Int.J.Curr.Microbiol.App.Sci (2021) *10*(03): 60-67

International Journal of Current Microbiology and Applied Sciences
ISSN: 2319-7706 **Volume 10 Number 03 (2021)**
Journal homepage: http://www.ijcmas.com

Original Research Article https://doi.org/10.20546/ijcmas.2021.1003.010

Impact Assessment of Technological Interventions on Yield Attributes and Seed Yield of Sesame

Jai Singh[1], A. K. Singh[2], Akhilesh K. Chaubey[1], Jasvinder Kaur[3] and Safeer Alam[4*]

[1]*Krishi Vigyan Kendra, Singrauli (MP), India*
[2]*KVK JNKVV, Jabalpur, India*
[3]*EEI Nilokheri, CCS HAU, Hisar, India*
[4]*SKUAST-Kashmir, Shalimar, Srinagar (J&K), India*

**Corresponding author*

Keywords

Sesame, Technology demonstration, Yield, Net return, Technology gap, extension gap and Technology index

Article Info

Accepted:
04 February 2021
Available Online:
10 March 2021

A B S T R A C T

Ninety Nine technology demonstrations were conducted on sesame in participatory mode covering 40 ha area covering five randomly selected villages in Sidhi district of Madhya Pradesh during 2009-10 to 2016-17 with an objective to assess the production potential of improved cultivars coupled with integrated nutrient, weed and pest management. Results revealed that the seed yield and the number of capsules were 667 kg/ha and 100.16/plant respectively under demonstrated technology over that of local check (farmer's practices) 506 kg/ha and 74.66 capsules/plant, which was 31.81 and 34.15 percent greater in seed yield and number of capsules/plant respectively. Irrespective of the locations and over the years, technology demonstrations resulted average additional net return of Rs.3598/ha and benefit-cost ratio (0.21) with the additional cultivation cost of Rs.1754/ha over that of farmer's practices. Technology and extension gap varied from 95 to 250 and 112 to 216 kg/ha irrespective of the years. Technology index ranged between 11.87 to 31.25 per cent during the study period.

Introduction

Sesame (*Sesamum indicum* L.) is an important and ancient Indian originated oilseed crop in the world to mankind's, with the archeological evidences dating back to 2250 and 19750 BC at Harappa with Indus valley (Najeeb *et al.*, 2012). It is referred as 'queen of oilseed' due to consumers liking and owing to its oil quality (Bedigian and Harlan, 1986). It has highest oil (46-64 per cent) content amongst the annual oilseed crops. It is rich in nutty flavor, dietary energy (6355 k cal/ kg) and is a common ingredient in cuisines across the world. Sesame seed is used for a wide array of edible products in raw or roasted form and also for industrial uses such as soaps, lubricants, lamp oil, used as ingredient in cosmetics, pharmaceutical uses and animal feed (Bedigian, 2011). India ranks second in world with 17.3 lakh hectare acreage after Sudan and third rank with 7.46 lakh tones production which is 12.4 percent of the world production (55.32 lakh MT) after Tanzania followed by Myanmar. Productivity of Sesame is less (436 kg/ha) than the potential yield of recommended varieties and other countries of the world (Anonymous, 2020).

The major constraints responsible for lower yield are inappropriate production technologies *viz*. broadcast method of sowing, under use/No. of fertilizers and poor weed management (Khalque and Begum, 1991). The greatest limitations of increasing in productivity of crop are inadequate supply of nutrients and poor production practices or poor in native fertility (Singh and Khan, 2003). Continuous use of poor production technologies by the farmers may not sustain soil fertility, productivity and profitability of the crop. In order to realize this opportunity, an analysis of the major current constraints limiting sesame productivity is needed in the crop area. However, use of improved production technologies are required to improve the soil health as well as to achieve sustainable crop productivity. Thus, the use of improved production technologies of sesame offers a great scope for increasing productivity and profitability. The yield of sesame can be increased by 20 - 52.42 percent with the adoption of improved technologies such as improved variety, recommended dose of fertilizer, weed management and plant protection. Keeping this in view, technology demonstrations were undertaken to improve the productivity and profitability of sesame with latest improved production technologies in participatory mode.

Frontline demonstration is one of the best tools for transfer of technology at farmers' field to show the variety/technology potential. Frontline demonstration has its significant and crucial role in agricultural production. Attempts are being made to increase area and productivity of sesame in Sidhi district under *Kymore Pleatu* and *Satpura Hills* agro climatic zone of Madhya Pradesh. In the consequence, technology demonstration were conducted at 99 locations in the district with the objective to find out the increase in yield and profitability under technology demonstrations over local check and the adoption behavior of technologies demonstrated, technology gap, gap in technology transfer tools and technology index under sesame production were taken in to the consideration for the study.

Materials and Methods

The aim of frontline demonstration in general is to raise production through transfer of technology, influence the farmers as well as the extension functionaries. In view of the problems and feedback the present study was designed to identify the impulse resulting from the front line demonstrations for spreading the improved Sesame production technology in Sidhi District of Madhya Pradesh. The Cross sectional data on output of sesame and input used per hectare have been collected from the FLDs. Technology demonstrations were conducted at 99 on farmers fields spread in five villages i.e. Chhavari, Hadbado, Karwahi, Mamder and Chorgrahi of the district during kharif season from 2009-10 to 2016-17 under rainfed condition. The soil was sandy loam to loam in texture with the low available nitrogen (118.5-198.7 kg/ha), medium phosphorus (12.5-16.1 kg/ha) and medium to high potassium (278.1-305.4 kg/ha) in the selected area. The soil organic carbon was also less at all the locations which varied from 0.22 to 0.25 percent. Each demonstration was conducted on an area of 0.4 ha and the same area adjacent to the demonstration plot was kept as local check (farmer's practice). The technology package included improved cultivars suitable for rainfed condition and tolerant to phytophthora, bacterial blight and leaf spot diseases. Sesame cv. TKG 306 was sown during a period of three years (2009-10, 2012-13 and 2015-16); TKG 22 in 2011-12 and JTS 8 in 2010-11, 2013-14, 2014-15 and 2016-17 under the demonstrations. Seeds were treated with metalaxyl-35 SD @ 6g/kg seed for prevention from seed borne diseases and inoculated with PSB @ 20 g/kg seed for increasing availability of available soil P_2O_5. Sowing was done between 05th July to 20th July every year with the seed rate of 5 kg/ha at 30 x15 cm plant geometry. Based on soil test value, NPKS applied @ 30:20:10:10 kg/ha through Di-ammonium phosphate (DAP), Urea, Muriate of potash (MOP) and bentonite sulphur. All the fertilizers were applied during sowing of the crop. Weed control was done by pre-emergence weedicide i.e. pendimethalin @ 1 kg a.i./ha and one hand weeding at 25 DAS. To protect the yield losses from 'til hock moth, spray of quinolphos 40 EC was carried out @ 1.5 litre/ha at ETL level. Harvesting was done during 5th to 15th October every year after two–third to three-fourth of the capsules was matured. The farmer's practice included seed rate of 10 kg/ha and basal application of 50 kg DAP which supplemented 9 kg N and 23 kg P_2O_5/ha. The seasonal rainfall varied from 325.2 to 719.4 mm in the crop season during study period.

The technology adoption of the frontline demonstrations was workout through technology gap, extension gap and technology index. Technology index show the feasibility of the evolved technology on the farmer field. To estimate the effect of all these parameters the following formulae given by Samui *et.al.*, (2000) were used.

Technology Gap = (Potential Yield-Demonstration Yield)

Extension Gap = (Demonstration Yield-Farmer yield)

Technology Index = (Technology gap/ Potential yield) X 100

Results and Discussion

Yield attributes and yield

The data on yield attributes and seed yield of sesame presented in Table 1 revealed that number of capsules per plant under the technology demonstrations were 103, 99, 102,101, 99, 97, 99 and 100 over that of local check (farmer's practices) which was recorded to be 69, 72, 70, 79, 80, 78, 79 and 82 during 2009-10 to 2016-17 respectively with the increase of 49.52, 37.50, 45.71, 27.84, 23.75, 24.35, 25.31 and 29.95 percent over the local check (farmers practice). The average number of capsules/plant was noted 99.6 under technology demonstrations which were 28.15 percent higher over farmer's practice (78). Number of seeds/capsule under technology demonstrations were 76.58, 67, 77.5, 71.62, 73.10, 74.10, 73.1 and 72.3 respectively with the average of 73.16 during 2009-10 to 2016-17 over that of farmer's practice (68.25, 62.15, 65.65, 67.1, 65.6, 66.95 and 67.1) with the average of 65.94. The number of seeds/capsule under technology demonstrations was 12.2, 7.8, 18.01, 6.73, 11.43, 11.42, 9.18 and 7.74 percent with the average of 10.89 percent over farmers practice. Rudrasen *et al.*, (2014) reported that the maximum average number of capsules/plant and number of seeds per capsule (103.62 and 71.1) were obtained under improved technology over that of farmer's practices (77.59 and 66.57) thus, there were 25.11 per cent more capsules per plant and 6.38 per cent seeds per capsule under improved technology as compared to local check.

The average seed yield under technology demonstrations was noted to be 628, 550, 640, 693, 690, 694, 690 and 705 kg/ha during

2009-10, 2010-11, 2011-12, 2012-13, 2013-14, 2014-15, 2015-16 and 2016-17respectively with mean seed yield of 685 kg/ha over that of farmer practice where it ranged between 375 to 581 kg/ha with the mean yield of 550 kg/ha. The additional seed yield under the technology demonstrations noted between 116 to 216 kg/ha over the years with an average of 135 kg/ha over the farmer's practices. The increase in seed yield under the demonstrations was 52.42, 46.66, 42.22, 24.41, 20.2, 20.06, 22.77 and 21.55 percent in 2009-10, 2010-11, 2011-12, 2012-13, 2013-14, 2014-15, 2015-16 and 2016-17 respectively over farmer's practice. The increase in grain yield under technology demonstrated area was mainly due to increased no. of capsules/plant and no. of grain/capsule. Rudrasen *et al.,* (2014) found that adoption of improved production technology in sesame with high yielding varieties to increase productivity by 35.38 percent as compared to farmer's practices of sesame production. Kumar *et al.,* (2015) reported that the yield attributes and seed yield of sesame varieties were significantly influenced by line sowing, use of integrated nutrient management, weed management and adoption of these improved technologies as a whole. Naik *et al.,* (2016) reported that an average of 13.72 percent increase in yield over farmers practices due to high yielding varieties and improved production technology of sesame. Similar results of yield enhancement in sesame crop in frontline demonstration have been reported by Chhodavadia, *et al.,* (2016) and Meena *et al.,* (2018) (Table 2).

Economics

The Economic viability of improved technology over farmers practices was calculated using the prevailing price of inputs and outputs in the respective years (Table 3). It was found that the additional cost of production of sesame under the technology demonstrations varied from Rs.1111 to 2686/ha with an average of Rs.1754/ha over farmer's practices where the cultivation cost ranged from Rs.9056 to 11982/ha with an average of Rs.10730/ha which is little higher than the average cost of cultivation of sesame crop (Rs 10254.54) reported by Singh *et al.,* (2015), may be due to technology followed by the farmers of the area. The additional cost in technology demonstrations incurred due to more cost involved on fertilizers, seed, seed treatment and integrated pest management; resulted in higher net return which ranged from Rs.4038 to 21915/ha with an average of Rs.14142/ha as compared to that of farmer's practices where it ranged from Rs.1649 to 18068/ha with the average of Rs.10544/ha. The improved technology also gave higher benefit cost ratio which recorded to be 1.56, 1.33, 1.80, 2.37, 2.42, 2.46, 2.47 and 2.64 as compared to 1.29, 1.17, 1.54, 2.10, 2.26, 2.31, 2.25 and 2.42 under farmers practice form 2009-10 to 2016-17. The additional income substantially benefitted the sesame growers improved their livelihood in the study area. These results are in agreement with those of Rudrasen Singh *et al.,* (2014) who reported additional net return and higher B:C ratio in frontline demonstration on sesame crop. The results from the present study clearly reflect the potential of improved production technology in enhancing sesame production and economic gain in rain fed farming situations of Sidhi district. Hence, the demonstrated technology has broad scope for increasing the area and productivity of sesame.

Gap in technology, extension and technology index

The results pertaining to gap in technology, extension and technology index given in Table 4 indicates that the average of the entire locations, the technology gap varied between

95 to 250 kg/ha during study period which confirm the wide technology adoption by the farmers. The above range of technology gap may be attributed to the dissimilarity in soil fertility, soil heterogenity and weather parameters during study conducted at different locations. Highest technology gap (250 kg/ha) was noted in the year 2010-11, however lowest (95 kg/ha) in 2016-17. These findings are in corroboration with the findings of Naik *et al.*, (2016) and Meena *et al.*, (2018) who reported the similar results. Dar *et al.*, (2018) also reported that farmers may be trained and make aware about the recommended package of practices, timely crop loan disbursal and inputs availability, proper market and transportation will help in improving yield in rice crop at farmers' field.

Table.1 Rainfall and physico-chemical characteristics of the soils in the study area

Year	Rainfall (mm) during crop period	No. of rainy days during crop period	Physico-chemical characteristics of the soil					
			pH	EC (dS/m)	Organic carbon (%)	Available Nitrogen (kg/ha)	Available Phosphorus (kg/ha)	Available Potassium (kg/ha)
2009-10	325.2	30	6.7	0.35	0.25	146.9- 167.2	13.2 – 14.8	280 – 299.1
2010-11	667.0	46	6.4	0.35	0.25	152.8 – 171	14 – 14.3	288 – 293.7
2011-12	718.3	41	6.2	0.34	0.22	120 – 134.3	14.1 – 14.9	290.6 – 299.5
2012-13	719.4	33	6.9	0.35	0.24	137 – 173.2	12.5 – 14.6	297.7- 292
2013-14	606	42	6.7	0.33	0.23	118.5- 179	13.2 – 14.9	283.5 – 298
2014-15	361.9	25	6.6	0.32	0.23	126.5- 181	15.2 – 16.1	291 – 305.4
2015-16	449	23	6.5	0.31	0.22	121.7- 198.7	13.9 – 15.8	278.1- 300.8
2016-17	516	37	6.6	0.29	0.23	119.1- 191.2	13.1 – 16.0	288.9 – 304.3

Table.2 Yield attributes and seed yield of sesame during study

Year	Variety	Area (ha)	No. of demo	No. of capsules/ plant		% increase over FP	No. of seeds/ capsule		% increase over FP	Yield (kg/ha)		% increase over FP
				Demo	FP		Demo	FP		Demo	FP	
2009-10	TKG 306	5	12	103	69	49.52	76.58	68.5	12.20	628	412	52.42
2010-11	JTS 8	5	12	99	72	37.5	67.0	62.15	7.80	550	375	32.90
2011-12	TKG 22	5	14	102	70	45.71	77.5	65.67	18.01	640	450	42.22
2012-13	TKG 306	5	13	101	79	27.84	71.62	65.10	9.37	693	557	24.41
2013-14	JTS 8	5	12	99	80	23.75	73.10	65.60	11.43	690	574	20.20
2014-15	JTS 8	5	12	97	78	24.35	74.10	66.50	11.42	694	578	20.06
2015-16	TKG 306	5	12	99	79	25.31	73.10	66.95	9.18	690	562	22.77
2016-17	JTS 8	5	12	100	82	21.95	72.30	67.10	7.74	705	581	21.34
Average		**40**	**99**	**99.66**	**78**	**28.15**	**73.16**	**65.94**	**10.89**	**685**	**550**	**25.11**

Table.3 Economics of sesame cultivation in technology demonstrations and farmer's practices

Year	Cost of cultivation (Rs/ ha)		Gross return (Rs/ha)		Net return (Rs/ha)		B:C ratio	
	FP	Demo	FP	Demo	FP	Demo	FP	Demo
2009-10	9056	11421	11742	17890	2686	6477	1.29	1.56
2010-11	9226	11912	10875	15950	1649	4038	1.17	1.33
2011-12	9893	12058	15300	21760	5406	9702	1.54	1.80
2012-13	11140	12251	23394	29106	12254	15500	2.10	2.37
2013-14	11380	12801	25830	31050	14450	18249	2.26	2.42
2014-15	11471	12995	26588	31924	15117	18929	2.31	2.46
2015-16	11691	13101	26414	32430	14723	18329	2.25	2.47
2016-17	11982	13335	29050	35250	18068	21915	2.42	2.64
Average	**10730**	**12484**	**21149**	**26920**	**10544**	**14142**	**1.92**	**2.13**

Table.4 Technology gap, extension gap and technology index in sesame demonstrations and farmer's practices

Year	Potential Yield (kg/ha)	Yield (kg/ha)		Technology gap (kg/ha)	Extension gap (kg/ha)	Technology index (%)
		Demo	FP			
2009-10	800	628	412	172	216	21.5
2010-11	800	550	375	250	175	31.25
2011-12	800	640	450	160	190	23.75
2012-13	800	693	557	107	136	20.0
2013-14	800	690	574	110	116	13.37
2014-15	800	694	578	106	112	13.25
2015-16	800	690	562	110	128	13.75
2016-17	800	705	581	95	124	11.87

The highest and lowest extension gap i.e. 216 and 112 kg/ha observed in the year 2009-10 and year 2014-15 respectively. It emphasizes that still there is a need to educate the sesame growers through various extension mechanism regarding the adoption of all the technology components of sesame to reverse these trend of wide extension gap. Adequate adoption of the technologies with improved and disease tolerant varieties will subsequently change this alarming trend of galloping the extension gap. The new technologies will eventually lead to the farmers to discontinue the old technology and to adopt new technology. Naik *et al.,* (2016) opined that the highest extension gap 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. Dar *et al.,* (2017) also reported in FLD on oil seed and pulses updated the knowledge and skills of the farmers. The extension activities (Field days, Kisan Mela, Trainings and Group discussions etc.) resulted in developing sound relationship between farmers and the scientists and to build confidence among the farmers.

The technology index show the feasibility of the evolved technology for the evaluation at farmers' field and the lower the value of technology index more is the feasibility of the technology (Meena *et al.,* 2018 and Naik *et al.,* 2016). It was found between 11.87 to 31.25 per cent which revealed that the lower value of technology index increased the feasibility rather than the higher value. These findings indicate that the existence of yield gap between the technologies generated at research station and its implication at farmer's field. Lowest technology index (11.87 percent) was observed in the year 2016-17 due to extensive adoption of variety and other technology components.

In conclusion technology demonstrations of various improved sesame varieties performed better which has been reflected by its average yield (685 kg/ha) over that of local check (550 kg/ha) at all the locations over the years. Based on the above findings, it may be concluded that adoption of various improved technology components with the improved seed varieties can reduce the yield gap up to a considerable extent leading to increase in productivity of the crop in the district. Moreover, extension agencies of the district need to educate and support to the farmers using different extension tools to reduce the extension gap for better sesame production and productivity. KVK has its important and significant role in serving as a linkage mechanism.

Acknowledgement

The authors are highly thankful to ICAR for providing financial assistance towards organizing frontline demonstrations on sesame which lead to enhance the productivity to a great extent and subsequently increase in the income per unit area as well as the livelihood of the farming community.

References

Anonymous, 2020. Food and Agriculture Organization Statistical Databases (FAOSTAT). Available online: http://faostat.fao.org/ (accessed on 5 February 2020).

Bedigian, D. 2011. *Sesame: The genus Sesamum*, 1st ed.; Taylor & Francis: Boca Raton, FL, USA, ISBN 978-0-8493-3538-9.

Bedigian, D., Harlan, J.R. 1986. Evidence for cultivation of sesame in the ancient world. Economic Botany, 40(2): 137–154.

Chhodavadia H.C. et al. 2016. Impact of Frontline Demonstration on Summer Sesame Growers. International Journal of Agriculture Sciences, ISSN: 0975-3710 & EISSN: 0975-9107, 8(25): 1514-1515.

Dar, M.A., Safeer Alam and Sushil Kumar (2017). An Evaluation of Extension activities organized under FLD on Oilseed and Pulses in KVKs of Punjab and J&K States. Ind. J. Extn. Edu. 53(1): 119-123.

Dar, M.A., Safeer Alam, Kaur, G., Sushil Kumar and Matto, J.M. (2018). Gap analysis in adoption of recommended package of practices of Paddy cultivation under temperate climatic conditions of Kashmir . Ind. J. Extn. Edu. 54(2): 114-119.

Khalque, M. A. and Begum. D. 1991. Area and production of oilseed crops, 1988-90. (In) fifteen years of oilseed research and development in Bangladesh. AST/CIDA. 28: 190.

Kumar, V; Sharma, V.; Sharma, S.C. Singh, S. and Sharma, R.K. 2015. Productivity enhancement in sesame (*Sesamun indicum* L.) as influenced by different improved production technologies. J. Oilseeds Res. 32(1): 87-90.

Naik, A; Devappagouda, H.P.; Raju,G.T. and

Zaheer, A.B.2016. Productivity enhancement odsesame (*Sesamum indicum* L.) through improved production technologies/ Frontline demonstrations. Res. Environ. Life Sci. 5: 573-5744.

Najeeb, U., Mirza, M.Y., Jilani, G., Mubashir, A.K., Zhou, W.J. 2012. Sesame. In: Gupta SK (ed), Technological innovations in major world oil crops, vol. 1. Springer, New York, pp 131–145.

Ramkishan Meena, Bacchu Singh, K.C. Meena, R.K. Meena, B. Singh and Prakash Gurjar. 2018. Performance of Front Line Demonstrations on Sesame (*Sesamum indicum* L.) in Karauli District of Rajasthan. *Int.J.Curr. Microbiol.App.Sci.* 7(3): 1507-1511.

Rudrasen Singh, A.K. Upadhayay, Prasant Srivastava, V.K. Singh and S.K. Singh. 2014. Productivity enhancement of Sesame (*Sesamum indicum* L.) through improved production technologies. *The Bioscan* 9(1): 107-110.

Samui, S.K., Maitra, S., Roy, D.K., Mandal, A.K. and Saha, D. 2000. Evaluation of Front Line demonstration on groundnut. *J. Indian Soc. Coastal Agric. Res.* 18: 180-183.

Singh, A., Singh, M., Laxmi, Pandey, A. and Sharma, R.P.(2015). An Economical appraisal of Sesame crop in Madhya Pradesh, India. Ecology, Environment and Conservation Journal, 21(suppl. issue): 153-158.

Singh, Raj and Khan, M. A. 2003. Response of clusterbean varieties to fertility levels and cropping systems under arid conditions. *In: Advances in Arid Legume Research*. Henry, A. Kumar, D. and Singh, N.B. (Eds) Scientific Publishers and Indian Society of Arid Legumes, Jodhpur. pp 225-228.

How to cite this article:

Jai Singh, A. K. Singh, Akhilesh K. Chaubey, Jasvinder Kaur and Safeer Alam. 2021. Impact Assessment of Technological Interventions on Yield Attributes and Seed Yield of Sesame. *Int.J.Curr.Microbiol.App.Sci.* 10(03): 60-67. doi: https://doi.org/10.20546/ijcmas.2021.1003.010