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Research Article

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Effect of Land Configurations and Sulphur Levels on Growth and Yield of Sesamum (*Sesamum indicum* L.)

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ABSTRACT

The experiment was conducted during Kharif 2017 at Experimental farm, Department of Agronomy, College of Agriculture, Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani. The soil was clayey in texture, low in nitrogen, low in phosphorus, rich in potash and alkaline in reaction. The experiment was laid out in split plot design with 3 replication and 12 treatments combinations. The broad bed furrow recorded higher mean plant height (cm), number of functional leaves plant^{-1}, leaf area plant^{-1}, number of branches plant^{-1}, total dry matter plant^{-1}, seed yield, straw yield, biological yield, harvest index than flat bed but found statistically at par with ridges and furrow; Application of RDF (50:25 NP kg ha^{-1}) with 30 kg sulphur ha^{-1} recorded higher mean plant height (cm), number of functional leaves plant^{-1}, leaf area plant^{-1}, number of branches plant^{-1}, total dry matter plant^{-1}, seed yield, straw yield, biological yield, harvest index than rest of sulphur levels but found at par with 20 kg sulphur ha^{-1}. The broad bed furrow (BBF) and application of RDF (50:25 NP kg ha^{-1}) with 30 kg sulphur ha^{-1} was found beneficial for increasing productivity and profitability.

Keywords: *Broad Bed Furrow, Growth, Sesamum, Sulphur, Yield.*

INTRODUCTION

Sesamum indicum L. (Syn. *Sesamum orientale* L.), which is known variously as Sesamum, til, gingelly, gergelim etc. is one of the most important oil seed crop grown extensively in India. Sesamum is the oldest indigenous oil plant with longest history of its cultivation in India. It is an excellent health food and contains 40-42 % quality protein, 23 % carbohydrates and 20% cholesterol free oil sesamum is called as 'the Queen of oils' because of extra ordinary cosmetic and skin care qualities of its oil. It is grown in all season of the year and being a short duration crop, fit well into various cropping sequence or systems. In India, Sesamum is an important edible oil seed crop, stand next to Groundnut It is mainly grown in Gujarat, Uttar Pradesh, Madhya Pradesh, Karnataka, Orissa, Bihar, Jharkhand, Andhra Pradesh, Kerala and Tamilnadu. Land configuration is the combination of soil management and the potential to improve the productivity of Alfisols and Vertisols in the semi-arid tropics.

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The land configuration treatment were FB (flat bed-traditional practices), Ridges & Furrow and BBF (Broad bed furrow) are applied to field for better water conservation, increase soil fertility and productivity of cropping systems. Proper land configuration is known for increasing moisture intake, it's storage and resultant yield. The broad bed and furrow help in providing more opportunity for in *situ* soil water conservation in rainfed Agriculture.

A suitable combination of major and micro element affects growth, yield and quality of Sesamum. Sulphur application has many advantages for sesamum regarding growth parameters, yield and quality. Sulphur application significantly improves the quality of sesamum oil in terms of free fatty acids, like linoleic acids and oleic acid. Sulphur as a plant nutrient can play a key role in augmenting the production and productivity of oilseeds in the country as it has a significant influence on quality and development of oilseeds. Sulphur is one of the 16 essential nutrients required by all plants for oilseed production, as one unit of sulphur produce 3-5 units of edible oil (Tandon, 1991). Sulphur perform many important role in the synthesis of protein, oil and vitamins. It is constituent of 3 amino acid (cystine, cystien and methionine) and thus play vital role for protein production (Takkar, 1987). The focus on modern agriculture on high yielding varieties, greater use of high analysis fertilizer, intensive cropping and decrease in the use of farm yard manure. Thus, now a days the deficiency of sulphur is becoming more evident. Taking note of the fact highlighted above, an experiment enltitled "Effect of land configurations and sulphur levels on growth and yield of Sesamum (*Sesamum indicum* L)'' under rainfed condition was undertaken during the *Kharif* season of 2017.

MATERIALS AND METHODS

The experiment was conducted during *Kharif* 2017 at Experimental farm, Department of Agronomy, College of Agriculture, Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani. The soil was clayey in texture, low in nitrogen, low in phosphorus, rich in potash and alkaline in reaction. The experiment was laid out in split plot design with twelve treatment combination; in Main plot, Land configurations L_1 - broad bed furrow, L_2 - ridges and furrow and L_3 –flat bed and in sub plot, sulphur level S_1 - Control (RDF), S_2 - RDF + 10 kg sulphur, S_3 - RDF + 20 kg sulphur, S_4 - RDF + 30 kg sulphur in replications.

Sowing of sesamum was done on 29th June 2017 by dibbling the seeds at two spacing *viz.* BBF is 30 cm ×10 cm and R&F/Flatbed is 45cm × 15cm. The recommended cultural practices and plant protection measures were taken. Fertilizer *viz.*, nitrogen, phosphorus and sulphur were applied to respective plots by using Urea, SSP and Bensulf uniformly in the lines opened for sowing as per the treatments. The crop was harvested on 26th Sep 2017.

Five plants from each net plot were randomly selected and labeled for taking biometric observations at different growth stages. The same plants were harvested separately for post harvest studies. The plants from each net plot were threshed and seeds were cleaned. The cleaned seeds obtained from each net plot were weighted in kg. After separation of seeds from biological yield, remaining material (stem+ bhoosa) was considered as straw yield and its final weights were recorded in kg per net plot, which were then converted into straw yield (Kg ha^{-1}) by multiplying hectare factor. The data obtained on various observations were tabulated and subjected to their analysis by using analysis of variance and the treatments were tested by F test (Panse & Sukhatme, 1967).

RESULTS AND DISCUSSION

Growth attributes and growth in land configurations

At harvest, maximum plant height was observed in land configuration L_1 i.e. broad bed furrow and it was at par with L_2 i.e. ridges and furrow and significantly superior over rest of the land configuration. The results are in conformity with the earlier findings reported by Desai (1989).

At harvest, Land configuration L_1 i.e. broad bed furrow has produced maximum number of functional leaves per plant at all dates of observations These findings are parallel with the earlier research reported by Jaypaul et al. (1995).

The number of branches increased gradually from 45 to 60 DAS and thereafter it remained almost same up to harvest. The maximum number of branches per plant (4.29) were noticed in land configuration (L_1) broad bed furrow which was statistically at par with (L_2) Ridges and Furrow. The present results are in close conformity with the earlier findings of Navade & More (1993).

Increase in dry matter was the cumulative effect of increase in various growth characters like plant height, number of functional leaves, number of branches and number of capsules per plant. Increase in dry matter accumulation per plant was affected by different land configurations (Table 1). Land configuration L_1 i.e. broad bed furrow has recorded maximum dry matter per plant over rest of the land configurations at all the stages of crop growth and found statistically at par with L_2 i.e. ridges and furrow.

Growth attributes and growth in sulphur levels

At harvest, maximum plant height was observed in S_4 RDF + 30 kg Sulphur it was at par with S_3 RDF + 20 kg Sulphur and significantly superior over rest of sulphur levels. The results are in conformity with the earlier findings reported by Tripathi et al. (2007).

The treatment S_4 RDF + 30 kg Sulphur has produced maximum number of functional leaves per plant at all dates of observations and at harvest significantly superior over rest of the sulphur levels. These findings are parallel with the earlier research reported by Tripathi et al. (2007).

The number of branches increased gradually from 45 to 60 DAS and thereafter it remained almost same up to harvest. The maximum number of branches per plant (4.12) were noticed in S_4 RDF + 30 kg Sulphur which was statistically at par with S_3 RDF + 20 kg Sulphur. The present results are in close conformity with the earlier findings of Subrahmaniyan et al. (1999), Vaiyapuri et al. (2004) and Raja et al. (2007).

The dry matter accumulation per plant was affected by different sulphur levels (Table 1). Treatment S_4 RDF + 30 kg Sulphur has recorded maximum dry matter per plant over rest of the sulphur levels at all the stages of crop growth and found statistically at par with S_3 RDF + 20 kg Sulphur. Increase in dry matter was the cumulative effect of increase in various growth characters like plant height, number of functional leaves, number of branches.

Yield attributes and yield in land configurations

Significant differences in number of capsules per plant and seed weight per plant were observed due to various land configurations. Land configuration L_1- broad bed furrow recorded higher number of capsules (31.82) and seed weight per plant (2.97 g). Similar finding are also reported by Muthamilselvan et al. (2006). Different sulphur levels could not influenced the seed yield per plant and 1000 seed weight (g) of sesamum. Significant differences in number of capsules per plant and seed weight per plant were observed due to various sulphur levels. Treatment S_4- RDF + 30 kg sulphur recorded higher number of capsules (32.41) and seed weight per plant (3.06 g). Similar finding are also reported by Tiwari et al. (2000).

Due to good management practices, plants got favourable environment for growth and development which ultimately reflected in accomplishing higher levels of yield and yield attributing characters.

The land configuration of L_1 - broad bed furrow in sesamum recorded significantly higher seed yield (590 kg ha^{-1}), straw yield (1552 kg ha^{-1}), biological yield (2142 kg ha^{-1}) and harvest index (27.54) followed by L_3 - flat bed which was at par with L_2 - ridges and furrow. Similar finding are also reported by Muthamilselvan et al. (2006).

Yield attributes and yield in sulphur levels

The sulphur level S_4 - RDF + 30 kg sulphur recorded significantly higher yield attributes, growth attributes, seed yield (629 kg ha^{-1}), straw yield (1652 kg ha^{-1}), biological yield (2281 kg ha^{-1}) and harvest index (27.54) followed by rest of the all treatments which was at par S_3 - RDF + 20 kg sulphur. Similar finding are also reported by Tripathi et al. (2007).

Table 1 : Growth attributing character of sesamum as influenced by different treatments at harvest

Treatments	Mean plant height (cm)	Mean number of functional leaves $plant^{-1}$	Mean leaf area (dm^2) $plant^{-1}$	Mean number of branches $plant^{-1}$	Mean dry matter $plant^{-1}$ (g)
Main plot **Land Configurations (L)**					
L_1 : Broad Bed Furrow	88.73	12.87	3.22	4.26	12.65
L_2 : Ridges and Furrow	81.55	11.70	2.93	3.75	11.29
L_3 : Flat Bed	73.77	9.52	2.48	2.69	11.72
S.E. m ±	3.47	0.42	0.11	0.15	0.15
C.D. at 5 %	10.57	1.32	0.37	0.48	0.57
Sub Plot **Sulphur Levels (S)**					
S_1 : Control (RDF)	66.70	8.17	2.08	2.87	9.16
S_2 : RDF + 10 kg Sulphur	77.76	10.90	2.75	3.43	10.43
S_3 : RDF + 20 kg Sulphur	86.92	12.72	3.21	3.92	12.75
S_4: RDF + 30 kg Sulphur	93.99	13.65	3.44	4.12	13.51
S.E. m ±	3.38	0.40	0.10	0.14	0.39
C.D. at 5 %	10.13	1.20	0.31	0.42	1.05
Interaction (L x S)					
S.E. m ±	6.37	0.77	0.19	0.26	0.50
C.D. at 5 %	NS	NS	NS	NS	NS
General Mean	**81.34**	**11.36**	**2.87**	**3.58**	**12.20**

Table 2 : Yield attributing character of sesamum as influenced by different treatments

Treatments	Weight of capsule $plant^{-1}$ (g)	Number of seed $capsule^{-1}$	Weight of seed $plant^{-1}$ (g)	Number of seed $plant^{-1}$	Test weight (g)
Main plot **Land Configurations (L)**					
L_1 : Broad Bed Furrow	7.31	35.71	2.97	1082.50	2.73
L_2 : Ridges and Furrow	7.11	35.41	2.82	1035.50	2.71
L_3 : Flat Bed	6.44	34.90	2.50	927.50	2.68
S.E. m ±	0.14	0.55	0.06	22.51	0.02
C.D. at 5 %	0.53	NS	0.22	88.38	NS
Sub Plot **Sulphur Levels (S)**					
S_1 : Control (RDF)	6.47	34.74	2.32	928.70	2.50
S_2 : RDF + 10 kg Sulphur	6.74	35.27	2.70	980.70	2.63

S_3 : RDF + 20 kg Sulphur	7.16	35.61	2.96	1055.00	2.79
S_4: RDF + 30 kg Sulphur	7.45	35.73	3.06	1096.30	2.90
S.E. m ±	0.15	0.62	0.10	25.73	0.03
C.D. at 5 %	0.46	NS	0.28	76.46	NS
Interaction (L x S)					
S.E. m ±	0.27	1.08	0.16	44.57	0.05
C.D. at 5 %	NS	NS	NS	NS	NS
General Mean	**6.95**	**35.30**	**0.76**	**1015.20**	**2.70**

Table 3 : Yield kg ha^{-1} and H.I. (%) of sesamum as influenced by different treatments

Treatments	**Seed Yield (kg ha^{-1})**	**Straw Yield (kg ha^{-1})**	**Biological Yield (kg ha^{-1})**	**Harvest index (%)**
Main plot **Land Configurations (L)**				
L_1 : Broad Bed Furrow	590	1552	2142	27.54
L_2 : Ridges and Furrow	575	1530	2105	27.31
L_3 : Flat Bed	542	1471	2014	26.91
S.E. m ±	11.15	17.79	27.77	-
C.D. at 5 %	41.74	59.61	105.85	-
Sub Plot **Sulphur Levels (S)**				
S_1 : Control (RDF)	478	1296	1775	26.92
S_2 : RDF + 10 kg Sulphur	557	1497	2054	27.11
S_3 : RDF + 20 kg Sulphur	612	1625	2237	27.49
S_4: RDF + 30 kg Sulphur	629	1652	2281	27.54
S.E. m ±	19.13	49.40	83.54	-
C.D. at 5 %	57.28	147.93	250.14	-
Interaction (L x S)				
S.E. m ±	30.10	75.38	127.55	-
C.D. at 5 %	NS	NS	NS	-
General Mean	**569**	**1518**	**2087**	**27.26**

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