adopt various interventions.

TBG-104 proved to be superior variety where it showed complete resistance to Yellow Vein Mosaic Disease and crop cycle completed within 80 days whereas LBG-752 being susceptible to YMV showed 12-45% disease incidence over the years of study. Yield parameters of both varieties (TBG-104 under demonstration and LBG-752 under Farmer practice) are shown in table 4.

Table 4: Average yield parameters under demonstration package and existing farmers practice.

Yield parameters	CFLD	FP
Plant height (cm)	39.5	34.6
No of branches per plant	6.5	3.5
No of pod per plant	16	9
No of seeds per pod	4.11	4.02
Test weight (g)	36.67	35.47

CONCLUSIONS

It is concluded from the above findings of cluster frontline demonstrations on Blackgram under National Food Security Mission implementing through Krishi Vigyan Kendra, Nellore proved to be an effective programme as the per cent increment in yield of Blackgram by adopting improved variety TBG-104 and scientific methods of Blackgram cultivation. Technological gap was also reduced to a great extent over the period of study. The study also calls upon the need for local weather forecast to mitigate vagaries of the rainfed cultivation of pulses. These demonstrations through input support and technology transfer built the mutual confidence and relationship between farmers and scientists. Field level demonstrations including training programme, field days, exposure visit *etc* once again proved to be necessary for horizontal spread of improved technologies. Moreover, Krishi Vigyan Kendras in each district can play the lead role in providing proper technical support to the farmers through different educational and extension activities to enhance productivity of crops.

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