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Optimization of spacing and nitrogen management practices on yield and monetary parameters of sesame (*Sesamum indicum* L.)

Mudiveti Venkat Ramana Reddy, Rajesh Singh and Wasim Khan

Abstract
A field experiment was conducted to determine the effect of spacing and nitrogen management practices on yield and monetary parameters of sesame during *kharif* 2020 at Crop Research Farm, Department of Agronomy, Naini Agriculture Institute, Sam Higginbottom University of Agriculture Technology and Sciences, Prayagraj, Uttar Pradesh, India. The experiment was laid out in randomized block design, with 9 treatments, each replicated thrice with three different spacing i.e., 30 cm x 10 cm, 45 cm x 10 cm, 60 cm x 10 cm and three levels of nitrogen management practices i.e., 100% RDN (*Recommended dose of Nitrogen*), 75% RDN + 25% N through Bokashi + *Azotobacter* inoculation and 50% RDN + 50% N through Bokashi + *Azotobacter* inoculation. The experiment was laid in randomized block design with nine treatments replicated thrice. Results revealed that spacing 45 cm x 10 cm and 75% RDN + 25% N through Bokashi + *Azotobacter* inoculation gave maximum grain yield (1256.67 kg/ha), stover yield (2112.67 kg/ha), Gross return (96362.92 INR/ha), Net return (66957.82 INR/ha), and B.C ratio (3.28).

Keywords: Sesame, yield, monetary parameters, spacing, RDN, bokashi, *Azotobacter*

Introduction
Sesame (*Sesamum indicum* L.) is amongst the oldest crops in the world under cultivation in Asia for more than 5000 years (Bisht *et al.*, 1998) [1]. The crop has primary origins in East Africa and in India. At the moment, India and China are the world's leading producers of sesame followed by Myanmar, Sudan, Uganda, Nigeria, Pakistan, Tanzania, Ethiopia, Guatemala and Turkey. Sesame (*Sesamum indicum* L.) which is recognized in various names such as til, gingelly, simsim, gergelim etc. Sesame is one of the world's oldest cultivated oilseed crops. Among the oilseed crops, sesame lines first for having the highest oil content of 46-64 percent and 6355 K cal/kg dietary energy in seeds (Sanjay Kumar and Goel 1994) [7]. Sesame oil with 85 percent unsaturated fatty acid is extremely stable and has plummeting effect on cholesterol and prevents coronary heart disease. Therefore, sesame is called as the *"Queen of oil seeds"* by virtue of its tremendous quality and utility **(**Sivagamy and Rammohan, 2013) [4].

Exploiting, by the better use of agronomic techniques can define the yield potential of sesame. Of the standard agronomic practices which can reflect the yield potential of *Kharif* sesame, plant geometry, and nutrient management practices are the imperative factors in determining yield. Canopy architecture which affects the light interception and CO_2 assimilation can impinge the productivity that can be altered by the plant geometry. Spacing can influence the yield and yield attributes *viz.*, number of capsules/plant, and number of seeds/capsules (Subrahmaniyan *et al.*, 2001) [9].

Nutrient management practices are the key inputs to augment productivity. Nitrogen is a structural constituent of chlorophyll and protein, thus ample furnish of nitrogen is beneficial for both carbohydrates and protein metabolism. A promising elucidation to cope up with the present crisis is by utilization of natural biological nitrogen-fixing system through different organic sources like bio fertilizers, organic manures besides with chemical fertilizers is crucial. Hence, effectual management of nitrogen is crucial for mounting crop productivity, enhancing the nitrogen use efficiency, and recuperating environmental sustainability by cutting down the nitrogen losses to the atmosphere and nitrate leaching to water bodies. (Wu *et al.*, 2009) [11]. Poor fertility status of the Indian soils is a major constraint for the growth and development of the crop. The organic matter content in soil can be enhanced by adding up FYM, vermicompost, green manures, Bokashi, etc. Bokashi is an organic fertilizer used for top

dressing and is a natural soil amendment. It boosts up and promotes the beneficial microorganisms and their activity that are usually present in the soil. It shortens the time required for soil restoration in contrast to cessation caused by agrochemicals. It can aid to buffer against the initial yield losses. This constitutes the most indispensable benefit of bokashi for resource-poor farmers who lack the fiscal resources to safeguard against suboptimal crop production (Helen *et al*., 2006) [3]. Bio-fertilizers play a vital role in escalating the availability of nitrogen. Thus, inoculation of the efficient strain of *Azotobacter* in the soil has been promising in enhancing the nitrogen status of soil and crop yield owing to their ability to fix atmospheric nitrogen and also secretes growth-promoting substance like gibberellins, indole acetic acid, etc. *Azotobacter* inoculation helps in the uptake of N, P alongside micronutrients like Fe and Zn and intensely supply to amplify the yield by supplying nitrogen to the crops. In view of above consideration the present investigation entitled "Optimization of Spacing and Nitrogen Management practices on Yield and Monetary parameters of Sesame (*Sesamum indicum* L.)" was carried out.

Materials and Methods

A field experiment was conducted during the *Kharif* season of 2020, to assess the effect of spacing and nitrogen management practices on yield and economics of sesame (*Sesamum indicum* L.) at the Crop research farm of Department of Agronomy, Naini Agriculture Institute, Sam Higginbottom University of Agriculture, Technology, and Sciences, Prayagraj, Uttar Pradesh, India which is located at 25^0 39' 42'' N latitude, 81^0 67' 56'' E longitude and 98 m altitude above the mean sea level The soil of the experimental plot was sandy loam in texture, neutral in soil reaction (pH 7.3), low organic carbon (0.57%), available P (32.10 kg/ha), EC (0.29 ds/m), available K (346 kg/ha). The experiment was laid out in Randomized Block Design comprising of 9 treatments which are replicated thrice. Treatment combination consisted of two factors, one with three different spacing i.e., 30 x 10 cm, 45 x 10 cm, 60 x 10cm and other with three levels of nitrogen management practices i.e., 100% RDN (*Recommended dose of Nitrogen*), 75% RDN + 25% N through Bokashi + *Azotobacter* inoculation, 50% RDN + 50% N through Bokashi + *Azotobacter* inoculation. The factors are combined to frame the 9 treatment combinations that are depicted in Table-1. The recommended dose of fertilizer (RDF) was 50:40:30 NPK kg/ha. Nitrogen fertilizer urea was applied as recommended in treatment combination, half as a basal dose and the rest half was sliced to two halves and applied as two doses at 30 DAS and at the flowering stage respectively. The full dose of Bokashi is applied as a basal dose by calculating on the basis of N content and P and K fertilizers are applied as basal dose at the time of sowing. Seed treatment was done with *Azotobacter* at the rate of 200ml/ha of seed as per the treatments. Shekhar variety seed was used for sowing during the research trial.

The crop was harvested from the net plot area (1 m^2) and manual threshing was carried out after proper drying. Later winnowed, cleaned and weighed the grain per net plot value, the grain yield per ha was computed and expressed in kilogram per hectare. The data were computed and analyzed by following the statistical method of Gomez and Gomez (1984) [2]. Yield parameters grain yield kg/ha, stover yield kg/ha, were recorded as per the standard method. The monetary parameters like cost of cultivation, gross returns, net returns, and Benefit: Cost ratios were worked out as per the standard method.

Table 1: Treatment combination

S. No.	Treatment No.	Treatment combination
1	T_1	Spacing 30 cm × 10 cm + 100% RDN
2	T_2	Spacing 30 cm × 10 cm + 75% RDN + 25% N through Bokashi + *Azotobacter* inoculation
3	T_3	Spacing 30 cm × 10 cm + 50% RDN + 50% N through Bokashi + *Azotobacter* inoculation
4	T_4	Spacing 45 cm × 10 cm + 100% RDN
5	T_5	Spacing 45 cm × 10 cm + 75% RDN + 25% N through Bokashi + *Azotobacter* inoculation
6	T_6	Spacing 45 cm × 10 cm + 50% RDN + 50% N through Bokashi + *Azotobacter* inoculation
7	T_7	Spacing 60 cm × 10 cm + 100% RDN
8	T_8	Spacing 60 cm × 10 cm + 75% RDN + 25% N through Bokashi + *Azotobacter* inoculation
9	T_9	Spacing 60 cm × 10 cm + 50% RDN + 50% N through Bokashi + *Azotobacter* inoculation

Note: RDF of Sesame: N: P: K-50:40:30 kg/ha; 100% RDN: Recommended dose of Nitrogen i.e., 50kg/ha; 75% RDN i.e., 37.5 kg/ha; 50% RDN i.e., 25 kg/ha.

Results and Discussions

Effect on yield of sesame

The statistical data regarding yield and yield attributes were presented in Table-2.

A maximum grain yield of 1256.6 kg/ha was recorded with the treatment T_5, However, T_3 has shared the statistical parity with the maximum i.e., T_5. The highest Stover yield was obtained with 2112.67 kg/ha by T_5, whereas the treatments T_3 and T_7 were found at par to the T_5, Lowest Grain and Stover yield were obtained by T_1 846.67 kg/ha and T_1 1690.33 kg/ha respectively. The graph for grain yield and Stover yield was represented in fig-1.

The plants might have received adequate nutrients, moisture, and light when sown at 45 cm x 10 cm because the competition for resources in spacing 30 x 10 cm and less plant population in 45 cm x 10 cm might have affected the yield and yield attributes. Higher grain yield and stover yield at spacing 45cm x 10cm spacing might be due to the availability of larger feeding area for better utilization of natural resources like space, sunlight, water, nutrients, etc. the finding was in agreement with Shinde *et al.*, (2011) [8] and Yadav *et al.*, (2007) [12].

The combined use of organic and inorganic fertilizers may have increased nitrogen supply, which might have contributed the better vegetative growth and fruiting which in turn resulted in increased dry matter production to readily hike stover yield. These results are in close accord with the findings of Nayek *et al*., (2014).

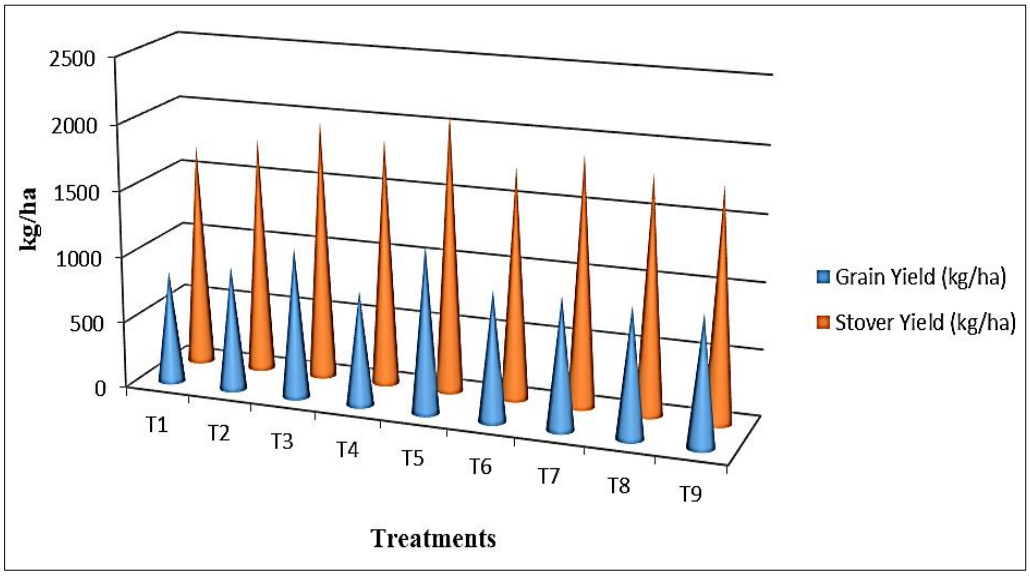

Fig 1: Graph depicting the grain and stover yield of sesame

Table 2: Effect of spacing and nitrogen management practices on yield of sesame

S. No.	T. No.	Grain yield (kg/ha)	Stover yield (kg/ha)
1	T_1	846.67	1690.33
2	T_2	940.00	1784.67
3	T_3	1133.33	1960.00
4	T_4	863.33	1870.67
5	T_5	1256.67	2112.67
6	T_6	976.67	1753.33
7	T_7	990.00	1892.67
8	T_8	976.67	1792.00
9	T_9	973.33	1757.33
	SEm (+)	75.00	78.74
	CD (P=0.05)	224.84	236.07

Effect on monetary parameters of sesame

The data regarding monetary parameters were presented in Table-3.

Maximum gross return (96362.92 INR/ha), net return (66957.82/ha), and Benefit: cost ratios of 3.28 were obtained by the treatment T_5, which have shown tremendous superiority over the rest of the treatments. Whereas, minimum gross return (65284.92 INR/ha) and net return (41174.72 INR/ha) was obtained in treatment T_1. Lowest Benefit: cost ratio (2.16) was recorded by the treatments T_6 and T_9. Monetary parameters are the foremost criteria to appraise the preeminent treatment which represents the economically sound and that can be time-honored by farming society. In the present study, the maximum gross returns, net returns, and B: C ratios were obtained by 45cm x10cm row spacing and 75% RDN + 25% N through Bokashi + *Azotobacter* inoculation. This was mainly owing to higher grain yield compared to other treatment combinations. Similar findings were supported by Tripathi and Rajput (2007) [10] and Sivagamy and Rammohan (2013) [4].

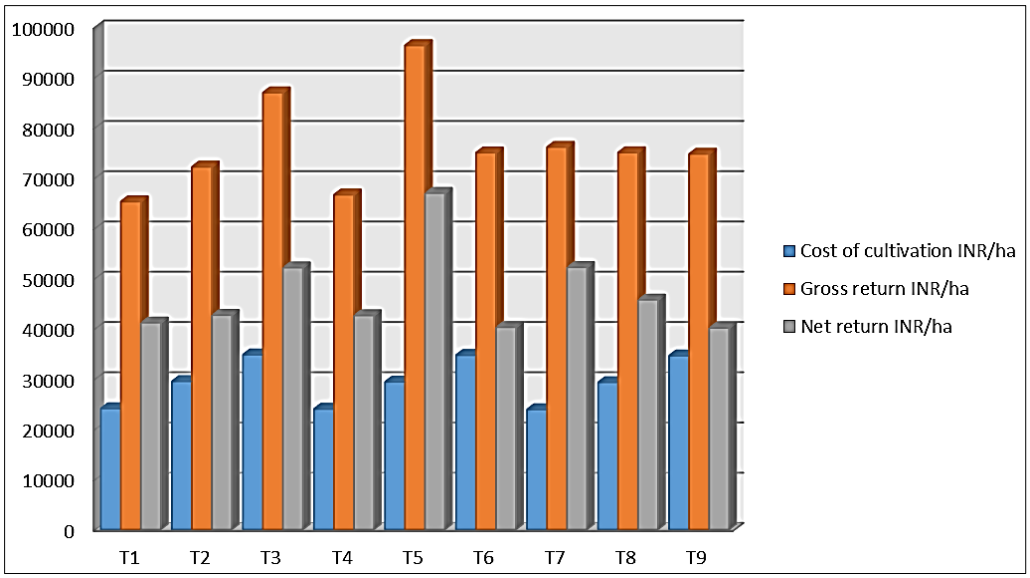

Fig 2: Monetary parameters of sesame

Table 3: Effect of spacing and nitrogen management practices on monetary parameters of sesame

S. No.	T. No.	Cost of cultivation (INR/ha)	Gross returns (INR/ha)	Net returns (INR/ha)	Benefit cost ratio
1	T_1	24110.20	65284.92	41174.72	2.71
2	T_2	29505.10	72190.33	42685.23	2.45
3	T_3	34820.10	86959.75	52139.65	2.50
4	T_4	24010.20	66642.42	42632.22	2.78
5	T_5	29405.10	96362.92	66957.82	3.28
6	T_6	34720.10	75003.58	40283.48	2.16
7	T_7	23910.20	76120.67	52210.47	3.18
8	T_8	29305.10	75042.25	45737.15	2.56
9	T_9	34620.10	74757.08	40136.98	2.16

Note: Monetary parameters were not subjected to statistical analysis

Conclusion

As the monetary units are the paramount importance in the farmer's point of view, for obtaining the highest yield and monetary parameters the treatment T_5 Spacing 45cm × 10cm + 75% RDN + 25% N through Bokashi + *Azotobacter* inoculation is the best treatment combination.

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References

1. Bisht IS, Mahajan Loknathan TR, Agrawal RC. Diversity in Indian sesame collection and stratification of germplasm accessions in different diversity groups. Genet Resour Crop Evol 1998;45:325-335.
2. Gomez KA, Gomez AA. Statistical procedures for agricultural research (2nd Ed.), John Wiley and Sons: New York, USA 1984.
3. Helen J, Leopoldo G, Rene J, Gerry G. Nature Farming Manual, Resource Efficient Agricultural Production-Canada 2006, P1-36.
4. Sivagamy K, Rammohan J. Effect of sowing date and crop spacing on growth, yield attributes and quality of sesame. IOSR Journal of Agriculture and Veterinary Science 2013;5(2):38-40.
5. Nayek SS, Koushik Brahmachari MD, Chowdhury R. Integrated approach in nutrient management of sesame with special reference to its yield, quality and nutrient uptake. The Bio scan 2015;9(1):101-105.
6. Preeti. Development of organic nutrient management for sesame *Sesamum indicum* L. M.Sc. (Ag.) Thesis 2010.
7. Sanjay Kumar S, Goel PD. A great ancient oilseed-sesamum. Farmer and Parliament 1994;12:6-7.
8. Shinde SD, Raskar BS, Tamboili BD. Effect of spacing and sulphur levels on productivity of sesame (*Sesamum indicum* L.) under summer condition. Journal of Maharashtra Agriculture University 2011;36(1):28-31.
9. Subrahmaniyan K, Arulmozhi N, Kalaiselven P. Influence of plant density and NPK levels on the growth and yield of sesamum (*Sesamum indicum* L.) genotype. Agriculture Science Digest 2001;21(3):208-209.
10. Tripathi ML, Rajput RL. Effect of different genotypes and fertility levels on yield, attributes and economic return of sesame, Advances in Plant Science 2007;20(2):521-522.
11. Wu YC, Zhou SL, Wang ZM, Feng HY. Recovery of residual fertilizer-nitrogen by wheat in a winter wheat-summer maize rotation in the North China plain: A soilcolumn study. Agron. J 2009;101(4):925-932.
12. Yadav RA, Mishra A, Singh D. Response of sesame cultivar under various plant spacing and seed rates, Plant Archives 2007;7(1):287-288.