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Enhancing Productivity and Profitability of Sesame in Nellore District of Andhra Pradesh

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ABSTRACT

Sesame (*Sesamum indicum* L.) is one of the most important oilseed crops grown next to groundnut in Nellore district of Andhra Pradesh. The productivity of sesame in the district is low and attempts were made to increase the area and improve the productivity by adopting high yielding variety along with integrated crop management (ICM) practices. The ICM practices including sowing of improved variety (YLM 66), seed treatment with mancozeb @ 30g/kg seed + neem oil application at 25-30 DAS+ arrangement of sticky traps to monitor sucking pest vectors + spraying of monocrotophos @ 1.6 ml/L of water at flowering to pod formation stage for insect management + spraying of carbendazim for control of leaf spot was demonstrated in farmer's field. The results revealed that increase in seed yield over farmers' practice was 40.0 and 30.10 per cent during 2019-20 and 2020-21, respectively. In terms of economics, it was observed that demo practices recorded higher net returns/ha compared to farmer's practice during the years 2019-20 and 2020-21. The benefit cost ratio during 2019-20 and 2020-21 was 3.23 and 3.31, respectively. The percent technology index varied between 24.6 to 42.0 per cent indicating a need to motivate the farmers to adopt economical viable technologies for increasing production, productivity and profitability of oilseed crops in Nellore district.

Key Words: Demonstration, Extension gap, Profitability, Technology gap and Technology index. Yield.

INTRODUCTION

Sesame (*Sesamum indicum* L.) is not grown on a large extent due to very poor yields (Pathak *et al*, 2017). The average yield of sesame (405 kg/ha) in India is low when compared with other countries in the world. In Andhra Pradesh sesame is cultivated in 0.39 lakh ha area with 0.14 lakh tones production with an average yield of 343 kg/ha (Anonymous, 2019). The main reasons for low productivity of sesame are its rainfed cultivation in marginal and sub marginal lands under poor management and input starved conditions. However, improved varieties and agro production technologies capable of increasing the productivity levels of sesame are now developed for different agro ecological situations in the country. A well-managed crop of sesame can yield 1200 - 1500 kg/ha under irrigated and 800 - 1000 kg/ha under rainfed conditions (Ranganatha, 2013).

The productivity of sesame is comparatively low in Nellore district, mainly because of non-availability of quality seed or improved variety, poor nutrient management and low knowledge on pest and disease management. Use good quality seed of recommended variety along with application of recommended dose of fertilizers at appropriate time and adopting need-based plant protection measures against insect pests and diseases are efficient measures for reducing knowledge gap of farmers and enhancing productivity and profitability of sesame in Nellore district of Andhra Pradesh. The main objective of the study was to demonstrate and popularize the improved agro-technology at farmers' fields under varied existing farming situations.

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MATERIALS AND METHODS

A total of 100 front line demonstrations were conducted during the year 2019-20 and 2020-21 under irrigated conditions in Nellore district of Andhra Pradesh. Each demonstration was conducted on an area of 0.4 ha. The ICM practice included sowing of improved variety (YLM 66), seed treatment with mancozeb @ 30g/kg seed + neem oil application at 25-30 DAS+ arrangement of sticky traps to monitor sucking pest vectors + spraying of monocrotophos @ 1.6 ml/L of water at flowering to pod formation stage for insect management + spraying of carbendazim for control of leaf spot (Table 1). The demonstrations were conducted in red loam soils and low to medium in fertility status. The pH of the soil varied from 6.2 to 7.1. Yield data for the improved practice and farmers' practice were recorded at the time of threshing. The season-wise details of sowing and harvesting were presented in Table 1. The yield gain in demonstrations above farmers' practice was computed using the method proposed by Yadav *et al* (2004). The estimation of technology gap, extension gap and technology index were done using following formula (Samui *et al*, 2000)

Economic analysis

The cost of cultivation of sesame includes cost of inputs like seeds, fertilizers and pesticides *etc*., purchased by the farmer's or provided by the KVK including labour charges and operational costs borne by the farmers. Gross returns were obtained by converting the harvest into monetary terms at the prevailing market rate during the course of demonstration. Net returns were obtained by deducting cost of cultivation from gross returns. The Benefit:Cost ratio was calculated by dividing gross returns by cost of cultivation (Deva *et al,* 2019).

RESULTS AND DISCUSSION

Comparison of Production Practices

It was evident that farmers generally did not follow recommended and improved technologies which created a wide gap for sesame production (Table 1). In farmer's adopted higher seed rate against the recommended optimum seed rate resulting in higher cost of seed input. Farmers also did not practice seed treatment, as seed treatment not only protects seeds from seed and soil-borne diseases, but also protects emerging seedlings against sucking insect pests that wreak havoc on crop emergence and its early growth (Sharma *et al,* 2015). However, many farmers in the country are neither familiar with the practice nor follow it instead of many efforts by Agriculture Scientists and Officials from the line departments. A partial gap in time of sowing was observed and it had no effect on yield of the crop. However, a slight increase in yield and less incidence of pest and disease was observed in some farmers` fields, likewise observations on partial gap in the time of sowing was noticed by Alam *et al,* (2020). The data (Table 1) revealed that farmers did not apply any soil test based recommended fertilizers and if applied, either higher dose or lower dose of fertilizers without top dressing which led to decreased yields. Similar findings were recorded by Sing and Bisen (2020) and Singh *et al,* (2016).

Yield

The yields of sesame in demonstration plots were higher when compared to farmer's plots. The percent increase in yield of demonstration plots over farmers plots ranged from 30.1 to 40 per cent. The increase in seed yield of demonstration plots was mainly due to the improved package of practices as recommended by the University and implemented under the supervision of Scientists from KVK, Nellore. Use of YLM 66 not only improved the yield of sesame but also decreased the incidence of phyllody disease. Introduction of seed treatment, time of sowing, applying fertilizers based on soil test values and adoption of plant protection measures for vector management of phyllody followed under CFLDs really jumped the yield of sesame compared to farmers` practices. It was evident that the yield of demonstration was

Table 1. Details of production technologies followed in sesame crop under Cluster Front Line Demonstration and farmers' practice in Nellore district of Andhra Pradesh.

Parameter	Demo Practice	Farmers Practice	Gap
Variety	Sarada (YLM 66)	Varaha (YLM 11)	Full
Land Preparation	Two Ploughings	One or two ploughings	Nil
Seed Rate	6 kg/ha	8-10 kg/ha	Higher seed rate
Seed Treatment	Mancozeb @3.0 g/kg seed	No seed Treatment	Full
Method of sowing	Line sowing	Line sowing	
Time of sowing	I FN of December to 1FN of January	II FN of December to 1FN of January	Partial
Fertilizer dose	40:20:20 (Based on soil test values) (Top dressing of half of N dose)	High dose or low dose of fertilizers (No top dressing)	Partial
Method of fertilizer application	Line	Line	Nil
Weed management	Pre emergence application of pendimethalin along with one need-based hand weeding	Pre emergence application of pendimethalin along with one need-based hand weeding	Nil
Plant protection	Neem oil application at 25-30 DAS+ Arrangement of sticky traps to monitor sucking pest vectors + Spraying of Monocrotophos @ 1.6 ml per litre of water at flowering to pod formation stage for insect management+ Spraying of Carbendazim for control of leaf spot.	No pesticide application for control of vector for YMV	Partial
Irrigation	Irrigated	Irrigated	Nil

Table 2: Technology gap, extension gap and technology index of sesame crop in Nellore district of Andhra Pradesh.

Year	Area (ha)	No of FLDs	Variety	Yield (kg/ha)			Percent increase over Farmers practices (%)	Technology Gap (kg/ha)	Extension Gap (kg/ha)	Technology Index (%)
				Potential Yield	Demonstrated Practices	Farmer Practices				
2019-20	20	50	YLM-66	1250	724	518	40.0	526	206	42.0
2020-21	20	50	YLM-66	1250	972	786	30.1	278	186	24.6

Table 3. Economic analysis of CFLD's on sesame crop in Nellore district of Andhra Pradesh.

Year	Cost of cultivation (Rs/ha)		Gross returns (Rs/ha)		Net returns (Rs/ha)		Additional cost of cultivation (Rs/ha)	Additional net returns (Rs/ha)	Benefit: cost Ratio	
	Farmers Practice	Demo Practice	Farmers Practice	Demo Practice	Farmers Practice	Demo Practice			Farmers Practice	Demo Practice
2019-20	22650	24550	55300	79250	30600	50050	1900	17300	2.44	3.23
2020-21	24500	25626	72400	84767	47900	59140	11326	11240	2.96	3.31

found better than the farmer's practice under the similar environmental conditions. Farmers who didn't adopt these technologies were motivated by results of demonstrations and agro-technologies followed in the CFLDs and were willing to adopt these all-new technologies in their fields in future (Table 2). These findings were in corroboration with the findings of Saravanakumar (2018), Sandhu and Dhaliwal (2016) and Anuratha *et al* (2018).

Technology gap

The technology gap is the difference between potential yield of the variety and yield observed in demonstration plot. The technology gap during 2019-20 and 2020-21 was 526 and 278 kg/ha respectively (Table 2). The observed technological gap may be attributed to the various constraints like dissimilarity in the soil fertility status, availability of moisture content, management of insect pests and diseases and erratic weather conditions that prevailed during crop season at different locations. Similar findings were observed by Meena *et al* (2018) and Kumar *et al* (2020). As the technology gap reflects the cooperation of farmers in conducting the CFLDs, the results were encouraging.

Extension gap

Extension gap is the difference between the yield of demonstration plot and farmer's plot. Extension gap of 206 and 186 kg/ha was observed during the years 2019-20 and 2020-21, respectively (Table 2). Implementation of recommended package of practices along with high yielding varieties as suggested by the ANGR Agricultural University subsequently helped in increasing the yield in demonstration plots. The extension gaps created need to be emphasized by educating the farmers through various extensions means. The present study was in line with earlier findings of Bezbaruah and Deka (2020).

Technology index

The technology index represents the feasibility of the evolved technology at the farmers' fields. The lower the values of technology index indicate more the feasibility of the technology to go through farmer's field. Maximum technology index value 42.0 per cent was noticed during 2019-20 while, minimum value of technology index of 24.6 per cent was noticed during 2020-21 (Table 2). This variation in technology index was due to irrigation potential of the area as many farmers rely on canal irrigation and also because of uneven weather conditions in the area of demonstrations during the years of study. Moreover, reduction of technology index over the years of study clearly indicted the feasibility of technologies demonstrated in frontline demonstrations. Similar findings in reducing the technology index by adopting the FLDs were also noticed by Mishra *et al* (2016) and Kumar *et al* (2020).

Economic Returns

The economic analysis revealed that during both the years of demonstration, gross returns, net returns and benefit to cost ratio was higher in demonstrated plots compared to farmer's practice indicating higher profitability. The benefit cost ratio of demonstration plots was 3.23 and 3.31 during the years 2019-20 and 2020-21 respectively (Table 3). Hence, by adopting improved production practices in sesame, yield potential and economic returns of the farming community of Nellore district can be raised. These results were in line with the earlier findings by Zimik *et al* (2020), Rao *et al* (2020) and Kaur *et al* (2020).

CONCLUSION

By adopting the recommended practices and improved technology, the seed yield of sesame can be increased to a greater extent in Nellore district of Andhra Pradesh. The increase in yield of sesame may be attributed due to use of newly released and improved variety, use of recommended seed rate for optimum plant stand, nutrient management based on soil test values and plant protection measures taken in accordance with recommended package of practices. The economic viability in the demonstrations had encouraged the farmers for adoption of interventions imparted. Thus, it can be concluded that technology gaps and extension gap can be minimized by adopting scientific intervention in the farmer's field, which lead to enhancement in the production and productivity of sesame in Nellore district of Andhra Pradesh.

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