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Performance of Blackgram and their Improved Variety in Chhatarpur Districts under Bundelkhand Region of Madhya Pradesh

U.K. Tripathi[1], R.K. Singh[2]* and Veenapani Srivastav[3]

ABSTRACT

Consistent efforts to popularize the improved variety PU 35 of blackgram along with recommended production since *kharif* 2011 are being taken up in District Chhatarpur by KVK for enhancing the yield and income of farmers. Since most of the farmers lack knowledge and adoption of high yielding diseases resistant varieties and thereby harnessing lower yields culminating in limited net returns. The performance of blackgram production through varietal replacement under central portion on the plateau of Bundelkhand region in Madhya Pradesh, showed that by the end of 2018, 65.1 and 16.8 per cent area has been occupied with blackgram and their improved variety 'PU 35 with an increase in yield by 489 kg per ha and net returns by 46.5 per cent over locally cultivated varieties. Maximum yield (10.29 q/ha) was obtained during 2018-19. During 2013-14 and 2015 (rainfall 1300 and 1161.4 mm) the improved variety of blackgram (PU 35) produced lower yields (907 & 925 q/ha) which showed that this variety can also perform better under average rainfall regime. The returns per rupee investment varied between 2.7 to 2.9 whereas it was 1.3 to 1.4 in locally cultivated varieties with traditional farmers practice during 2011 to 2018.

Keywords: Economic impact, Improved varieties, Impact and Spread of technology

INTRODUCTION

Blackgram (*Vigna mungo*) is an important economic pulse crop and considered as a good source of protein for human being. Blackgram has been a predominant crop in Madhya Pradesh especially in Chhatarpur district which accounts for 65.1 per cent (2, 61,450 ha) area under Blackgram cultivation. The district Chhatarpur falls under central portion on the plateau of Bundelkhand region in M.P. and lies between north latitudes 240 06' and 250 20' and longitude 790 59' and 800 26 East. Current average productivity of the crop in the district is 540 kg per ha as against the state and national productivity of 730 and 585 kg per ha respectively (Anonymous, 2018). However, the productivity of blackgram is quite low as compared to yield potential in the experimental station (Singh *et al*., 2017). Though there are several factors for low production and productivity of blackgram crop in the district, however, lower seed replacement with improved varieties is crucial one. The lower seed replacement rate with improved varieties is due to their inadequate availability in spite of development of numerous location specific varieties with 20-25 per cent yield superiority over the local cultivars with additional trait of resistance against insect-pests and diseases (Singh *et al*., 2019). Moreover, the farmers did not follow the recommended production technology. In view of these, KVK Chhatarpur introduced the improved variety PU 35 during *kharif* 2011 along with improved production technology in and continued till 2018.

[1]SRF NICRA, (MP), Jawaharlal Nehru Krishi Vishwa Vidyalaya, KVK, Chhatarpur, Madhya Pradesh
[2]KVK Chhatarpur, Madhya Pradesh
[3]Senior Scientist and Head, KVK Chhatarpur, Madhya Pradesh
*Corresponding author email id: rajiv_kvk@rediffmail.com

METHODOLOGY

The module demonstrated (5.0 ha) at farmer's field during *kharif* 2011 included use of improved variety PU 35, balanced dose of fertilizers (20:60:20 NP_2O_5K kg/ha) based on soil test values and seed treatment with fungicide (Carbendazim + Thiram @ 1+2 g/kg seed) followed by seed inoculation with *Rhizobium leguminosorum* and phosphorus solubilizing bacteria (PSB) @ 5 g per kg seeds each and one spray of imazethapyer @ 1 litre per ha at 15 days after sowing for weed management. The performance of the crop was compared with the farmer's practice on the same location, which included use of only 50 kg DAP per ha, higher seed rate (25 kg/ha) and sowing of seeds without seed treatment with fungicides and biofertilizers. The soil of demonstrations site was sandyloam. The crop was sown between first week of July and harvested during second week of September. The seed rate of improved variety of Blackgram (PU 35) was used @ 20 kg per ha. Soil test based tailored NPK fertilization was applied as basal dose. The crop was protected from insect-pests and diseases as per recommendation. The yield data from demonstration field and farmer's crop was collected after harvesting the crop during 2011. In subsequent year (2011-2018), the horizontal spread of the improved variety (PU 35 and LBG 20) in the farmers' field of district was made through frequent farmers contact, interface with farmers, training of farmers and Rural Agricultural Extension Officer (RAEO), Krishak Sangoshthi and field days on blackgram. In addition, the progressive farmers of the district also disseminated the information about improved variety among the farming community through personal contact in subsequent years of study. For economic evaluation in term of gross and net return and cost benefit ratio, the prevailing rates for input, labour and produce was utilized. Rainfall data were also recorded during the study period to analyze the performance of the variety (PU 35). For getting feedback about the introduced variety from blackgram growers a comprehensive schedule was developed. The information's were mainly collected with due cooperation of RAEO in the District. The personal interviews with the RAEO and farmers were also conducted for getting the feedback in the study area.

RESULTS AND DISCUSSION

Change in area

Reduced fallow area and soybean cultivated area from 21350 to 19752 ha and 31900 to 19400 ha respectively during 2011-2018 (Table 1) was observed. Blackgram crop has covered 261450 ha area out of 401390 ha area of *kharif* crops in Chhatarpur districts. 65.1 per cent area under blackgram was observed during 2018-19 against 35.8 per cent during 2011 and it reduced area under soybean cultivation by 56.1 percent due to adoption of improved production technique of blackgram as soybean crop has been susceptible to biotic and abiotic stress due to dominancy of monotony cropping system in this region. The production and productivity of soyabean was stagnant or declining against to potential/average

Table 1: Changes in area of *Kharif* crops in Chhatarpur District

Year	Area under improved var.	Area under black gram (000ha)	*Kharif* area (000ha)	Fallow area (000ha)	Reduce fallow area (%)	Varietal spread of black gram (%)	Area spread under black gram (%)	Soybean area (000ha)	Replacement of soybean Crop by black gram (%)
2011-12	5	50700	141500	21350		0.01	35.8	31900	-
2012-13	30	80500	193500	21000	1.6	0.04	41.6	31000	2.8
2013-14	1400	150000	253400	20600	3.6	0.93	59.2	28200	11.9
2014-15	2800	180000	312430	20200	5.6	1.56	57.6	26500	19.1
2015-16	6500	200000	354620	19900	7.2	3.25	56.4	24300	28.7
2017-18	16500	240000	382300	19700	8.3	6.88	62.8	22300	39.5
2018-19	42300	261450	401390	19752	8.1	16.18	65.1	19400	56.1

productivity due to heavy infestation of yellow mosaic virus, stem fly, and Rhizoctonia aerial blight. Apart from these, premature shedding of flowers, pods and leaves also caused reduction in yield under stress conditions as reported by Singh *et al*. (2016). As such introduction of improved variety "PU 35" of blackgram and promotion of cultivation of blackgram in the place of old variety of blackgram and soybean crop the shift in area could be achieved. Besides this reduction in fallow area by 8.1 per cent was occupied by blackgram crop in *kharif* season to fulfill requirement of pulses and farmers income. Blackgram crop was found suitable in Bundelkhand region due to their suitability (resistant and tolerant to biotic and a biotic stress and short duration), similar results were found in soybean and chickpea crop by varietal performance and suitable technological intervention by Singh *et al*. (2017) and Singh *et al.* (2019).

Yield performance

Adoption of improved variety 'PU 35" of blackgram increased the seed yield by 123 per cent over existing varieties (Berkha/T9) in a span of seven years of study (Table 2). Irrespective of variety and seasonal variations, the average yield achieved from improved variety was 1029 kg per ha as compared to that of 540 kg per ha under farmers' practice during seven years. It is evident from the results that the improved variety of blackgram (PU 35) performed better under average rainfall situation (Table 3). Maximum yield (10.29 q/ha) was obtained during 2018-19 when annual rainfall in Chhatarpur district was recorded as 668.2 mm during crop period. During 2013-14 and 2015-16 when higher rainfall was 1300 and 1161.4 mm respectively during crop period, the improved variety of blackgram (PU 35) produced lower yield 907 and 925 kg/ha which showed that this variety can also perform better under average rainfall regime. The yield increase with the improved variety under the farming situation of demonstration area is likely to be effective in area with similar microclimate. The year-to-year fluctuations in yield can be explained on the basis of variations in microclimatic condition of that particular place. Singh *et al.* (2013) also opined that depending on identification and use of farming situation, specific interventions may have greater implications in enhancing systems productivity. Yield enhancement in different crops in front line demonstration has amply been documented by Kumbhare *et al.* (2014); Nain *et al.* (2014) and Nain *et al.* (2015).

Horizontal spread of the variety

Improved blackgram variety PU 35 was sown only in 5 ha area during *kharif* 2011-12 in village Chowkhada and in the second year this variety occupied 30 ha area in other farmer's fields by fellow farmers. During 2018-19, the horizontal spread of the variety PU 35 increased by 16.8 per cent (42300 ha) out of total area of blackgram

Table 2: Horizontal Spread of Improved Variety (PU 35) of Blackgram and its productivity in District Chhatarpur

Year	Horizontal Spread (ha)		Horizontal Spread of improved variety and black gram crop (%)		Average yield (kg/ha)	
	PU 35	Horizontal spread of Blackgram	PU 35	Horizontal spread of Blackgram	Improved variety along with package and practices	Locally cultivated varieties
2011-12	5	50700	0.01	35.8	880	405
2012-13	30	80500	0.04	41.6	891	410
2013-14	1400	150000	0.93	59.2	907	405
2014-15	2800	180000	1.56	57.6	950	429
2015-16	6500	200000	3.25	56.4	925	415
2017-18	16500	240000	6.88	62.8	983	502
2018-19	42300	261450	16.18	65.1	1029	540

Table 3: Effect of Rainfall on the production of blackgram in District Chhatarpur

Year	Rainfall (mm) in *Kharif* season (June-Sept.)	No. of rainy days	Average yield (kg/ha)	
	Chhatarpur District		PU 35	Locally cultivated varieties
2011-12	796	**29**	880	405
2012-13	**895**	35	891	410
2013-14	1300	57	907	405
2014-15	**547.5**	21	950	429
2015-16	1161.4	52	925	415
2017-18	525.2	18	983	450
2018-19	**668.3**	29	1029	540

261450 ha of Chhatarpur district (Table 3). Before adoption of this variety the farmer used to harvest an average maximum production of blackgram of 540 kg per ha, and now the same farmer is producing 1029 kg per ha of blackgram. The better performance of blackgram variety over others grown at the location appears on account of its trait of doing well under either higher or lower rainfall conditions, better germinability, inbuilt resistance to YMV and moderately resistance to *Rhizoctonia* aerial blight disease and tolerance to insect-pests. This makes it possible to optimize productivity of blackgram by adoption of improved variety ‘‘PU 35" in light and heavy black soils of high rainfall regions. Similar report was found in soybean and chickpea crops by Singh *et al.* (2016) and Singh *et al.* (2019).

Economic evaluation

The cost of cultivation in improved cultivar was comparatively higher (Rs. 13500-16200) as compared to farmer’s practice (Rs. 13,000-15,700) on account of additional input provided in the demonstration. Higher gross returns (Rs. 39292–45945) and net returns (Rs 25792-29745) were obtained from improved variety (PU 35) as compared to local cultivar (Rs. 18083-20539) and (Rs. 5083-4839) respectively. The average net return obtained from improved variety was 46.4 per cent higher over locally cultivated varieties (Table 4). The returns per rupee investment were accordingly reflected in improved variety (2.8 to 2.9) as compared to locally cultivated varieties (1.3 to 1:4). The variation in cost of cultivation during study period is attributed to variation in cost of inputs and that of produce. The result suggests economic viability and agronomic feasibility of adopted module in soybean cultivation. The results are in conformity of findings reported by Dudhade *et al.* (2009); Jain and Trivedi (2006).

Impact of technology

The achievements and outcome of improved variety (PU 35) are outstanding. Blackgram has registered significant increase in productivity and returns per rupee investment. The average yield of improved variety (PU 35) of Blackgram has exhibited 43.9 per cent increase in yield against to farmers locally cultivated varieties. This is primarily due to introduction of high yielding disease resistant variety along with improved technology against farmer practices as cited by Singh *et al*. (2019) who reported similar report in chickpea crop. It could be possible mainly due to effective dissemination of improved variety and production technique (PU 35) of blackgram crop by bringing awareness among farmers and farm women along with RAEO of the village through various field oriented activities, training programme and availability of literature related to package and practices of blackgram crop in accordance with Singh *et al*. (2017) and Singh *et al*. (2018).

Feedback of blackgram growers

Adoption of a given variety (PU 35) is usually a process, which passes through awareness about the variety, assessment of the expected returns from the variety, the farmer may then decide to grow. Good performance of the variety was observed during

Table 4: Economic Evaluation of Horizontal Spread of Improved Variety of Blackgram (PU 35) in Chhatarpur District

Year	Average cost of cultivation (Rs./ha)		Gross returns (Rs./ha)		Net returns (Rs./ha)		Returns/Rupee investment	
	Improved practices	Local practices	Improved practices	Local practices	Improved practices	Local practices	Improved practices	Local practices
2011-12	13500	13000	39292	18083	25792	5083	2.9	1.4
2012-13	14200	13700	39783	18307	25583	4607	2.8	1.3
2013-14	14900	14300	40498	18798	25598	4498	2.7	1.3
2014-15	15200	14900	42418	19155	27218	4255	2.8	1.3
2015-16	15800	15100	43087	19423	27287	4323	2.7	1.3
2017-18	16000	15400	43891	19646	27891	4246	2.7	1.3
2018-19	16200	15700	45945	20539	29745	4839	2.8	1.3

evaluation with the farmers. For getting feedback about the variety, approximately 35 rural extension officer and 225 farmers were interviewed through comprehensive questionnaire in the study area. Since this variety has tolerance to excessive soil moisture or long dry spell during crop period, resistant to YMV and Rhizocotonia aerial blight and tolerant to insect and pests therefore, it was found suitable in terms of increased profitability and reduced risk. The farmers decided to switch off the other variety and adoption of this improved variety. Scientist gain insights about the level of adoption and the underlying factors that constraint or facilitate the adoption process, it is useful to examine the factors that determine technology uptake similar result was found in pigeonpea and chickpea crop under front line demonstration by Singh *et al.* (2017) and Singh *et al.* (2019). This information is important to both researchers and policy makers. The researcher would gain useful feedback on the level of uptake of the variety/technology by the blackgram growers and the attributes of the technology that conditioned the level of adoption. This can be useful in decision to develop well-suited variety that meets the needs of the target of increasing population in future. Policy makers can use such information to reform the policies that slower down the technology uptake or formulate and implement new instruments that hasten and support the adoption process.

CONCLUSION

The farmers of Chhatarpur district have been sowing the improved variety (PU 35) of blackgram crop consistently since last seven years which brought out significant increase in yield of blackgram crop that leads positive socio-economic changes in farmers life. The study also suggests that similar kind of approach can effectively convince the other farmers in other villages to adopt improved variety (PU 35) with recommended package of production to optimize their productivity which may effectively contribute to increase the national production of blackgram.

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REFERENCES

Anonymous (2018). www.farmer.gov.in.Sucess Report pp 20.

Dudhade, D.D., Deshmukh G.P., Harer, P.N. and Patil, J.V. (2009). Impact of front line demonstration of chickpea in Maharashtra, *Legume Research- An International Journal*, **32**(3), 206-208.

Jain, P.C. and Trivedi S.K. (2006). Response of soybean (*Glycine max* (L.) Merrill) to phosphorus and biofertilizers, *Legume Research,* **28**(1), 30-33.

Kumbhare, N.V., Dubey S.K., Nain M.S. and Bahal Ram (2014). Micro analysis of yield gap and profitability in pulses and cereals, *Legume Research- An International Journal*, **37**(5), 532-536.

Nain, M.S., Ram Bahal, Dubey, S.K. and Kumbhare, N.V. (2015). Adoption gap as the determinant of instability in Indian legume production: Perspective and implications, *Journal of Food Legumes*, **27**(2), 146-150.

Nain, M.S., Kumbhare, N.V., Sharma, J.P., Chahal, V.P. and Bahal, R. (2015). Status, adoption gap and way forward of pulse

production in India, *Indian Journal of Agricultural Science*, **85**(8), 1017-1025.

Singh, R.K., Jaiswal, R.K., Kirar, B.S. and Baghel, K.S. (2016). Enhancement of soybean production through varietal replacement- A cause study, *Soybean Research*, **14**(1), 52-57.

Singh, R.K., Singh, D. and Singh, R. (2019). Accelerating the chickpea productivity through suitable technological interventions in Vindhyan Plateau Zone of Madhya Pradesh, *Indian Journal of Extension Education*, **55**(1), 92-98.

Singh, R.K., Singh, S.R.K., Singh, T.K., Gautam, U.S. and Dixit A.K. (2013). Yield performance of soybean in Vindhyan Plateau of Madhya Pradesh, *Soybean Research*, **11**(1), 66-73.

Singh, R.K., Jaiswal, R.K., Kirar, B.S. and Mishra, P.K. (2017). Performance of improved varieties of pulse crops at farmers' field in Kymore Plateau and Satpura Hills Zone of Madhya Pradesh, *Indian Journal of Extension Education*, **53**(4), 136-139.