

Original Research Article

Effect of spacing and manganese on Growth and Yield 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 effect of spacing and manganese on growth and yield of sesame. The Treatments consists of 3 levels of spacing (30 ×10 cm, 40×10 cm, 50 ×10 cm) and three levels of manganese (1.5, 3.0, 4.5 kg/ha) are included respectively. The experiment was laid out in Randomized Block Design with 10 treatments and replicated thrice. The results showed that spacing of 50×10cm + Mnso₄ 4.5kg/ha (Treatment-9) Plant height (87.66 cm), Number of branches/plant (6.27), plant dry weight (15.74 g/plant), number of capsules per plant (52.47), number of seeds per capsules (74.50), test weight (3.37 g), seed yield (1.19 t/ha), straw yield (2.67 t/ha) and Biological yield (3.6t/ha).

Key words: - Spacing, Manganese, Growth, Yield, Zaid.

INTRODUCTION

Sesame (*Sesamum indicum L.*) is most important oil crop and it belongs to family Pedaliaceae sesame is self pollinated crop, it betterly known as “Queen of oil seed crop”. Indian climate is most suitable for cultivation of oil seed crops. India is major producer of sesame and ranks area (1.78Mha) and production (0.81Mt/ha) first. Among all the oil seed crops, sesame has the highest oil, protein contents and carbohydrates (Raja et al., 2007). Sesame crop thrives best on moderately fertile, well drained soils Ph range. Sesame oil has 85% unsaturated fatty acid. (Niravparimalet al.,). Gujarat is largest producer of sesame followed by west Bengal, Maharashtra, Rajasthan, Tamilnadu and karnataka. Spacing is most important component in intensive farming. Proper spacing should be maintained for increasing yield and it also provides satisfactory absorption of nutrients, sufficient light interaction and also spacing avoids intra species competition. From all cultural practices, row spacing is most important component. Optimum plant spacing enables the sesame plant to grow properly both its aerial and underground parts by utilizing maximum radiant energy to boost crop production. (Shindeet al.,). Application of Manganese improves plant growth and development and sustains metabolic role with different plant cells compartments and it is essential to photosynthesis reactions, enzyme activation. And also it have much importance in N metabolism and CO₂ assimilation and regulate the nitrate reductase. (Tisdaleet al.,) By applying manganese seed yield can be increased (Krishasamyet al., 1994) manganese

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deficiency leads to an accumulation of NO_3^- -N in plant tissue, and is essential for splitting water molecules during photosynthesis. Manganese is very important essential micronutrient for improving growth and development. Keeping these points in view the present experiment was conducted to assess effect of spacing and manganese nutrients in crop physiology.

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MATERIALS AND METHODS:

The experiment was conducted during Zaid season of 2022. The experiment was conducted in Randomized Block Design consisting of ten treatment combinations with three replications and was laid out with the different treatments allocated randomly in each replication. The soil of the experimental field was sandy loam in texture, slightly alkaline reaction (pH 7.1) with low level of organic carbon (0.28%), available N (225 Kg/ha), P (19.50 kg/ha) and higher level of K (92.00 kg/ha). The treatment combinations are T₁ 30×10 cm + Mnso_4 1.5 kg/ha, T₂ 40×10 cm + Mnso_4 1.5 kg/ha, T₃ 50×10 cm + Mnso_4 1.5 kg/ha, T₄ 30×10cm + Mnso_4 3.0 kg/ha, T₅ 40×10 cm + Mnso_4 3.0kg/ha, T₆ 50×10 cm + Mnso_4 3.0kg /ha, T₇ 30×10 cm + Mnso_4 4.5 kg/ha, T₈ 40×10 cm + Mnso_4 4.5 kg/ha, T₉ 50×10cm + Mnso_4 4.5 Kg/ha, T₁₀ - Control (RDF). The observations were recorded on different growth parameters at harvest viz. plant height (cm), number of branches per plant, plant dry weight, Number of capsules per plant, number of seeds per capsules, test weight, seed yield and stover yield.

RESULTS AND DISCUSSION

A. Growth Attributes:

At 75 DAS, maximum plant height (87.66 cm) was recorded in treatment No.9 with application of 50×10 cm + Mnso_4 4.5 Kg/ha which was significantly superior over all other treatments and treatment with application of 50×10 cm + Mnso_4 3.0 kg/ha (84.33cm) is statistically at par with treatment application of 50×10cm + Mnso_4 4.5 kg/ha. At 75DAS, the highest branches per plant was observed in the with 50×10 cm + Mnso_4 4.5 kg/ha (6.27) which was significantly higher over rest of the treatments and treatment with application of 50×10cm + Mnso_4 3.0 kg/ha (6.10) which were statistically at par with application of with 50×10cm + Mnso_4 4.5 kg/ha. At 75 DAS, maximum plant dry weight (15.740g) was recorded with application 50×10 cm + Mnso_4 4.5 kg/ha which was significantly superior over all other treatments and treatment with application of 50×10 cm + Mnso_4 3.0 kg/ha. (15.64 g) is statistically at par with treatment (T₉) with the application of 50×10 cm + Mnso_4 4.5 kg/ha. (Patel et al., (2012)).

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Yield Attributes

Treatment with application of 50×10cm + Mnso_4 4.5 Kg/ha was recorded maximum number of capsules per plant (52.47) which was significantly superior over all other and treatment with application of 50×10cm + Mnso_4 3.0 Kg/ha (50.53) which was statistically at par with the treatment with application of 50×10cm + Mnso_4 4.5 Kg/ha. Treatment with

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application of 50×10cm + Mnso₄4.5 Kg/ha was recorded maximum number of seeds per capsules (74.50) which was significantly superior over all other and treatment with application of 30×10cm + Mnso₄4.5 Kg/ha (73.07) and 50×10m + Mnso₄ 1.5 Kg/ha (72.67) which was statistically at par with the treatment with application of 50× 10cm + Mnso₄4.5 Kg/ha. Treatment with application of 50× 10cm+ Mnso₄4.5 Kg/ha was recorded maximum test weight (3.37g) which was significantly superior over all other and treatment with application of 50×10 cm + Mnso₄3.0 Kg/ha (3.20) which was statistically at par with the treatment with application of 50 ×10cm + Mnso₄4.5 Kg/ha. Treatment with application of 50× 10cm + Mnso₄4.5 Kg/ha was recorded maximum seed yield (1.19 t/ha) which was significantly superior over all other and treatment with application of 40×10cm + Mnso₄4.5 Kg/ha (1.16) which was statistically at par with the treatment with application of 50×10cm + Mnso₄4.5 Kg/ha. Treatment with application of 50×10cm + Mnso₄4.5 Kg/ha was recorded maximum stover yield (2.67t/ha) which was significantly superior over all other and treatment with application of 50×10cm + Mnso₄3.0 Kg/ha (2.66 t/ha) which was statistically at par with the treatment with application of 50× cm + Mnso₄4.5 Kg/ha. Treatment with application of 50× 10cm + Mnso₄4.5 Kg/ha was recorded maximum harvest index (30.82 %) and minimum with application of 40×10cm + Mnso₄4.5 kg/ha (30.36%). (Elayaraja et al 2019).

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CONCLUSION

On the basis of one season experimentation it can be concluded that with the application of GA₃ 50×10 cm + Mnso₄ 4.5 kg/ha was found more productive (1.19 t/ha) and economically viable.

The conclusions are based on research done in one season data only which requires further trails are needed to confirm the results.

Reference.

Elayaraja, D., Sathiyamurthi S. and Kamalakannam P. (2019). Study on influence of organics and micro nutrients for increasing sesame (*SesamumindicumL.*) production and sustainable soil fertility in coastal and soils. *Journal of Pharmacognosy andPhytochemistry*2: 483-487.

Habimana, F., Stalin, P. and Muthumanickam. (2016) Effect of manganese on growth and yield, manganese uptake and quality of Sesame (*SesamumIndicumL.*).*IndianJournal of Agronomy*8:14-18.

Hemalatha, S., Jagannatham, A. and Rao, P.V. (1999).Effect of nitrogen fertilization and row spacing on growth and yield of sesamum.*Journal of Oilseed Research*, 16(1):128- 129.

Jan, A., Ali, S., Adail, M. and khan, A. (2014) Growth and yield components of sesame (*SesamumindicumL.*) as influenced by phosphorous levels under different row spacing. *Journal of Environment and Earth Science*.4 (22), 2224-3216.

Patel, T.D., Patel, Z.G.,Patel , H.C. and Patel, B.S.(1988). Investigation on optimum spacing for different varieties of sesame grown in summer season under south Gujarat conditions.*Gujarat research journal* 13 (2): 1-3.

Sanjay N.Shah,Hiren K .Patel and AmitP.Patel (2020). Effect of Spacing and Topping on Yield of Summer sesame (*SesamumindicumL.*).*International Journal of Current Microbiology and Applied Sciences* 9(5):2312-2319.

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Table.1. Effect of spacing and manganese levels on growth attributes of sesame.

Treatments	Plant height (cm) 60 DAS	Number of branches per plant At 60 DAS	Plant dry weight (g/hill)At 60DAS
30×10cm + Mnso₄1.5 kg/ha	68.6	4.00	11.46
40×10cm+ Mnso₄ 1.5 kg/ha	69.03	3.80	11.86
50×10cm+ Mnso₄ 1.5 kg/ha	70.63	3.93	12.15
30×10cm + Mnso₄3.0 kg/ha	68.76	3.85	11.56
40×10cm + Mnso₄3.0 kg/ha	69.23	4.03	11.96
50×10cm + Mnso₄3.0 kg/ha	71.4	4.23	12.28
30× 10cm + Mnso₄4.5 kg/ha	68.9	4.20	11.65
40× 10cm + Mnso₄4.5 kg/ha	69.33	4.17	12.08
50×10cm + Mnso₄4.5 Kg/ha	72.16	4.47	12.37
Control (RDF)	68.0	3.97	11.35
SEm(±)	0.27	0.11	0.04
CD (p=0.05)	0.82	0.34	0.12

Table.2 Effect of spacing and manganese levels on yield attributes and yield of Sesame.

Treatments	No. of Capsules per plant	No. of seeds per Capsule	Test weight (g)	Seed yield (t/ha)	Stover yield (t/ha)	Harvest index (%)
30×10cm + Mnso₄1.5 kg/ha	47.03	68.87	2.10	1.00	2.54	29.37
40 ×10cm+ Mnso₄ 1.5 kg/ha	45.17	69.10	2.63	1.04	2.57	28.80
50×10cm+ Mnso₄ 1.5 kg/ha	46.77	72.67	3.07	1.07	2.59	29.23
30×10cm + Mnso₄3.0 kg/ha	46.47	68.17	2.40	1.10	2.60	29.72
40 ×10cm + Mnso₄3.0 kg/ha	45.27	72.60	2.77	1.11	2.62	29.75
50×10cm + Mnso₄3.0 kg /ha	50.53	74.43	3.20	1.17	2.64	30.70
30×10cm + Mnso₄4. 5 kg/ha	47.60	73.07	2.43	1.13	2.61	30.21
40 ×10cm + Mnso₄4.5 kg/ha	48.40	72.07	2.90	1.16	2.66	30.36
50×10cm + Mnso₄4.5 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