The Pharma Innovation Journal 2022; 11(4): 310-312

www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277- 7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2022; 11(4): 310-312

www.thepharmajournal.com
Received: 15-02-2022
Accepted: 27-03-2022

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Effect of plant geometry and sulphur on growth and yield of sesame (*Sesamum indicum* L.)

Vibhav Singh, Rajesh Singh and Thakur Indu

Abstract
A field experiment entitled "Effect of Plant geometry and Sulphur on growth and yield of Sesame (*Sesamum indicum* L.)" was conducted during *Zaid* season 2021 at Krishi Vigyan Kendra, SHUATS, Allahabad, (U.P.). The soil of experimental plot was sandy loam in texture, nearly neutral in soil reaction (pH 6.7). The treatment consisted of Spacing (25x15cm^2, 30x15cm^2, 35x15cm^2) and Sulphur (20kg, 30kg, 40kg). The experiment was laid out in Randomized Block Design with nine treatments which were replicated thrice. The variety G-4 was sown 14th April 2021 by line sowing with seed rate of 4 kg/ha at spacing according to treatments details. The result showed that there were significant increase in growth and yield parameters *viz.*, plant height (95.40 cm), plant dry weight (13.90 g/plant) recorded higher with the application of 35 cm x 15 cm + 30 kg Sulphur at 75 DAS. Whereas, yield parameters such as capsule (35.87/plant), seeds (38.47 /capsule), test weight (2.90 g), seed yield (867.97 kg/ha), stover yield (1554.20 kg/ha), harvest index (39.36%) and oil content (48.32%) were recorded maximum in the treatment combination of 30 cm x 15 cm + 40 kg sulphur at 75DAS respectively.

Keywords: Growth, spacing, sulphur, yield, *Sesame*

Introduction
Sesame, (*Sesame indicum* Linn. *syn. Sesamum* oriental Linn.), a member of order Tubiflorea, Family Pedaliaceae, is perhaps the oldest oilseed known and used of human-beings (Joshi, 1961; Weiss, 1983). Sesame is called as "Queen of oil seed crop" by virtue of its excellent quality. According to Assyrian legend, when the gods met to create the world, they drank wine made from sesame seeds. In early Hindu legends, tales were told in which sesame seeds represent a symbol of immortality. "Open sesame", the famous phrase from the Arabian Nights, reflects the distinguishing feature of sesame seed pod, which bursts open when it reaches maturity. Sesame is very drought tolerant crop of semiarid regions. It is superior to other oil seed crop due to adaptability to varied agro-climatic condition and higher degree of drought tolerance it is widely grown in countries such as India, China, Bangladesh, Turkey, and also in drier parts of African and Mediterranean countries. Worldwide, it is used for its Nutritional, Medicinal, and industrial purposes. It has been called survivor crop with an ability to grow where most crops fail. Sesame ranks first for having oil content of 46-64% and 6355 k cal/kg dietary energy in seeds (Sanjay kumar & Goel, 1994). India ranks first in world with 19.47 Lakh ha area and 8.66 Lakh tonnes production. The average yield of sesame (413 kg/ha) in India is low as compared with other countries in the world (535 kg / ha). The main reasons for low productivity of sesame are its rainfed cultivation in marginal and submarginal lands under poor management and input starved conditions. The crop is grown in almost all parts of the country. More than 85% production of sesame comes from West_Bengal, Madhya_Pradesh, Rajasthan, Uttar_Pradesh, Gujarat, Andhra Pradesh and Telangana. Seeds of sesame is also rich source of protein (20-28%), sugar (14-16%) and minerals (5-7%). This oil has 85% unsaturated fatty acid is highly stable and has washing effect on cholesterol & prevents coronary heart disease. Sesame as a valuated oil seed appears to have numerous industrial applications. In India, sesamum seeds are used for oil extraction (78%), edible purposes (20%) and seed purpose (2%). Out of that 70% used for edible purpose as salad and cooking oil and remaining 30% used for non-edible purpose like domestic and toilet soaps and for manufacture of margarine (Rathore *et al*, 2005) [4]. Sesamum seed contains 50-60% oil which has excellent stability due to the presence of natural antioxidants such as sesamolin, sesamin and sesamol. They enrich blood and are useful in snake bites, bleeding piles etc. Sesame oil is used for preparation of medicines for dry cough, Asthama, disease of lungs, burning sensation, ear and eyes disease. Recently Omega-6 fatty acid desaturase was also extracted from sesamum which is helpful for heart patients (Jin *et al*., 2001) [1].Among the

cultural practices, row spacing is one of the vital components, manipulation of that can lead for optimizing yield. Population density has profound have an impact on on grain yield. The plant density may be adjusted through the usage of either distinctive seed rates or distinctive row spacing. Optimum planting density permits the sesame plant to develop well each in its aerial and underground elements through making use of most radiant energy, area and water which in the long run leads to reinforce crop production (Shinde et al, 2011) Sulphur is crucial plant nutrient can play a key function in augmenting the production and productiveness of oilseeds in the country because it has giant have an effect on on best and improvement of oil seeds and the quality realize for its function in synthesis of proteins, oils and vitamins. Keeping this in view, the present investigation was carried out to the study the Effect of plant geometry and sulphur on growth and yield of sesame.

Materials and Methods

The experiment was conducted during *Zaid* season of 2021 2021 at Krishi Vigyan kendra, SHUATS, Allahabad, (U.P.). Which is located at 25° 40'10''N latitude, 81°85'31" E longitude and 98 m altitude above the mean sea level (MSL). The experiment was conducted in Randomized Block Design consisting of nine treatment combinations with three replications and was laid out with the different treatments allocated randomly in each replication. The variety G-4 was sown 14th April 2021 by line sowing with seed rate of 4 kg/ha at spacing according to treatments details The soil of the experimental field was sandy loam in texture, slightly alkaline reaction (pH 7.2) with low level of organic carbon (0.35%), available N (203.7 Kg/ha.), P (17.14kg/ha.) and higher level of K (92.00 kg/ha.). The treatment combinations are T_1 - Spacing 25 x15 cm + sulphur - 20 kg/ha, T_2 - Spacing 30 x15 cm + sulphur - 20 kg/ha, T_3 - Spacing 35x 15 cm + sulphur - 20 kg/ha, T_4 - Spacing 25x 15 cm + sulphur - 30 kg/ha, T_5 - Spacing 30 x 15 cm + sulphur - 30 kg/ha, T_6 - Spacing 35 x 15 cm + sulphur - 30 kg/ha., T_7 - Spacing 25 x 15 cm + sulphur - 40 kg/ha, T_8 - Spacing 30 x 15cm + sulphur - 40 kg/ha, T_9 - Spacing 35 x 15cm + sulphur - 40 kg/ha. The observations were recorded on different growth parameters at harvest *viz*. plant height (cm), plant dry weight, Number of capsule per plant, number of seeds per capsule, test weight, grain yield and stover yield.

Fig 1: 1st Irrigation after sowing

Fig 2: 55 DAS at flowering stage

Result and Discussion

Growth Attributes

The data pertaining to growth parameters have been presented in table1. The important growth parameters plant height (cm) and plant dry weight (g/plant), were influenced significantly by various treatment. At harvest, the highest plant height (95.40 cm) was recorded by T_6 (35cmx15cm) +30kg Sulphur. Where, T_5 (30cmx15cm) +30kg Sulphur had recorded (94.95 cm) which were statistically at par with T_6 (35cmx15cm) +30kg Sulphur. These results are in accordance with the finding of Sarkar and Banik (2002) [6]. At the time of harvest plant dry weight was found significant. However, T_6 (35cmx15cm) +30kg Sulphur had recorded highest plant dry weight (13.9 g) while T_5 (30cmx15cm) +30kg Sulphur had recorded (13.4 g) which was found statistically at par with T_6 (35cmx15cm) +30kg Sulphur. The least plant dry weight (10.0 g) was recorded by T_1 (25cmx15cm) +20kg Sulphur. These results are in accordance with the finding of Saren *et al*., (2004) [5], Kithan *et al.* (2017) [2]. An increase in plant height may be due to a better nutritional environment for plant growth at active vegetative stages as a result of improvement in root growth, cell multiplication, elongation and cell expression in the plant body and indirect involvement of Sulphur in the photosynthesis process of plants. Parmar *et al*., (2018) [3].

Table 1: Effect of Plant geometry and Sulphur on growth attributes of Sesame at Harvest

Treatments	Plant Height (cm)	Plant Dry Weight(g/plant)
Spacing 25 x15 cm + sulphur - 20 kg/ha	82.10	10.00
Spacing 30 x15 cm + sulphur - 20 kg/ha	82.59	10.50
Spacing 35x 15 cm + sulphur - 20 kg/ha	87.71	10.20
Spacing 25x 15 cm + sulphur - 30 kg/ha	85.53	11.40
Spacing 30 x 15 cm + sulphur - 30 kg/ha	94.95	13.40
Spacing 35 x 15 cm + sulphur - 30 kg/ha	95.40	13.90
Spacing 25 x 15 cm + sulphur - 40 kg/ha	93.01	10.30
Spacing 30 x 15cm + sulphur - 40 kg/ha	94.37	11.80
Spacing 35 x 15cm + sulphur - 40 kg/ha	93.57	11.50
SEm (±)	0.99	0.31
CD (5%)	2.97	0.93

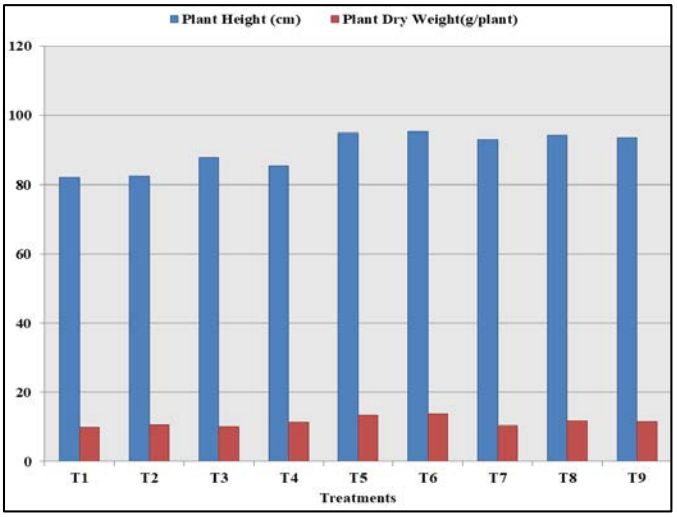

Fig 3: Show the different of plant height and dry weight

Yield attributes

Capsules per plant was found significant. The maximum number of capsules per plant was recorded highest (35.87) by T_8 (30cmx15cm) +40kg Sulphur. Where T_5 (30cmx15cm) +30kg Sulphur had recorded (35.60) were found statistically at par with T_8 (30cmx15cm) +40kg Sulphur. Seeds per capsules was found significant. The maximum number of seeds per capsules was recorded (38.47) by T_8 (30cmx15cm) +40kg Sulphur. Where T_5 (30cmx15cm) +30kg Sulphur had recorded (37.33) were found statistically at par with T_8 (30cmx15cm) +40kg Sulphur. Test weight was found significant. The maximum test weight was recorded (2.95) by T_8 (30cmx15cm) +40kg Sulphur. Where T_5 (30cmx15cm) +30kg Sulphur, T_6 (35cmx15cm) +30kg Sulphur, T_9 (35cmx15cm) +40kg Sulphur had recorded (2.87, 2.85 and 2.85) were found statistically at par with T_8 (30cmx15cm) +40kg Sulphur. Seed yield was recorded significant. The maximum seed yield was recorded (867.97 kg/ha) by T_8 (30cmx15cm) +40kg Sulphur. Where T_5 (30cmx15cm) +30kg Sulphur, T_6 (35cmx15cm) +30kg Sulphur had recorded (796.21 kg/ha and 778.65) which was statistically at par with T_8 (30cmx15cm) +40kg Sulphur. (Thakur and Patel, 2004) [7]. Stover yield was recorded significant. The maximum Stover yield was recorded (1554.20 kg/ha) by T_8 (30cmx15cm) +40kg Sulphur. Where T_5 (30cmx15cm) +30kg Sulphur, T_6 (35cmx15cm) +30kg Sulphur had recorded (1512.63 kg/ha and 1478.81) which was statistically at par with T_8 (30cmx15cm) +40kg Sulphur. Harvest index was recorded significant. The maximum Harvest index was recorded (39.36%) by T_8 (30cmx15cm) +40kg Sulphur. Where T_5 (30cmx15cm) +30kg Sulphur had recorded (38.03%) which was statistically at par with T_8 (30cmx15cm) +40kg Sulphur. Oil content was not subjected to statistical analysis. The maximum Oil content was recorded (48.32%) by T_8 (30cmx15cm) +40kg Sulphur. The marked improvement in capsules/plant and test weight by applying sulphur could be ascribed to overall improvement in vigour and crop growth as a consequence balanced nutritional environment as discussed above. Supply of sulphur in adequate amount also helps in the development of floral primordial i.e. reproductive parts, which results in the development of capsules and seeds in plants. Similar findings have also been reported earlier by Yadav *et al.* (2022) [8]

Table 2: Effect of Plant geometry and Sulphur on Yield attributes of Sesame

Treatments	No. of Capsule per plant	No. of Seeds per Capsule	Test Weight (g)	Seed Yield (kg/ha)	Stover Yield (kg/h.)	Harvest Index (%)	Oil Content (%)
Spacing 25 x15 cm + sulphur - 20 kg/ha	32.67	33.20	2.68	636.00	1205.42	32.94	45.34
Spacing 30 x15 cm + sulphur -20 kg/ha	32.73	32.47	2.68	643.00	1280.17	34.72	46.06
Spacing 35x 15 cm + sulphur -20 kg/ha	32.93	33.27	2.74	665.00	1314.38	34.28	46.11
Spacing 25x 15 cm + sulphur - 30 kg/ha	34.20	34.07	2.69	693.00	1378.00	35.06	45.86
Spacing 30 x 15 cm + sulphur - 30 kg/ha	35.60	37.33	2.87	796.21	1512.63	38.03	46.28
Spacing 35 x 15 cm + sulphur - 30 kg/ha	35.13	37.27	2.85	778.65	1478.81	37.58	45.86
Spacing 25 x 15 cm + sulphur - 40 kg/ha	33.70	35.47	2.81	705.00	1417.12	34.70	46.18
Spacing 30 x 15cm + sulphur - 40 kg/ha	35.87	38.47	2.90	867.00	1554.20	39.36	48.32
Spacing 35 x 15cm + sulphur - 40 kg/ha	35.00	36.53	2.85	755.00	1437.22	36.37	47.66
S.Em (±)	0.36	0.39	0.08	21.96	23.49	0.32	-
CD (5%)	1.09	1.16	0.25	65.85	70.43	0.96	-

Conclusion

On the basis of one season experimentation, It can be concluded the application of (30cmx15cm) +40kg Sulphur was found the most superior treatment combination for obtaining higher seed yield (867.00 kg/ha.) in Sesame.

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