Original Research Article

Effect of spacing and manganese on Yield and Economics and Quality of sesame (*Sesamum Indicum L.)*

Abstract

A field research trail was conducted during *Zaid* season (2022) at Crop Research Farm, Department of Agronomy, SHUATS, Prayagraj (U.P.). To study the influence of yield and economics and quality on sesame. The Treatments consisted of 3 levels of spacing (30×10cm, 40× 10cm, 50× 10 cm) and 3 levels of manganese (1.5,3.0 and 4.5 kg/ha). The experiment was laid out in Randomized Block Design with 10 treatments and replicated thrice. The results showed that Viz: significantly number of capsules/plant (52.47), number of seeds per capsules (74.50), test weight (3.37 g), seed yield (1.19 t/ha), stover yield (2.67 t/ha) and oil content (48.10%).Maximum Gross returns (113050.00INR/ha), Net returns (76944.15 INR/ha) and B:C ratio (2.13) was found in treatment (T_9)with the application of 50 × 10cm + $Mnso_4$ 4.5 Kg/ha.

Key words: - *Spacing, Yield, Manganese, Zaid, Economics.*

INTRODUCTION

Sesame*(Sesamum indicum L.)*is important oil seed crop it plays crucial role in Indian agricultural economy both in area as well as production. It is a drought resistant crop and it can be easily survive or grown under rain-fed conditions. Sesame mostly grown in summer season and also in kharif season.Sesame is oldest known oil seed crop it is popular worldwide.It is commonly known as Till, Gingelly, Simsim. It is popular and have highest protein contents, oil content. (Raja *et al.,* 2007).Oil content of sesame is varies from 46-52%. Sesame seeds are rich in protein , energy, dietary fiber, carbohydrate and also contains riboflavin, thiamine.Proper spacing supply sufficient light, efficient , absorption of nutrients and water from soil and at optimum spacing avoids intra space competition. Spacing have

effect on yield attributes viz., number of capsules/ plant, number of seeds/ capsules (Subrahmaniyan *et al .,*) Optimum plant spacing starts the sesame plant to grow properly both its aerial and underground parts through utilizing radiant energy more to encourage crop production. (Shinde *et al .,*)spacing will bring a positive effect on yield.It is most important component in farming system in intensive method.Micro nutrients bring positive effect on yield parameters. Manganese is a plant constituent also it activates enzymes involved in protein synthesis.photosynthesis.Manganese deficiency mostly leads to NO_3 - N in plant tissues.mostly the signs of manganese deficiency includes like decrease in number of lower per plant , infertility of pollen (Ziaeian et al ., 2001). Keeping these points in view an experiment was conducted to achieve yield with profitable investment by treatment combinations of different spacing and also manganese levels.

MATERIALS AND METHODS:

A research trail was conducted during *Zaid* season of 2022. The experiment was conducted in Randomized Block Design and it consists of ten treatment combinations with three replications and was laid out variously with different treatments assigned randomly in each replication. The soil in experimental field was sandy loam texture, having alkaline reaction (pH 7.1) with very low organic carbon (0.28%), available higher Nitrogen (225 Kg/ha), Phosphorous (19.50 kg/ha) and higher level of potassium (92.00 kg/ha). Treatment combinations areT_1 - 30×10 cm + $Mnso_4$ 1.5 kg/ha, T_2 - 40×10 cm + $Mnso_4$ 1.5 kg/ha, T_3 - 50×10 cm + $Mnso_4$ 1.5 kg/ha, T_4 - 30×10cm + $Mnso_4$ 3.0 kg/ha, T_5 - 40×10 cm+ $Mnso_4$ 3.0kg/ha, T_6 - 50×10 cm+ $Mnso_4$ 3.0kg /ha, T_7 - 30×10 cm + $Mnso_4$ 4.5 kg/ha, T_8 - 40×10 cm+ $Mnso_4$ 4.5 kg/ha, T_9 - 50× 10cm + $Mnso_4$ 4.5 Kg/ha, T_{10} - Control (RDF) . The observations were recorded on yield parameters Number of capsules/plant, number of seeds/ capsule, test weight, grain yield and stover yield, oil content, gross returns net returns, B:C ratio.

RESULTS AND DISCUSSION

A. Yield:

Treatment with the application of 50×10 cm + $Mnso_4$ 4.5 Kg/ha was reported maximum number of capsules/ plant (52.47) which was significantly superior over all from other and treatment with application of 50×10 cm +$Mnso_4$ 3.0 Kg/ha (50.53) which was

statistically at par with the treatment with the application of 50×10 cm + $Mnso_4$ 4.5 Kg/ha.Treatment with application of 50×10 cm + $Mnso_4$ 4.5 Kg/ha was recorded maximum number of seeds per capsules (74.50) which was significantly superior over all other and treatment with application of 30×10 cm + $Mnso_4$ 4.5 Kg/ha (73.07) and 50×10m + $Mnso_4$ 1.5 Kg/ha (72.67) which was statistically at par to the treatment with application of 50× 10cm + $Mnso_4$ 4.5 Kg/ha.Treatment with application of 50× 10cm+ $Mnso_4$ 4.5 Kg/ha was recorded maximum test weight (3.37g) which was significantly superior over all other and treatment with application of 50×10 cm + $Mnso_4$ 3.0 Kg/ha (3.20) which was statistically at par to the treatment with application of 50 ×10 cm + $Mnso_4$ 4.5 Kg/ha. Treatment with application of 50× 10cm + $Mnso_4$ 4.5 Kg/ha was recorded maximum seed yield (1.19 t/ha) which was significantly high over all other and treatment with application of 40×10 cm + $Mnso_4$ 4.5 Kg/ha (1.16) which was statistically at par with the treatment with application of 50×10 cm + $Mnso_4$ 4.5 Kg/ha.Treatment with application of 50×10 cm + $Mnso_4$ 4.5 Kg/ha was recorded maximum stover yield (2.67t/ha) which was significantly more from all other and treatment with application of 50×10 cm + $Mnso_4$ 3.0 Kg/ha (2.66 t/ha) which was statistically at par to treatment application of 50× cm + $Mnso_4$ 4.5 Kg/ha.Treatment with application of 50× 10 cm + $Mnso_4$ 4.5 Kg/ha was observed maximum harvest index (30.82 %) and minimum with application of 40×10 cm + $Mnso_4$ 4.5 kg/ha (30.36%). (Elayaraja *et al* 2019.

B. Oil Content :-

With treatment application of 50× 10cm + $MnSo_4$ 4.5kg/ha found more oil content (48.10%) and higher compared to all other treatments. With treatment of 50× 10 cm +$MnSo_4$ 3.0kg/ha observed (47.54%) and it was statistically at par with 50 ×10cm + $MnSo_4$ 4.5kg/ha.

C. Economics:

Economic viability and efficiency of crop cultivation are mostly outcome of crop production with less production cost. Higher cost of cultivation (36,105.85)was observed in (T_9) 50× 10cm + $Mnso_4$ 4.5kg/ha. Maximum Gross returns (113050.00₹/ha), net returns (76944.15₹/ha), B: C ratio (2.13) was reported in (T_9) 50× 10 cm + $Mnso_4$ 4.5kg/ha.

CONCLUSION

Based on conclusions of one season experimentation it can be concluded that with the application of 50×10 cm + $Mnso_4$ 4.5 kg/ha was found more productive (1.19 t/ha) and it can be recommended to farmers after further trails.

Conclusions are on the basis of research done in one season data only which requires further trails are needed to confirm the results.

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Table.1 Effect of spacing and manganese on yield attributes and yield of Sesame.

Treatments	No. of Capsules per plant	No. of seeds per Capsules	Test weight (g)	Seed yield (t/ha)	Stover yield (t/ha)	Harvest index (%)
30×10 cm + $Mnso_4$ 1.5 kg/ha	47.03	68.87	2.10	1.00	2.54	29.37
40 ×10cm+ $Mnso_4$ 1.5 kg/ha	45.17	69.10	2.63	1.04	2.57	28.80
50×10cm+ $Mnso_4$ 1.5 kg/ha	46.77	72.67	3.07	1.07	2.59	29.23
30×10cm + $Mnso_4$ 3.0 kg/ha	46.47	68.17	2.40	1.10	2.60	29.72
40 ×10cm + $Mnso_4$ 3.0 kg/ha	45.27	72.60	2.77	1.11	2.62	29.75
50×10 cm + $Mnso_4$ 3.0 kg /ha	50.53	74.43	3.20	1.17	2.64	30.70
30×10 cm + $Mnso_4$4. 5 kg/ha	47.60	73.07	2.43	1.13	2.61	30.21
40 ×10cm + $Mnso_4$ 4.5 kg/ha	48.40	72.07	2.90	1.16	2.66	30.36
50×10 cm + $Mnso_4$ 4.5 Kg/ha	52.47	74.50	3.37	1.19	2.67	30.82
Control (RDF)	46.97	65.03	2.07	0.90	2.50	26.47
SEm (±)	1.02	1.75	0.09	0.04	0.01	0.02
CD (5%)	3.05	5.22	0.28	0.14	0.03	0.06

Table.2 Effect of spacing and manganese on economics

S.no	Treatments	Total cost of cultivation (INR/ha)	Gross returns (INR/ha)	Net returns (INR/ha)	B:C ratio
1.	30×10 cm + $Mnso_4$ 1.5 kg/ha	35,930.55	94683.33	58752.78	1.64
2.	40 ×10cm+ $Mnso_4$ 1.5 kg/ha	35,830.55	98800.00	62969.45	1.76
3.	50×10cm+ $Mnso_4$ 1.5 kg/ha	35,630.55	101650.00	66019.45	1.85
4.	30×10cm + $Mnso_4$ 3.0 kg/ha	36,116.85	104183.33	68066.48	1.88
5.	40 ×10cm + $Mnso_4$ 3.0 kg/ha	36,016.85	105766.67	69749.82	1.94
6.	50×10 cm + $Mnso_4$ 3.0 kg /ha	35,916.85	111150.00	75233.15	2.09
7.	30×10 cm + $Mnso_4$4. 5 kg/ha	36,305.85	107666.67	71360.82	1.97
8.	40 ×10cm + $Mnso_4$ 4.5 kg/ha	36,205.85	110200.00	73994.15	2.04
9.	50×10 cm + $Mnso_4$ 4.5 Kg/ha	36,105.85	113050.00	76944.15	2.13
10.	Control (RDF)	35,743.35	85183.33	49439.98	1.38

Table .3 Effect of spacing and manganese on oil content of sesame

S.no	Treatments	Oil content (%)
1.	**30×10 cm + $Mnso_4$ 1.5 kg/ha**	45.20
2.	**40 ×10cm+ $Mnso_4$ 1.5 kg/ha**	45.48
3.	**50×10cm+ $Mnso_4$ 1.5 kg/ha**	46.02
4.	**30×10cm + $Mnso_4$ 3.0 kg/ha**	46.14
5.	**40 ×10cm + $Mnso_4$ 3.0 kg/ha**	46.10
6.	**50×10 cm + $Mnso_4$ 3.0 kg /ha**	45.70
7.	**30×10 cm + $Mnso_4$4. 5 kg/ha**	47.54
8.	**40 ×10cm + $Mnso_4$ 4.5 kg/ha**	46.45
9.	**50 ×10cm + $Mnso_4$ 4.5kg/ha**	47.15
10.	**Control (RDF)**	48.10
	SEm (±)	S
	CD (5%)	0.98