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Effect of plant population and varieties on growth and yield of sesame (*Sesamum indicum* L.)

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Abstract

A Field Experiment was conducted during *Zaid*, 2021 at Crop Research Farm, Department of Agronomy, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj (U.P) to study the “(Effect of Plant population and Varieties on growth and yield of Sesame (*Sesamum indicum* L.))” The treatment consists of three different spacing (20cm x10cm, 25cm x10cm and 30cm x10cm) and three different Sesame varieties (Sekhar, Varaha and Swetha). The experiment was conducted by following randomized block design with nine treatments and were replicated thrice. The results revealed that significantly higher in growth and yield parameters with the treatment combination of Variety Sekhar + Spacing 30cm x 10cm., viz., Plant height (88.1cm), Number of branches per plant (7.01), Dry weight (23.28g), number of Capsules per plant (42.3), number of seeds per capsule (58.5), Test weight (3.58g), seed yield (0.84t/ha), stover yield (2.26t/ha). Maximum Gross returns (75600 INR/ha), Net returns (52250 INR/ha) and B:C ratio (2.25) were recorded with the Variety Sekhar + spacing 30cm x 10cm which was superior over all the treatments.

Keywords: Sesame, spacing, varieties

Introduction

Sesame (*Sesamum indicum* L.) is an annual crop and it is one of the important oil crops of the world and belongs to the order Tubiflorae and family Pedaliaceae cultivated for seed (Raikwar and Srivastava, 2013) sesame is variously known as sesamum, til, Simsim, Benised, Gingelly, Gergelim etc. and it is one of the world’s oldest cultivated oilseed crop and first oil seeds from which oil was extracted by ancient Hindus, which was used for certain ritual purposes (Arnon, 1972). Sesame is known as “Queen of oil seed crop” by virtue of its excellent quality edible oil, protein content and its resistance to oxidation and acidity even when stored at ambient air temperature (Kale *et al.*, 2018) [7]. Is cultivated in warm regions of the tropic and sub tropics. It is a major oilseed crop in the world because of its easiness of extraction, great stability and resistance to drought. Sesame was cultivated and domesticated on the Indian subcontinent during Harrapan and Antolian eras (Bedigian and Vander 2003).

Sesame is a major oilseed crop in the world because of its easiness of extraction, great stability and resistance to drought. Sesame contains 40-50% oil, 20-25% protein, 20-25% carbohydrate and 5-6% ash (Salunkhe *et al.*, 1992). The oil is used or edible purpose (73%), hydrogenization (8.3%) and industrial purpose (4.2%) in the manufacture of paints, insecticides and pharmaceuticals. Sesame oil contains both insecticidal and anti-fungal properties. It is adds to formulations to help coat plant surfaces and used as a surfactant (Calvert & Chalker-scot, 2014). Sesame cake is a rich source of proteins, carbohydrates and mineral-nutrients, such as calcium, phosphorus and also rich in vitamin ‘E’ content. It contains 6.0 to 6.2% nitrogen, 2.0 to 2.2% phosphorus and 1.0 to 1.2% potash. It can be used as manure (Reddy 2005).

Optimizing plant density and row spacing are very important for improving grain yield in a particular environment. Maximum yield of sesame is achieved by the best spatial arrangement of plants for effective canopy development, water and nutrient utilization and pest control (Caliskan *et al.*, 2004).

Row spacing is one of the important components of systematic cultivation and manipulation of that could increase yield performance. Due to proper space plant can gains of sufficient sunlight, water and nutrition from soil which can influence healthy yield of plant. In densely populated sesame fields, the intraspecific competition between the plants is high resulting in lower grain yield. On the contrary, sparsely populated fields with wider spacing could lead to uneconomic utilization of space, profuse growth of weeds and pests and reduction of yield per

unit area (Nandita Roy *et al.*, 2009)^[9].

Sekhar is a Dark seeded sesame variety and released in year of 2001. The oil content of 50-52% and produces the yield of average 700-800kg/ha and tolerant to leaf curl, powdery mildew, Macrophomina and Phytophthora blight.

Varaha is a white seeded sesame variety and released in year of 1993. The oil content of 50-53% and produces the yield of average 800-850kg/ha and produces uniform maturity.

Swetha is a white seeded sesame variety and released in year of 2001. The oil content of 50-52% and produces the yield of average 750-800kg/ha and determinate type tolerant to leaf curl, powdery mildew, stem rot, Macrophomina and Phytophthora blight.

Keeping the views like inter-plant competition for optimum plant nutrients, sunlight, moisture and aeration in wind, It is required to find out a fair combination of plant geometry and variety to achieve the maximum yield.

Materials and Methods

The experiment was carried out during *Zaid*, 2021 at Crop Research Farm, Department of Agronomy, Naini Agricultural Institute, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj (U.P.) which is located at 25° 57' N latitude, 81° 50' E longitude and 98 m altitude above the mean sea-level. The experiment consists of nine treatments which were replicated thrice in a randomized block design with three different spacing viz., (20cm x 10cm, 25cm x 10cm and 30cm x 10cm) and three different varieties of Sesame viz., (Sekhar, Varaha and Swetha). The treatment combinations which are T₁: Variety Sekhar + Spacing 20cm x 10cm, T₂: Variety Sekhar + Spacing 25cm x 10cm T₃: Variety Sekhar + Spacing 30cm x 10cm T₄: Variety Varaha + Spacing 20cm x 10cm T₅: Variety Varaha + Spacing 25cm x 10cm T₆: Variety Varaha + Spacing 30cm x 10cm T₇: Variety Swetha + Spacing 20cm x 10cm T₈: Variety Swetha + Spacing 25cm x 10cm T₉: Variety Swetha + Spacing 25cm x 10cm. Irrigation was based on the necessity and at the time of sowing. Growth attributes viz., Plant height(cm), Number of Branches, Plant dry weight(g/plant), Crop growth rate(g/m²/day), Relative growth rate(g/g/day) and Yield attributes viz., capsules/plant, seeds/capsule, Test weight(g) Yield parameters viz., seed yield(t/ha), stover yield(t/ha) and harvest index (%) were recorded with standard basis of observation. The data was analysed statistically by using analysis of variance as applicable in Randomized Block Design (Gomez and Gomez, 1984).

Results and Discussion

Growth attributes

Data in Table 1 revealed plant height at harvest recorded a significant difference among treatment combinations. At 90DAS, significantly highest plant height (88.1cm) was observed in treatment Variety Sekhar + Spacing 30cm x 10cm which was superior over the treatment which was followed by treatment combination Variety Varaha + Spacing 30cm x 10cm with (88.5cm), respectively.

The plant height was remarkably accelerated at 30 cm x 10 cm spacing which might be due to the tendency of plant to elongate toward light, when insufficient incidental solar radiation is intercepted in the plant canopy particularly lower one. The results are in conformity with those reported by Yadav *et al.*, (2007)^[17].

Further, plant dryweight at 90DAS (23.28g/plant) was recorded significantly higher in Variety Sekhar + Spacing 30cm x 10cm which was followed by the treatment

combination of in Variety Sekhar + Spacing 25cm x 10cm with (22.92g) and in Variety Varaha+ Spacing 30cm x 10cm with (22.83g) respectively.

Similarly, Crop growth rate recorded at 75-90DAS (2.9 g/m²/day) was recorded a significantly higher with Variety Varaha + Spacing 20cm x 10cm and followed by (2.5g/m²/day) with variety Swetha + Spacing 20cm x 10cm and (2.1 g/m²/day) with Variety Sekhar + Spacing 30cm x 10cm, respectively.

Data depicted in table 1 shows that Relative growth rate recorded at harvest stage was found non-significant effect among treatments. However, highest relative growth rate (0.003g/g/day) were recorded with Variety Sekhar + Spacing 30cm x 10cm and Variety Varaha + Spacing 30cm x 10cm. While lowest relative growth rate(0.001g/g/day) was observed in Variety Sekhar + Spacing 25cm x 10cm, Variety Swetha + Spacing 25cm x 10cm and Variety Swetha + Spacing 30cm x 10cm Farmyard, respectively.

Data in Table 1 revealed Number of branches at 90DAS recorded a significant difference among treatment combinations. At 90DAS, significantly maximum number of branches was observed Variety Sekhar + Spacing 30cm x 10cm of (7.01) which was superior over the treatment which was followed by treatment combination Variety Varaha + Spacing 30cm x 10cm(6.52)and Variety Swetha + Spacing 30cm x 10cm of with (6.31), respectively.

Yield attributes and yield

As given in Table 2 seeds per capsule recorded a significant difference among treatment combinations. However, capsules (42.3/plant) recorded significantly higher in Variety Sekhar + Spacing 30cm x 10cm which was followed by the treatment combinations of Variety Swetha + Spacing 30cm x 10cm with (39.4/plant) respectively.

Further seeds per capsule was noticed maximum (54.5seed/capsule) in Variety Sekhar + Spacing 30cm x 10cm and followed by Variety Varaha + Spacing 30cm x 10cm(49.7) and treatment combination, Variety Swetha + Spacing 25cm x 10cm(49.6) respectively.

Data depicted in table 2 shows that Test weight recorded at 90DAS, had a significant effect among treatments. Significantly higher Testweight (3.58g) were recorded in Variety Sekhar + Spacing 30cm x 10cm which was followed by Variety Varaha + Spacing 30cm x 10cm and Variety Sekhar + Spacing 30cm x 10cm (3.55g and 3.49g).

Similarly, Seed yield recorded a significant difference among treatment combinations. However, Seed yield (0.84t/ha) recorded significantly higher in Variety Sekhar + Spacing 30cm x 10cm. Whereas, Variety Varaha + Spacing 30cm x 10cm of (0.82t/ha) is statistically at par to Variety Sekhar + Spacing 30cm x 10cm. The seed yield is the combined effect of different factors contributing towards it. It appears logical to assume that it is the function of yield attributing characters as increase in any one of these will result in increased yield these results are in close conformity with Singh *et al.* 2015.

Data presented in table 2 shows that significantly higher stover yield was recorded in Variety Sekhar + Spacing 30cm x 10cm (2.26t/ha) which was followed by Variety Varaha + Spacing 30cm x 10cm (2.26t/ha) respectively.

Data in Table 2. Revealed that Harvest index shown that there was a no significant difference among treatments. However highest harvest index (27.52%) were recorded in Variety Swetha+ Spacing 20cm x 10cm. While, lowest harvest index (21.07%) were observed in Variety Varaha+ Spacing 20cm x 10cm respectively.



Fig 1: Sesame crop in Zaid season of 2021 at Crop Research Farm, SHUATS, Prayagraj (Allahabad).

Table 1: Effect of Plant population and Varieties on growth attributes of Sesame

	Treatments	Plant height (cm) at 90DAS	Branches/ plant at 90DAS	Plant dry weight (g/plant) 90DAS	CGR (g/m ² /day) 90DAS	RGR (g/g/day) at 90DAS
T ₁	Variety Sekhar + Spacing 20cm ×10cm	82.3	5.86	20.12	1.8	0.002
T ₂	Variety Sekhar + Spacing 25cm ×10cm	84.3	5.64	22.92	1.9	0.001
T ₃	Variety Sekhar + Spacing 30cm ×10cm	88.1	7.01	23.28	2.1	0.003
T ₄	Variety Varaha + Spacing 20cm ×10cm	82.5	5.67	18.32	2.9	0.001
T ₅	Variety Varaha + Spacing 25cm ×10cm	80.9	6.14	19.27	1.3	0.002
T ₆	Variety Varaha + Spacing 30cm ×10cm	85.5	6.52	22.83	1.9	0.003
T ₇	Variety Swetha + Spacing 20cm ×10cm	82.7	5.62	19.02	2.5	0.001
T ₈	Variety Swetha + Spacing 25cm ×10cm	82.6	5.89	20.24	1.8	0.001
T ₉	Variety Swetha + Spacing 30cm ×10cm	85.0	6.31	20.60	1.7	0.002
	F-Test	S	S	S	S	NS
	S.Em+	1.22	0.16	0.12	0.58	0.01
	CD (P=0.05)	3.58	0.56	0.68	0.81	-

Table 2: Effect of Plant population and varieties on yield attributes and yield of Sesame

	Treatments	Capsules/Plant	Seed/Capsule	Test weight(g)	Seed yield (t/ha)	Stover yield (t/ha)	Harvest index (%)
T ₁	Variety Sekhar + Spacing 20cm ×10cm	35.8	45.6	3.37	0.64	2.10	23.45
T ₂	Variety Sekhar + Spacing 25cm ×10cm	36.7	48.7	3.49	0.70	2.18	26.83
T ₃	Variety Sekhar + Spacing 30cm ×10cm	42.3	58.5	3.58	0.84	2.26	27.15
T ₄	Variety Varaha + Spacing 20cm ×10cm	38.9	46.8	3.24	0.59	1.98	21.07
T ₅	Variety Varaha + Spacing 25cm ×10cm	37.1	47.9	3.55	0.78	1.97	26.04
T ₆	Variety Varaha + Spacing 30cm ×10cm	38.5	56.2	3.48	0.82	2.24	21.84
T ₇	Variety Swetha+ Spacing 20cm ×10cm	38.0	45.8	3.16	0.58	1.92	27.52
T ₈	Variety Swetha + Spacing 25cm ×10cm	36.3	54.6	3.29	0.61	2.13	22.69
T ₉	Variety Swetha + Spacing 30cm ×10cm	39.4	48.7	3.43	0.83	1.88	22.47
	F-Test	S	S	S	S	S	NS
	S.Em+	1.02	1.78	0.09	0.00	0.02	0.34
	CD (P=0.05)	3.48	5.38	0.12	0.02	0.02	-

Conclusion

Based on the findings of experimentation in one season in a year, it is concluded that application of Variety Sekhar + Spacing 30cm ×10cm was found more helpful for attaining better growth and yields in Sesame under Eastern U.P. climatic condition.

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