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Yield Performance of Soybean (*Glycine max* L.) in Madhya Pradesh

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ABSTRACT

KrishiVigyan Kendra, Burhanpur conducted 60 demonstrations on soybean during 2010 to 2014 in four adopted villages. The critical inputs were identified in existing production technology through farmers meeting and group discussions with the farmers. Average higher yield (2009.6 kg/ha) was obtained in demo plot over local check (1698.6 kg/ha) and an additional yield of 18.33 per cent was obtained in the demonstration plot. Average yield gap and technology index were found 290 kg/haand 12.62 per cent, respectively.Averages of gross and net returns of demonstration were 25.60 and 37.53 per cent higher than the farmers' practice, respectively.It was found that the percentage of damaged plant was lower in demonstration compared to farmers' practice. The seed treatment with thiamethoxam 70 WS @ 3g/ kgfollowed by spraying of thiamethoxam 25 WG @ 100 g/ha at the flowering and pod initiation stage inhibited stem fly attackconsequently lesser premature shedding of pods as compared to farmers' practice. Results suggested economic viability and agronomic feasibility of the FLD technology for soybean cultivation.

Key Words: Front line demonstration, Intervention, Technology, Yield.

INTRODUCTION

Among the oilseed crops, soybean has a great importance because of its high protein content than that of oil content. On account of high protein (40%) and oil (20%) contents, it serves as an ideal crop to provide these two vital constituents to human body. Good quality of protein provided by soybean is capable of alleviating the wide-spread protein malnutrition in the country. The soybean oil is highly digestible and devoid of cholesterol. Soybean is a legume that grows in tropical, sub-tropical and temperate climates. India ranked fifth in production after United States, Brazil, Argentina, and China. In spite of its high yield potential (4.5 t/ha), soybean productivity was much less in India (1.07 t/ha) than the world average of 2.43t/ha(FAOSTAT, 2011). In India, Madhya Pradesh being a leading state in soybean cultivation was renounced as soya state based on its area and production *viz.*, 5.51 mha(59.3%) of 6.10 Mt (60.2%),respectively.

In general the productivity of oilseed crops in Madhya Pradesh is low because of least technological backup, small and marginal land holdings and poor adoption of improved package of practices. Therefore, efforts have been made through frontline demonstrations (FLDs) to introduce innovative package of practices of soybean with a view to increase its productivity in the district. Hence, the present investigation has been undertaken to evaluate the impact of front line demonstration on yield enhancement of soybean, technology adoption and the role of technology in minimizing the disease and insect infestation.

MATERIALS AND METHODS

Study was carried out under rainfed condition and60 demonstrations were conducted in its adopted villagesviz.,Dhoolkot, Harda, Hanumatkheda and Umarda of Burhanpur district of Madhya Pradeshduring kharif season of 2010to 2014. Before

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Table1. Comparison between technological intervention and local check under FLDs.

Sr. No.	Particular	Technological Intervention (Demonstration)	local check (Farmers' practice)	Technological Gap
1.	Farming situation	Rainfed	Rainfed	No gap
2.	Variety	JS-9305 (new)	JS-335 (old)	Full gap (100%)
3.	Land preparation	Summer deep ploughing followed by rotavator	Summer deep ploughing followed by rotavator	No gap
4.	Time of sowing	last week of June to first week of July	last week of June to first week of July	No gap
5.	Seed treatment	2g thirum+ 1g carbendazim/ kg seed	No seed treatment	Full gap (100%)
6.	Seed rate	75 kg/ha	100 kg/ha	25% more than recommendation
7.	Method of sowing	Line sowing	Line sowing	No gap
8.	Nutrients application	20:60:20:20 kg NPKS/ha	18: 46:15:0 kg NPKS/ha	Not as per recommendation
9.	Weed management	Imazethapyrfollowed by hoeing	Only hoeing (No chemical)	Full gap (100%)
10.	Plant protection measures	Applied Trizophos 40 EC and Propenophos 50 EC @ 2.5 ml/liter water.	Use of Indiscriminate and non recommended pesticides	Full gap (100%)

conducting the FLDs,a list of sample farmers was prepared. The specific package of practices oriented training to be imparted to the selected farmers (Kumar *et al,* 2010). The differences in between demonstrated technology and existing farmers' practices (local check) are mentioned in table 1.

To study the yield and yield attributes,25 plants were selected by randomly placing of quadrate at five places in demo plots as well as in farmers' practice (FPs) plots after harvesting the crop. The economical assessment was done as per prevailing market prices. The data were collected from both demos as well as farmers' practice plots and analyzed for the yield gap, yield index (Samui *et al,* 2003).

RESULTS AND DISCUSSION

Yield

The implementation of improved production technology remarkably increased theyield (16.90–20.33%) over farmers' practice (Table 2). The average yield under recommended practice was 2009.6kg/ha (18.33% higher) as compared to the farmers' practice 1698.8 kg/ha. Yield enhancement under recommended practice might be due to balanced nutrition as per soil testvalue, integrated approach, involving fertilizers and biofertilizers which play a vital role in making availability of plant nutrients. Similar results were observed by Tomar *et al* (2003) and Tiwari *et al*(2003).

Economical Assessment

The cost of cultivation in demonstration was comparatively higher as compared to farmers' practice because of additional input applied in demonstration (Table 3). Average of gross and net returns of demonstration was 25.60 and 37.53%higher than that of farmers' practice, respectively. It showed that the adoption of demonstrated technology by the farmers would be economically gainful proposition. Similar results were observed in B: C ratio. These results were in conformity of the results as reported by Deshmukh *et al* (2005).

Table 2. Performance of technological intervention (FLDs) on yield and yield attributes.

Year	Plant population (No./ m²)		Seed yield (kg/ha)		Seed index (g/100 seed)		Percent increase over control (FP)
	RP	FP	RP	FP	RP	FP	
2010-11	40	45	1896	1618	11.8	10.9	17.18
2011-12	42	45	2058	1743	11.8	10.9	18.07
2012-13	42	45	2158	1846	12.0	10.9	16.90
2013-14	42	45	1923	1598	11.8	10.9	20.33
2014-15	42	45	2013	1689	12.0	10.9	19.18
Average	**41.6**	**45**	**2009.6**	**1698.8**	**11.88**	**10.9**	**18.33**

RP: Recommended Practice FP: Farmers Practice

Disease incidence

The data recorded on plants infested with wilt (Charcoal Rot and Collar Rot) caused by *Macrophomina phaseolina* and *Sclerotium rolfsii* revealed that, incidence of disease was lower in demonstration plot as compared to farmers' practice. The data(Table 4)reflected that the percentage of damaged plant (11.10) was lower in demonstration as compared to farmers' practice (14.95). This could be ascribed toseed treatment followed by fungicide spray at 25 days after germination, which effectively reduced disease incidence. The findings were in line with the results reported by Mauncio *et al* (2006).

Insect infestation

During the study,the data (Table 4) on

Table 3. Economical comparison between recommended practice and farmers practice.

Year	Gross cost (Rs./ha)		Gross return (Rs./ha)		Net return (Rs./ha)		B: C Ratio	
	RP	FP	RP	FP	RP	FP	RP	FP
2010-11	16764	16290	56997	45612	40233	29322	3.40	2.80
2011-12	16820	16528	55001	45286	38181	28758	3.27	2.74
2012-13	17924	17276	61658	49754	43734	32478	3.44	2.88
2013-14	18542	17760	66009	52747	47467	34987	3.56	2.97
2014-15	18780	17834	65730	49756	46950	31922	3.50	2.79
Average	17766	17137	61079	48631	43313	31493	3.43	2.83

Table 4. Impact of technological intervention on pest infestation.

Year	Disease affected plants/m2		Damage (%)		Shading of pre mature pods (No./pod)		Damage (%)	
	RP	FP	RP	FP	RP	FP	RP	FP
2010-11	5.2	7.5	11.55	14.15	6.0	11	21.42	34.37
2011-12	5.5	8.3	12.22	15.66	5.5	9	19.64	28.12
2012-13	4.8	8.0	10.66	15.09	5.0	8	17.85	25.0
2013-14	4.5	7.9	10.0	14.90	4.0	6	14.28	18.81
2014-15	5.0	7.8	11.07	14.95	5.1	8.5	18.26	26.50
Average	5.0	7.9	11.10	14.95	5.12	8.5	18.29	26.56

infestation of stem fly (Melanagrous myzasajae) caused premature shedding of pods. Seed treatment with thiamethoxam 70% WS @ 3g/kgfollowed by spraying of thiamethoxam 25%WG@ 100 g/ha at the flowering and pod initiation stage caused lesser premature shading of pods (5.12)as compared to farmers' practices (8.5). Similar results were quoted by Savajji (2006) and reported control of stem fly with application of thiamethoxam.

Yield gap and yield index

Variations in yield gap (142–404 kg/ha) reflected the impact of recommended technology used in FLDs in subsequent years. These results were in close conformity with the findings of Mitra and Samajdar (2010).The yield index showed the feasibility of the evolved technology at the farmers' fields. Lower value of yield index mean more feasibility of disseminated technology (inverse relations). The reduction in yield index (6.17) is good indicator of increased feasibility of demonstrated technology in these demonstrations and it can be gainful proposition for the farmers of the district.

Table 5:Impact of FLDs on yield gap and yield index

Year	Yield gap (kg/ ha)	Yield index (%)
2010-11	404	17.56
2011-12	242	10.52
2012-13	142	6.17
2013-14	377	16.39
2014-15	287	12.47
Average	290	12.62

CONCLUSION

From the study, it might be concluded that the use of recommended practices for soybean cultivation can reduce technology gap up to a certain extent. Consequently it increased the productivity of soybean in the Burhanpur district. However, extension agencies in the district need to provide proper technical support to the farmers through different educational and extension methods with a view to reduce the extension gap in soybean production.

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