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Performance and Adoption of Improved Production Technology of Sesame (*Sesamum indicum L.*) in Bundelkhand region of Madhya Pradesh

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ABSTRACT

To understand economic feasibility of technology transfer and adoption in Sesame (*Sesamum indicum L.*), front line demonstrations on improved variety (JTS-8), fertilizer application (30:60:20 NPK), plant protection (seed treatment with Carbendazim 2 g/kg, foliar spray of Mancozeb and Endosulphan), full package of practices *etc.*, a study was carried out during the rainy season *(Kharif)* of 2008, 2009 and 2010. Improved technology had given higher yield in all respects. Improved variety 'JTS 8' gave 17 per cent more yield (322 to 410 kg/ha) over farmers practices and ₹ 8750/ ha. in term of net return. The yields obtained under fertilizer management were 18 per cent (314-502kg/ha), plant protection 22 per cent (505-314kg/ha), weed control 27 per cent (513-328kg/ha) and full package of practices 32 per cent (585-348kg/ha). Minimum technology gap (148) existed in fertilizer management component of technology demonstration, while minimum extension gap (88) existed in improved variety component of technology demonstrations.

Key words : Improved production technology, demonstrations, fertilizer management.

INTRODUCTION

Sesame (*Sesamum indicum L.)*, is an important edible oilseed crop of India with 40-54 per cent oil and 20-25 per cent protein and is a valuable nourishing food and flavouring agent. Its oil has a desirable fatty acid composition and excellent stability against oxidative rancidity. Sesame oil has relatively high percentage of unsaponifiable matter and also contains two minor constituents, sesamin and sesamolin together with sesamol which is present in traces. Sesamol is formed during hydrolysis of sesamolin. These chemical constituents possess antioxidant property (Yadav *et al.* 2008). It is widely cultivated under rainfed or irrigated conditions, with poor resources in marginal/ problem soils. Being of short duration, this crop fits well in different cropping systems and is grown under mono, mixed and multiple cropping systems during rainy and summer seasons under wider range of agro-climatic condition in the major sesame-growing states. India accounts for 29 per cent of sesame area 26 per cent production and 40 per cent export of the world covering approximately 7.26 million ha. under this crop. In Madhya Pradesh, sesame cultivation is mainly confined to Chhatarpur, Tikamgarh, Panna, Khandawa, Shahdol, Jabalpur districts in 1, 79, 900 ha with very low productivity of 284 kg/ha.

Area under sesame has been showing a declining trend due to soybean cultivation in the state. Similarly, the overall oilseed production also has been stagnant mainly because the more fertile lands and better agronomic practices have gone for cereal crops, subjecting oilseeds to selection pressure for adoption to stress environment like survival on marginal land with low fertility and rainfed situation. In view of this, to boost oilseed production in India, a special programme of frontline demonstration under national oilseed development project was initiated to demonstrate the production potentials benefits of latest technologies *vis-à-vis* traditional farming practice.

METHODOLOGY

To generate the data on economic feasibility of technology transfer and adoption in sesame, frontline demonstrations were conducted in the Chhatarpur district where sesame crop is grown in a sizeable area by Agricultural Research Station, Nowgong, Chhatarpur during *Kharif* season of 2008, 2009 and 2010. The demonstrations on improved variety (JTS 8), fertilizer application (30:60:20 NPK), plant protection (seed treatment with Carbendazim 2g/kg, foliar spray of Mancozeb and Endosulphan for management of pest and disease), full package of practice (Improved variety 'JTS 8', seed treatment with Carbendazim 2g/kg, application of pre-emergence weedicide Alachlor 1.0 kg a.i./ha, basal application of fertilizer 20:60:20 kg NPK/ha. 10kg nitrogen after one month, foliar spray of Mancozeb 0.2 % and Endosulphan 0.2 %). Finally yields were calculated and cross sectional data on outputs and inputs used per ha were collected from FLD trails.

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In addition to this, data on traditional practices followed by the farmers were also collected form the equal area. The benefit:cost (B:C) ratio was calculated based on gross return. To estimate technology, extension gap and technology and adoption index, the following formulae were used :

1. Technology gap=Potential yield–Demonstration yield
2. Extension gap = Demonstration yield– farmers yield

RESULTS AND DISCUSSION

The data as shown in Table 1 indicate that the improved variety of sesame under demonstration was 'JTS 8' whereas the farmers used a mixture of variety 'TKG 55' and 'TKG 22' which had been cultivated by the farmers continuously for last few years. Under frontline demonstration, the yield was 410 kg/ha., 17 per cent higher than the traditional practice of farmers (mixture of 'TKG 55' and 'TKG 22') that yielded 322 kg/ha. The gross-return obtained under demonstration was ₹ 8,700/ha. which was exclusively owing to the replacement of the variety, and the B:C ratio was 2.64. Under fertilizer management component of demonstration, NPK dose applied was @ 30:60:20 kg/ha while the farmers applied DAP @ 50 kg/ha, *i.e.* N and P @ 9 and 23 kg/ha. This indicated that the farmers were not in a habit of applying potassium as a nutrient to sesame crop which otherwise is an important nutritional element of oilseed crops. The yields obtained were 502 and 314 kg/ha under demonstration and farmers practice, respectively, which showed an increase of 18 per cent. The gross-return was ₹ 11,675 per ha. and the B:C ratio was 2.99. The third front line demonstration on sesame was the plant protection component which included seed treatment with Carbendazim @ 2g/kg seed and foliar spray of Mancozeb and Endosulphan for management of disease and insects pest. In contrast the farmers practice, include spray of any available insecticide on the appearance of insect. The yield of sesame under demonstration was 505 kg/ha as against the farmers practice of 348 kg/ha, being 22 per cent higher. The gross-return obtained under demonstration was ₹ 11320/ha and B:C ration was 2.95. The fourth component of front line demonstration was weed control (pre-emergence weedicide Alachlor 1.0 a.i. kg/ha.) as against the farmer practice of hand-weeding which was comparatively costly due to high cost of labour in manual weeding. The yield obtained under demonstration was 513 kg/ha, which was 23 per cent higher as compared to the yield of 314 kg/ha. obtained under farmer practice. The gross-return was ₹ 11,655/ha while the benefit:cost ratio was 3.04. Under the demonstration of full package of practice the yield obtained was 585 kg/ha being 32 per cent more than the farmers practice of 328 kg/ha. The gross-returns was ₹ 13,725 / ha and the B:C ratio was 3.46. On analysing the B:C ratio and net return of demonstration, it can be stated that both the benefit:cost ratio and the net return were highest under demonstriation of full package of practices recommended for sesame. However, under component demonstration it was found that the B:C ratio was highest (3.04) for weed control. From the Table it can also be inferred that there was significant higher yields of sesame under frontline demonstration as compared with that of traditional farmer practice. The frontline demonstration also revealed that yields of sesame can be increased up to 17 per cent only by the replacement with improved variety 'JTS 8'. Similarly, increase in yields of sesame may be obtained up to 18 per cent by fertilizer management and application of recommended and balanced fertilizer application to the crop. In case of plant- protection measures, it was observed that yield of sesame increased up to 22 per cent by seed treatment with Carbendazim @ 2g/kg seed and foliar spray of Mancozeb and Endosulphan for management of disease and pest. As against handweeding it was found that chemical weed control may increase the yield of sesame up to the extent of 23 per cent. Jain *et al*. (1999) also found the maximum seed yield of sesame with Alachlor liquid 1.5 kg a.i./ha. The overall application of full package of practices revealed that the sesame yield may be increased up to 32 per cent as compared to the traditional farming practices being adopted by the farmers.

As regards the data presented in Table 2 it can be observed that six frontline demonstrations each laid down under improved variety, fertilizer management and plant protection, weed control and full package of practices. The potential yield of the improved variety of sesame 'JTS 8' under frontline demonstration was 650 kg/ha. The yields obtained on frontline demonstrations and farmers fields under different aspects, *i.e.* improved variety, fertilizer management, plant protection, weed control and full package of practices were 410-322, 502-314, 505-314, 513-328 and 585-348 kg/ha. respectively.

The technology gaps obtained were 240, 148, 366, 322 and 302 kg/ha. respectively and the extension gaps obtained were 88, 188, 190, 185 and 237 respectively. Further analysis of data showed that the maximum technology gap (366 kg/ha.) existed in plant-protection component of technology demonstration, whereas the minimum technology gap (148 kg/ha.) existed in fertilizer management component of technology demonstration. In case of extension gap, maximum extension gap (237 kg/ha.) was found in full package of practices frontline demonstration while minimum extension gap (88 kg/ha.) existed in improved variety component of technology demon striation

Table1: Impact of improved technology on yield of Sesame

Technology demonstrated		Yield (kg/ha)			Gross return (₹/ha)	Net return (₹/ha)
Demonstration	Farmers practices	Demo-nstration	Farmers practices	Increase in yield (%)		
Improved variety ('JTS 8')	Mixed seed of 'TKG 55' and 'TKG 22'	410	322	17	8,700	2.64
Fertilizer management (NPK 30: 60: 20 /ha)	DAP 50 kg/ha	502	314	18	11,675	2.99
Plant protection (seed treatment with Carbendazim 2 g/kg, foliar spray of Mancozeb and Endosulphan)	Spray of any insecticide on insect appearance	505	348	22	11,320	2.95
Weed control (pre-emergence weedicide A lachlor 1.0 kg a.i./ha)	Hand-weeding	513	314	23	11,655	3.04
Full package of practices	Mixed seed of 'TKG 55 ' and 'TKG 55' + DAP 50 kg/ha	585	328	32	13,725	3.46

Table 2: Extension and yield gap for Sesame crop in different years

Name of Technology	No. of Demonstrations	Yield (kg/ha)			Technology gap kg/ha	Extension gap kg/ha
		Potential	Improved practices	Farmers practice		
Improved variety	06	650	410	322	240	88
Fertilizer management	06	650	502	314	148	188
Plant protection	06	650	505	314	366	190
Weed control	08	650	513	328	322	185
Full package of practices	08	650	585	348	302	237

CONCLUSION

Front line demonstrations on improved variety ('JTS 8'), fertilizer application (30:60:20 NPK), plant protection (seed treatment with Carbendazim 2 g/kg, foliar spray of Mancozeb and Endosulphan), full package of practices. Improved technology had given higher yield in all respects. Improved variety 'JTS 8' gave 17 per cent more yield (322 to 410 kg/ha) over farmers practices and ₹ 8,750/ ha. in term of gross-return. The yields obtained under fertilizer management were 18 per cent (314-502kg/ha), plant protection 22 per cent (505-314kg/ha), weed control 27 per cent (513-328kg/ha) and full package of practices 32 per cent (585-348kg/ha). Minimum technology gap (148) existed in fertilizer management component of technology demonstration, while minimum extension gap (88) existed in improved variety component of technology demonstrations.

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