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Effect of Different Level of Phosphorus and Sulphur on Growth and Yield Attributes of Sesame

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Abstract

A field experiment was conducted to study the effect of different level of phosphorus and sulphur on yield attributes and yield of sesame during *kharif* 2011–12 at Department of Agronomy, College of Agriculture, Latur. The soil of the experimental plot was clay texture, low in available nitrogen (186.8 kg ha^{-1}), medium in available phosphorous (15.9 kg ha^{-1}), high in available potassium (343.2 kg ha^{-1}) and slightly alkaline (pH 8.02) in reaction. The experiment field was uniform and well levelled. Gross plot size was 5.4×4.2 m^2 and net plot size was 4.5×3.6 m^2 respectively. The experiment was laid out in Factorial Randomized Block Design with three replications. The spacing 675 cm^2 and recommended dose of fertilizers (50:25:00 NKK ha^{-1}) were used. The treatments consists of three levels each of phosphorus and sulphur. The phosphorus applied as 20 kg P_20_5 ha^{-1}, 25 kg P_20_5 ha^{-1}, 30 kg P_20_5 ha^{-1} and 20 kg S ha^{-1}, 25 kg S ha^{-1}, 30 kg S ha^{-1}. The application of 30 kg P_2O_5 was recorded significantly higher growth and yield attributing character over the rest of the phosphorus levels. Among three sulphurtreatment 30 kg sulphur ha^{-1} was recorded significantly higher growth and yield attributing characters over the application of 20 and 25 kg sulphur ha^{-1}

Keywords: Sesame, phosphorus, sulphur, dry matter, yield

1. Introduction

Sesame is an ancient oilseed crop grown throughout India having tremendous potential for export. It offers several advantages by virtue of its faster growth and short duration. However, it has not contributed enormously to the total oilseed production mainly because of average low yield level (323 kg ha^{-1}). Therefore, there is an urgent need to augment its productivity through the incorporation of wide adaptability and high yield potential.India, China, Burma, Sudan, Pakistan, and Mexico are the main sesame producing countries of the world. In India, sesame is important edible oilseed crop, stands next to groundnut. In India it is mainly grown in Gujrat, Uttar Pradesh, Madhya Pradesh, Karnataka, Orissa, Bihar and Tamil Nadu. In Maharashtra, it was grown on 56 thousand hectares with production of 15 thousand tones and productivity of 268 kg ha^{-1}.Maximum quantity of seeds (78%) used for oil extraction, edible purpose (20%) an seed purpose (2%). Most of the oil of sesame used for edible purposes (73%) and industrial purposes (4.2%) in the manufacturing of paint, pharmaceuticals, insecticide and also used as perfume oil. Sesame seed consumed as fried and mixed with sugar Jaggery and oil cake used as cattle feed of millions of animals. Oil cake can be used as manures which contain 6-6.2% N, 2–2.2% P_2O_5 and 1-1.2% K_2O.

India ranks first both in the area and production of sesame. The major sesame producing countries are India, China, Myanmar, Sudan, Pakistan, Mexico, Ethiopia, Srilanka, Burma, Africa, etc. Sesame is an important oilseed crop next to the groundnut. In India major sesame cultivating states are Gujarat, Rajasthan, Madhya Pradesh, Karnataka, Maharashtra, Utter Pradesh, Tamil Nadu, Andhra Pradesh, Kerala and Punjab. In Maharashtra important district growing this crop are Jalgaon, Nashik, Dhule, Pune, Solapur and Latur. Sesame is cultivated on an area about 19.50 lakh ha with production of 8.5 lakh metric tonnes and productivity 436 kg ha^{-1}. (Anonymous, 2016).

2. Materials and Methods

The field experiment carried out at Experimental Farm of Agronomy Section, College of Agriculture, Latur, Maharashtra, India during *kharif* season of 2011 on sesame (Phule Till No.1). The soil of the experimental plot was clay texture, having good drainage capacity, low in available nitrogen (186.8 kg ha^{-1}), medium in available phosphorous (15.9 kg ha^{-1}), high in available potassium (343.2 kg ha^{-1}) and slightly alkaline (pH 8.02) in reaction. The climate of Marathwada region on annual basis can be classified as semi-arid type. The experiment field was uniform and well levelled. Gross plot size was

5.4×4.2 m[2] and net plot size was 4.5×3.6 m[2] respectively. The experiment was laid out in Factorial randomized block design with three replications along with two factors i.e. sulphur and phosphorus. Sowing was done on 5th July, 2011 by dibbling method with spacing 675 cm[2] and recommended dose of fertilizers were used (50:25:00 NKK ha^{-1}). The treatments were P_1: 20 kg P_2O_5 ha^{-1},P_2: 25 kg P_2O_5 ha^{-1}, P_3: 30 kg P_2O_5 ha^{-1} and S_1: 20 kg S ha^{-1} S_1: 25 kg S ha^{-1} S_1: 30 kg S ha^{-1}.

3. Results and Discussion

3.1. *Effect of phosphorus on growth attributing characters of sesame*

Data pertaining to growth attributes is presented in Table 1 revealed that the maximum plant height (104.2 cm), number of functional leaves (89), leaf area (18.8), no. of capsules plant^{-1} (58.1), and dry matter accumulation plant^{-1} (19.6 g) was recorded due to the application of 30 kg phosphorous ha^{-1} and which was significantly superior over the 20 and 25 kg phosphorous ha^{-1}. The higher no. of branches plant^{-1} (4.2) were recorded due to the application of 30 kg phosphorus ha^{-1} and significantly superior over the 20 kg phosphorus ha^{-1} but satisfactory at par with 25 kg phosphorous ha^{-1}.

3.2. *Effect of sulphur on growth attributing characters*

The data presented in Table 1 revealed that the maximum plant height (102.5 cm), no. of functional leaves (79) and leaf area (18.3 dm^2) were recorded due to the application of 30 kg sulphur ha^{-1}. Which was at par with the application of 25 kg sulphur ha^{-1} and significantly superior over the application of 20 kg sulphur ha^{-1}. The higher no. of branches (4.3), no. of capsules (54.9) and dry matter production plant^{-1} (19.9 g), were recorded due to the application of 30 kg sulphur ha^{-1}and which was significantly superior over the application of 20 and 25 kg sulphur ha^{-1}.

Table 1: Growth attributing characters as influenced by different treatments

Treatments	Mean plant height (cm)	No. of functional leaves plant^{-1}	Leaf area plant^{-1}	No. of branches plant^{-1}	No. of capsules plant^{-1}	Total dry matter plant^{-1} (g)
Phosphorus levels						
P_1: 20 kg P ha^{-1}	92.2	60	16.2	3.7	45.4	15.6
P_2: 25 kg P ha^{-1}	95.1	73	17.6	3.8	48.4	17.2
P_3: 30 kg P ha^{-1}	104.2	80	18.8	4.2	58.1	19.6
SEm±	2.97	2.2	0.55	0.14	1.60	0.53
CD (p=0.05)	8.9	6.8	1.66	0.43	4.80	1.58
Sulphur levels						
S_1: 20 kg S ha^{-1}	90.8	70	16.5	3.6	47.7	16.0
S_2: 25 kg S ha^{-1}	98.0	73	17.9	3.8	49.9	17.4
S_3: 30 kg S ha^{-1}	102.5	79	18.3	4.3	54.9	19.1
SEm±	2.97	2.2	0.55	0.14	1.60	0.53
CD (p=0.05)	8.9	6.8	1.66	0.43	4.80	1.58
Interaction P×S						
SEm±	5.14	3.9	0.96	0.24	2.79	0.91
CD (p=0.05)	NS	NS	NS	NS	NS	NS

3.3. *Effect of phosphorus on yield attributing characters*

Data presented in Table 2 revealed that the higher no. of seeds

Table 2: Yield attributes and seed yield as influenced by different treatments

Treatments	NSP	NSC	WCP	TW	SYP	WCP*	SY	SY*	BY	HI
Phosphorus levels										
P_1: 20 kg P ha^{-1}	1551	35.6	10.7	2.70	4.2	10.7	543	1484	2028	26.7
P_2: 25 kg P ha^{-1}	1795	36.4	11.6	2.71	4.9	11.6	624	1587	2211	28.2
P_3: 30 kg P ha^{-1}	2099	43.2	13.6	2.71	5.7	13.6	728	1785	2514	28.9
SEm±	54	1.20	0.44	0.004	0.14	0.44	19	56	75	
CD (p= 0.05)	162	3.60	1.31	NS	0.44	1.31	58	169	225	

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Treatments	NSP	NSC	WCP	TW	SYP	WCP*	SY	SY*	BY	HI
Sulphur levels										
S_1: 20 kg S ha^{-1}	1642	35.2	10.5	2.70	4.4	10.5	566	1480	2046	27.6
S_2: 25 kg S ha^{-1}	1814	38.6	12.1	2.71	4.9	12.1	637	1619	2256	28.2
S_3: 30 kg S ha^{-1}	1989	40.0	13.3	2.71	5.4	13.3	693	1785	2451	28.3
SEm±	54	1.20	0.44	0.004	0.14	0.44	19	56	75	-
CD (*p*=0.05)	162	3.60	1.31	NS	0.44	1.31	58	169	225	-
Interaction P×S										
SEm±	93	93	0.76	0.007	0.25	0.76	34	98	130	-
CD (*p*=0.05)	NS	NS	NS	NS	NS	NS	101	NS	NS	-

NSP: No. of seeds plants^{-1}; NSC: No. of seeds capsule^{-1}; WCP: Weight of capsulesplant^{-1} (g); TW: Test Weight (g); SYP: Seed yield plant^{-1} (g); WCP*: Weight of capsules plant^{-1} (g); SY: Seed yield (kg ha^{-1}); SY*: Straw yield (kg ha^{-1}); BY: Biological yield (kg ha^{-1}); HI: Harvest index (%)

plant^{-1} (2099), no. of seeds capsules^{-1} (43.2), seed yield pant^{-1} (5.7), weight of capsules plant^{-1} (13.6) seed yield (728 kg ha^{-1}), straw yield (1775 kg ha^{-1}) and biological yield (2514 kg ha^{-1}) was recorded due to the application of 30 kg phosphorus ha^{-1} and which was found significantly superior over the application of 25 and 20 kg phosphorus ha^{-1}.

3.4. Effect of sulphur on yield attributing characters

The datapertaining to yield attributing characters is presented in Table 2 indicate that higher no. of seeds (1989), seed yield (5.4 g), seed yield (693 kg ha^{-1}) and straw yield (1785 kg ha^{-1}) were recorded due to the application of 30 kg sulphur ha^{-1} and which was significantly superior over the application of 20 and 25 kg sulphur ha^{-1}. The higher no. of seeds capsule^{-1} (40.0), weight of capsules plant^{-1} (13.3) and biological yield (2950 kg ha^{-1}), were recorded due to the application of 30 kg sulphur ha^{-1}, which was satisfactory at par with the application of 25 kg sulphur ha^{-1} and significantly superior over the 20 kg sulphur ha^{-1}.

4. Conclusion

Application of 30 kg Phosphorus as well as 30 kg sulphur is essential for obtaining better yield of sesame.

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