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Comparative Performance of Production Components on Sesame Crop in Jhansi District of Uttar Pradesh

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ABSTRACT

Sesame is an important *kharif* crop of Bundelkhand region of Uttar Pradesh and Madhya Pradesh which can fetch higher foreign exchange provided its production can be increased so that we can cater larger global market. To evaluate performance of 5 different components *viz.* whole package, seed treatment, improved variety, method of sowing and fertilizer management. These were evaluated in five villages of Babina block in Jhansi district of Uttar Pradesh and found that all components had positive response on yield performance with 12.12 to 31.83 per cent more yield was obtained as compared to farmers practice in the region.

Keywords: FLD, Sesame, Sesamum indicum, production technology, technology gap, extension gap, technology index.

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INTRODUCTION

Sesame (*Sesamum indicum* L.) is an ancient and important oleaginous crop that is grown mainly in the tropical and subtropical regions of Asia, Africa, and South America. It belongs to the Pedaliaceae family, the genus of sesame and adapted to hot areas (Weiss, 2000). Sesame can be considered as an ancient oilseed crop as it has been domesticated by man from 3000 years ago. Also, it is one of the important edible oilseeds cultivated in India and is commonly known as til, its seeds are predominantly rich in oil (50%) and protein (18-20%). Sesame cultivation has recently increased due to its drought resistance and easy growing circumstances, but most crucially due to farmers' need to diversify their sources of income (Dossa *et al*., 2017; Sadiq *et al*., 2020). An important agricultural export commodity. In India, though sesame is cultivated in one or more seasons (*kharif* and *rabi*) nearly 75% of annual acreage and production comes from *kharif* crop (June-November) (Anon, 2019). Nearly 73% of the oil is used for edible purposes, whereas 8.3% for hydrogenation and 4.2% for industrial purposes in the manufacture of paints, pharmaceuticals and insecticides. In addition to its economic, pharmaceutical and food interests, sesame farming has agronomic advantages in the crop rotation system (Lobell *et al*., 2008; Verma *et al*., 2016).

During 2022-23 in India area under sesame was 14.81 lakh hectares with a total production of 7.49 lakh tonnes with average productivity of 502 kgs per hectare. States like Madhya Pradesh, Uttar Pradesh, Rajasthan and West Bengal together contributed 90% of the total sesame area in the country under irrigated conditions (Anon, 2023).In Indian states area under sesame production is highest in Uttar Pradesh, Madhya Pradesh, Rajasthan, West Bengal and Gujarat are top five states but when we consider production Uttar Pradesh stands fifth (Directorate of oilseeds development, https://oilseeds.dac.gov.in/) leading states from production point of view are West Bengal, Madhya Pradesh, Gujarat, Rajasthan and Uttar Pradesh. It is surprising to note that in terms of productivity, no state from the top 5 states that have the higher acreage or higher production comes in the list. While states having highest productivity of sesame were Meghalaya, West Bengal, Arunachal Pradesh, and Puducherry (Directorate of oilseeds development, https://oilseeds.dac.gov.in/). This indicates that states that have large area and high production are lacking in some aspect and with proper technological intervention production can be increased.In Uttar Pradesh major districts in which sesame is predominantly grown are Jhansi, Hamirpur, Mahoba, Jalaun, Banda, Hardoi, Unnao Fatehpur, Sitapur, and Shahjahanpur. Out of these districts Jhansi is leading district in terms of acreage with 90010-hectare area. (https://iopepc.org/misc/2019_20/Kharif%202019%20Sesame%20crop%20survey.pdf). FLD in oilseeds is an effective extension intervention to demonstrate the production potential of improved technologies on farmers' fields for harnessing the productivity potential of oilseed crops in the country (Sangwan *et al*. 2021).

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MATERIALS AND METHODS

Frontline demonstrations were conducted on 20 acres of land with 20 demonstration plots involving RT-351 sesame variety and other inputs as per package mentioned in Table no.1.

The present investigation was carried out during the *kharif* 2020 in the five villages of Babina block in Jhansi district (U.P.) under front line demonstration. The data were collected from FLD plots, and farmer practices (as local checks).

Per cent increase in yield =

$$\frac{\text{Yield gain in DP plot (q/ha)} - \text{Yield gain in FP plot (q/ha)}}{\text{Yield gain in FP (q/ha)}} \times 100$$

Where, DP = Technology demonstrated plot, FP = Farmers' practice

The following formula was used for the calculation of benefit: cost ratio:

$$\text{B:C ratio} = \frac{\text{Gross return}}{\text{Cost of cultivation}}$$

To estimate the technology gap, extension gap and the technology index following formulas are used. The extension gap, technology gap and technology index were calculated as suggested by Dayanand *et al*. (2012).

Technology gap = Potential yield - Demonstration yield

Extension gap = Demonstration yield - Farmer's yield

Technology index=

$$\frac{\text{(Potential yield-Demonstration yield) X 100}}{\text{Potential yield}}$$

RESULTS AND DISCUSSION

The data in the tables 2 and 3 shows that due to technology interventions under FLD evaluation there is increase of 31.06% in yield in whole package from farmers practice, due to improved nutritional status of the demonstration plot. Soil and seed borne diseases can reduce yield by reducing effective photosynthetic area in case of foliar diseases and plant population in wilt incidence if not managed timely in the farmer's field. Sesame crop in Bundelkhand faces major diseases, which are soil and seed borne in nature. These can be managed by seed treatment, therefore seed treatment component got 342 kg per hectare was realized. Fertilizers help in proper growth and development of the crop plant and it can be a limiting factor in realising higher yield specially in sesame because it is mostly grown in resource poor soils and most of the area is rainfed, therefore fertilizers component of demonstration showed improvement in yield and 326 kg per hectare productivity was obtained which was 22.57% higher than the farmer's practice. In Jhansi district and nearby areas sesame farmers do sowing by broadcasting, by use of seed drill proper plant population at appropriate spacing can be maintain which helps in getting more yield per plant resulted in net return of Rs. 17,947/- as compared to Rs.11,928/- in farmer practice which is 50.46% higher. In improved variety, RT 351 variety of the sesame was given to farmers which has potential yield of 800 kg per hectare in this component 326 kg per hectare yield was obtained while only 291 kg per hectare was obtained in farmers field due to enhanced production farmers have better chance of realising higher net returns which was highest in method of sowing, followed by seed treatment, improved variety, fertilizer management, and whole package, consecutively cost of production was highest in whole package followed by fertilizer management, improved variety, method of sowing and least in seed treatment. Consecutively the B: C ratio represents this relation of cost of production and gross return and highest B:C ratio of 3.7 was obtained in method of sowing and seed treatment, followed by 3.4 in improved variety, 2.6 and 2.5 in fertilizer management and whole package respectively.

On comparing gap in realising potential yield, technology gap, extension gap and computing technology index it was found that highest technology gap was in whole package, fertilizer management, improved variety, seed treatment and method of sowing which was 479, 474, 474,458, and 449 kg per hectare respectively, indicates lot of scope for improvement whole package had included plant protection measure which are important as a abiotic and biotic stresses hamper

Table 1: Description of technology intervention under FLD on Sesame

Particulars	Technological intervention(T)	Farmers Practices (T)	Gap
Whole package	Variety Sesamum- RT 351 DAP Herbicide-Pendimethlin 30%EC & Imazethapyr 10%SL Fungicide- Copper oxychloride 50%WP, Carbendazim 50%WP & Thiram 75%WS Insecticide – Imidacloprid 17.8 SL & Chlorpyriphos 50% EC + Cypermethrin 5% EC	Local	Full gap
Seed treatment	Variety Sesamum- RT 351 Carbendazim 50%WP + Thiram 75% WS	Not done	Full gap
Fertilizer Management	Variety Sesamum- RT 351 DAP	No fertilizer use	Full gap
Method of sowing	Line sowing Variety Sesamum- RT 351	Broadcasting	Full gap
Improved variety	Variety Sesamum- RT 351	Local	Full gap

production every year specially one leaf spot disease was observed and also reported by farmers as "lauka" in local language which can reduce yield to zero, under favourable set of conditions and if managed effectively higher yields can be obtained as it affects the crops every year.

Extension gap was quite low as compared to technology gap lowest being in improved variety 35 kg per hectare followed by fertilizer management 60 kg per hectare, whole package (76 kg per hectare), method of sowing (79 kg per hectare), and seed treatment (82 kg per hectare).While evaluating technology index, we have obtained highest production only up to 59.88% of potential yield of the variety in whole package and lowest of 56.13% in method of sowing, indicating role of all packages incorporated in whole package component just by sowing in proper spacing in method of sowing yield can be improved by 56.13% over farmers practice similar observations found by Tripathi and Singh,(2012) in their study found 32 per cent increase of sesame yield in full package practice and minimum extension gap in improved variety component. Singh *et al*. (2019) reported higher yield under full package component. The findings of the present study are in line with the findings of Sangwan *et al.* (2021). Productivity of crops per unit area could be increased by adopting improved practices in a systematic manner along with high yielding varieties (Ranawat *et al*., 2011 and Rai *et al*., 2016).

Table 2: Comparison of production gap, technology gap, extension gap and technology index.

Technology	Yield (kg/ha)		Increase in yield (%)	TG (kg/ha)	EG(kg/ha)	TI (%)
	IT	FP				
Whole package	321	245	31.06	479	76	59.88
Seed treatment	342	260	31.83	458	82	57.25
Fertilizer management	326	266	22.57	474	60	59.25
Method of sowing	351	272	29.11	449	79	56.13
Improved variety	326	291	12.12	474	35	59.25

IT= Improved technology, FP= farmers practice, TG= Technology gap, EG= Extension gap TI= Technology index

Table 3: Comparison of Gross Return, Net Return, Cost Cultivation & BC Ratio of Sesame as grown under FLDs and farmer practices.

Technology	Yield (kg/ha)		Increase in yield (%)	Cost of cultivation (Rs. /ha)		Gross return (Rs. /ha)		Net return (Rs. /ha)		B:C ratio	
	IT	FP		IT	FP	IT	FP	IT	FP	IT	FP
Whole package	321	245	31.06	9028	7347	22477	17115	13449	9768	2.5	2.3
Seed treatment	342	260	31.83	6558	7040	23947	18165	17389	11125	3.7	2.6
Fertilizer management	326	266	22.57	8927	7138	22823	18634	13896	11496	2.6	2.6
Method of sowing	351	272	29.11	6605	7089	24552	19017	17947	11928	3.7	2.7
Improved variety	326	291	12.12	6654	7287	22823	20356	16169	13069	3.4	2.8

IT= Improved technology, FP= farmers practice

CONCLUSION

The above results showed that the highest increase in sesame seed yield was in whole package and seed treatment component by 31.06 and 31.83 per cent respectively. Method of sowing and fertilizer management component comes second with 29.11 and 22.57 per cent increase in yield respectively and least increment in yield was in improved variety component with 12.12 per cent more yield as compared to farmers practice. The result indicates that the Frontline demonstrations had good performance over the farmers practice in Babina block of Jhansi district.Therefore, it can be concluded that on adopting recommended region-specific complete package of practices, higher yields can be obtained by farmers and FLDs are helpful in demonstration of package of practices on farmers fields.

Conflict of Interest

The Authors declare that there is no conflict of interest among the authors.

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