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Evaluation of frontline demonstration of sesame for sustainable food production in Kalaburagi district of Karnataka

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Abstract
Sesame (*Sesamum indicum* L.) is one of the important oilseed crops in Indian agriculture. One of the major constraints of its low productivity is non-adoption of improved technologies. The Krishi Vigyan Kendra, Kalaburagi has conducted frontline demonstration at adopted farmer's field. Front line demonstration were conducted at 36 farmers field, to demonstrate production potential and economic benefit of improved technologies comprising short duration, phyllody resistant varieties, line sowing, integrated nutrient management and timely weed management, integrated nutrient, pest and disease management. The improved technology recorded a mean yield of 6.30 q/ha which was 21.4% higher than that obtained with farmers practice yield of 4.90 q/ha. The improved technologies resulted higher mean net income of Rs.27336/ha with a benefit cost ratio of 4.50 as compared to local practice (Rs. 20805/ha, 3.71 respectively). There is a need to adopt multipronged strategy that involves enhancing sesame production through better adoption of improved technology.

Keywords: sesame, test weight, technology index, yield and economics

Introduction

Sesame (*Sesamum indicum* L.) is one of the important oilseed crops in Indian agriculture. Sesame seeds are rich source of food, nutrition, edible oil and bio-medicine. Sesame oil has excellent nutritional, medicinal, cosmetic and cooking qualities for which it is known as 'the queen of oilseeds'. The crop is now grown in a wide range of environments, extending from semi-arid tropics and subtropics to temperate regions. Consequently, the crop has a large diversity in cultivars and cultural systems. India is the largest producer of sesame in the world. In general, average productivity of sesame continues to be lower (144 to 234 kg/ha) than expected from agricultural technology for the last 20 years, mainly due to its cultivation on marginal lands, under poor management and without inputs except seed. The major constraint responsible for lower yield are inappropriate production technologies viz; broadcast method of sowing, no use of fertilizer and untimely weed management (45 DAS), (Khaleque and Begum, 1991) [2].

In the medium term, accelerating import substitution, improving efficiency of the oil processing sector, and judicious use of tariffs are vital (Chand *et al.*, 2004) [6]. The improved technology packages were also found to be financially attractive. Yet, adoption levels for several components (of the improved technology were low, emphasizing the need for better dissemination (Kiresur *et al*., 2001). Several biotic, abiotic, and socioeconomic constraints inhibit exploitation of the yield potential and these needs to be addressed. Kalaburgi and its population wholly dependent on agriculture and allied activities. With the start of technology mission on oilseeds, frontline demonstration on sesame using new crop production technology was started with the objectives of showing the productive potentials of the new production technologies under real farm situation over the locally cultivated sesame crop. Keeping this in view, frontline demonstrations on sesame were conducted to demonstrate the production potential and economic benefits of latest improved technologies on farmer's fields.

Materials and Methods

Frontline Demonstration is the new concept of field demonstration evolved by ICAR with the inception of technology mission on oilseeds and pulses. The main objective of frontline demonstrations is to demonstrate newly released crop production technologies and its management. practices in the farmer 's field. The present investigation was carried out during the kharif season in the adopted villages of 'Krishi Vigyan Kendra of Kalaburagi (Karnataka state). Materials and methods adopted for front line demonstration are given in table 1. The FLD was conducted to study the gaps between the potential 'yield and demonstration yield, extension gap and the technology index. The Krishi Vigyan Kendra of Kalaburagi conducted frontline demonstrations 36 were organized on farmer's field to demonstrate the impact of integrated crop management technology on sesame productivity over three years during *Kharif*season2014-15to 2016-17. Each frontline demonstration was laid out on 0.4 ha area, adjacent 0.4 ha was considered as control (farmer's practice). The yield data were collected from both the demonstration and farmers practices by random crop cutting method. Qualitative data were converted into quantitative form and expressed in terms of per cent increase in yield calculated using following formula (Samui *et al.*, 2000) [9].

Table 1: Improved production technology and Farmers practices of sesame under FLD

S. No.	Technology	Improved practices	Farmers practice	GAP (%)
1	Variety	DSS-9	Local	100
2	Time of sowing	June-july	August	Partial gap
3	Pre-emergent herbicide	Pendimethalin (@ 1 l/ha)	No herbicide	Full gap
4	Seed rate	12-15 kg/ha	18-20 kg/ha	Partial gap
5	Sowing method	Line sowing	Line sowing	No gap
6	Seed treatment	Imidacloprid 60FS @ 5 gm /kg seeds	No seed treatment	Full gap
7	Fertilizer dose (NPK kg/ha)	50:25:25	25:10:10	Partial gap
8	Plant protection	Spray of Imidacloprid 17.8 SL @ 0.3 ml/ltr of water at 45 and 60 DAS @300 ml / ha + Sparay of Hexaconazole @1 ml/lit of water at 45 and 60 DAS @ 1 lit/ha + Use of Dimethoate 1.75 ml/litr	Non-adoption of recommended package of practices and injudicious use of pesticides and spray Dursban 20 EC (Chloropyriphos) @ 500ml/acre	Full gap

Technology gap = Potential yield – Demonstration
Yield Extension gap = Demonstration yield – Farmers yield
Technology index = ((Potential yield - Demonstration yield) / Potential yield} X 100

Table 2: Growth and yield attributing characters of sesame through FLDs

Year	No of Demo.	Area (Ha)	Plant height (cm)		No. of capsules /plant		No. of seeds / capsules		1000 seed weight	
			Demo	Check	Demo	Check	Demo	Check	Demo	Check
2014-15	12	5	129.7	120.9	85.4	69.8	71.9	66.8	2.93	2.07
2015-16	12	5	119.8	108.6	72.7	52.4	64.3	59.5	2.46	1.97
2016-17	12	5	148.6	126.7	98.6	73.4	75.4	70.1	2.79	2.03
Average	12.0	5.0	132.7	118.7	85.6	65.2	70.5	65.5	2.73	2.02
Total	36	15	-	-	-	-	-	-	-	-

Table 3: Seed yield and economics of sesame as affected by improved and local practices in farmers' fields

Year	No of Demo.	Area (Ha)	Yield (q/ha)			% increase in yield over farmers practice	Cost of cultivation (Rs/ha)		Gross return (Rs/ha)		Net return (Rs/ha)		B:C	
			Potential yield	Demo yield	Farmers practice		Demo	Check	Demo	Check	Demo	Check	Demo	Check
2014-15	12	5	10	6.4	5.3	17.4	7350	6240	33063	27295	25713	21055	4.50	4.37
2015-16	12	5	10	5.7	4.4	22.7	7150	5860	31922	24672	24772	18812	4.46	4.21
2016-17	12	5	10	6.8	5.1	24.0	8900	8190	40425	30737	31525	22547	4.54	3.75
Average	12.0	5.0	10	6.3	4.9	21.4	7800	6763	35136	27568	27336	20805	4.50	4.11
Total	36	15	-	-	-	-	-	-	-	-	-	-	-	-

Table 4: Performance of Front Line Demonstrations (FLD) of sesame

Year	No of Demo.	Area (Ha)	Yield (q/ha)			% increase in yield over farmers practice	Technological gap (q/ha)	Extension gap (q/ha)	Technological index (%)
			Potential yield	Demo yield	Farmers practice				
2014-15	12	5	10	6.4	5.3	17.4	3.58	1.12	35.80
2015-16	12	5	10	5.7	4.4	22.7	4.32	1.29	43.20
2016-17	12	5	10	6.8	5.1	24.0	3.24	1.62	32.40
Average	12.0	5.0	10	6.3	4.9	21.4	3.71	1.34	37.13
Total	36	15	-	-	-	-	-	-	-

Results & Discussion

During the 2014-15 to 2016-17 of three years study period it was observed that the adoption of improved production technologies in demonstration trials has increased the yield over the farmers' practices. Frontline demonstration was conducted on 5 hectares of land with 24 demonstration plots involving DSS-9 sesame variety.

The growth and yield attributing parameters are increased with improved production technology. On an average of three years study, the plant height, Number of capsules per plant and Number of seeds/capsules and test weight increase were observed132.7 cm, 85.6, 70.5 and 2.73 g, respectively compare to farmers practice (118.7 cm, 65.2, 65.5 and 2.02 g, respectively). The result indicates that the Frontline demonstration has given a good impact over the farming community of kalaburagi as they were motivated by the new agricultural technologies applied in the FLD plots (Chand, 2002) [8].

Yield of sesame was varied in different years, which might be due to the soil moisture availability & rainfall condition, climatic aberrations, disease and pest attacks as well as the change in the location of trials every year. The high yielding variety had performed extremely well when compared to local check. The percentage increase in the yield over local check was 21.4 over a check. The technology gap which shows the gap in the demonstration yield over potential yield were3.24 to4.32 during 2014-15 and 2016-17, respectively. The additional cost increased in the improved technologies was mainly due to more cost involved in balanced fertilizer, improved seed and weed management practices. Similar results also have been reported by Khan *et al.* (2009) [5]. To get maximum yield of sesame recommended package of practices should be followed. By not following any one management practice yield may be reduced severely and it was also observed that delay in sowing, unbalanced does of fertilizer, untimely weed management and plant protection drastically reduced the grain yield of sesame.

The technology gap observed may be attributed to dissimilarity in the soil fertility status and weather conditions. Hence location specific recommendation appears to be necessary to bridge the gap between the yields. The highest extension gap of 1.62 was recorded during 2016-17 which emphasized the need to educate the farmers through various means for the adoption of improved high yielding varieties and newly improved agricultural technologies to reverse this trend of wide extension gap. More and more use of new HYV's by the farmers will subsequently change this alarming trend of galloping extension gap (Hedge, 2004) [3]. This high extension gap in all these varieties requires urgent attention from planners, scientists, extension personnel and development departments. The lower the value of technology index more is the feasibility of the technology. The new technologies. Will eventually lead to the farmers to discontinuance of old varieties with the new technology, the technology index shows the feasibility of the evolved technology at the farmers' field. The lower the value of technology index more is the feasibility of the technology (Sagar and Chandra, 2004) [6]. The technology index is 32.40 to 43.20 per cent during three years study, respectively which shows the good performance of ICMin Kalaburagi conditions and this will accelerate the adoption of. Newer technologies to increase the productivity of sesame in this area. These results are in conformity with the findings of Sagar and Ganesh Chandra (2004) [6].

Technology gap (Table 4), the gap in the demonstration yield over potential yield ranges from 13.2 to 17.1. The technology gap observed may be attributed to dissimilarity in the soil fertility status and weather conditions as well as the soil moisture availability. The technological gap may be attributed to the dissimilarity in the soil fertility status and weather conditions (Mukharjee, 2003) Hence location specific recommendation appears to be necessary to bridge the gap between the yields of different technologies. The highest extension gap of 2.15 was recorded during 2012-13.This finding is in corroboration with the findings of Hiremath and Nagaraju, 2010. The highest technology index were 75 percent for the year 2010-11 and lowest in 2013-14 with 52.8 percent. This emphasized the need to educate the farmers through various means for more adoption of newly improved agricultural technologies to bridge the wide extension gap. More and more use of new high yielding varieties by the farmers will subsequently change this alarming trend of galloping extension gap.

There is a need to adopt multipronged strategy which involves enhancing sesame production through horizontal and vertical expansion and productivity improvements through better adoption of improved technology. In the fragile environments and poor farm resource base, sesame is the best choice for farmers. Cultivation of sesame also helps in protecting the environment from the risk of high input agriculture.

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