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Research Article

PERFORMANCE OF SESAME AND MUNGBEAN TO DIFFERENT SULPHUR LEVELS UNDER INTERCROPPING SYSTEM

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Abstract: The study was carried out the result of mungbean and sesame (herbaceous plant) intercropping systems with different sulphur levels during *kharif* season of 2017-18. Among the various row ratios, sole planting of crops gave considerably higher seed yield and uptake of nutrients. The best productivity in terms of mungbean equivalent yield (1.21 t/ha) was obtained under sole mungbean followed by mungbean + sesame in 4:1. Higher growth and yield of mungbean and sesame was recorded with increase in levels up to 45 kg S/ha. Intercropping of mungbean + sesame (4:1) gave considerably highest land equivalent magnitude relation.

Keywords: *Intercropping, Growth Attributes, Mungbean and Sesame, Sulphur*

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Introduction

Pulses are the main source of protein particularly for vegetarians and contribute about 14 per cent of the total protein of an average Indian diet. Production and productivity of pulses is very low than the requirement to meet even the minimum level of per capita consumption. The per capita availability of pulses has been declined from 74.9 g in 1959 to 33 g in 2008 as against the minimum requirement of 70 g per capita/day prescribed by ICMR which may causes malnutrition among the growing population [1]. Nowadays, there is decline in production of pulse crops; this is due to competition with high productive crops like coarse cereals and millets. Short offer of pulses and oilseeds has forced our country to import pulses and edible oil. Underneath these circumstances intercropping of pulses and oilseeds could also be a possible and viable choice to augment per unit space productivity of those crops through temporal intensification that may be comparable with different higher productive crops [2,3].

Mungbean and sesame are the essential food crops cultivated and became the major part of protein diet in semi-arid areas of Rajasthan [4]. There is a decrease in productivity of crops due to decline in soil fertility mainly NPK and micronutrients in addition to this Sulphur plays a vital role in production [5,6]. The organic nutrient for agriculture involves farm yard manure, cattle dung manure, poultry manure, pig manure, compost, vermicompost, city waste compost, municipal solid waste compost, green manure etc [7,8]. Sulphur is an essential element for plant growth, which helps in the formation of plant protein next to Nitrogen and Phosphorus. Sulphur deficiency has been reported over 70 countries worldwide of which India is one among them [9]. In generally, Sulphur is also essential for synthesis of vitamin (biotin and thiamine), Sulphur containing amino acids and promotes nodulation in legumes. Highest grain and straw yield of green gram was obtained by application of Sulphur [10].

As pulse crops need higher quantity of sulphur as compare to cereals particularly in low S soils of semi-arid region of Rajasthan [11]. Keeping these points under consideration an investigation was undertaken to assess intercropping ratios with sulphur levels on yield and quality of mungbean and sesame crop.

Materials and methods

The field experiment was conducted during *kharif* season of 2017-18 at Agriculture Farm of O.P.J.S. University, Churu district of Rajasthan. Experiment comprising of twenty treatments (RBD design) combos of five intercropping systems *viz*., sole mungbean (Var.-RMG-268) and sole sesame (Var.-RT-125), mungbean + sesame in 2:1, 3:1 and 4:1 row magnitude relation, with 4 sulphur levels *viz*., 0, 15, 30 and 45 kg S/ha. The soil of experimental plots is loamy sand in texture, alkaline in soil reaction (pH 8.2), low in organic carbon (0.16%), on the market atomic number 7 (132.5 kg/ha), on the market phosphorus (16.0 kg P_2O_5 /ha), on the market SO_4 -2-S (8.16 ppm) and medium in metallic element (142.2 kg K_2O/ha) content. The experimental crops were planted in lines 10x10 cm in sole crops and 10x30 in intercrops ten cm apart. Intercropping, third, fourth and fifth row of mungbean was replaced by one row of sesame in 2:1, 3:1 and 4:1 row proportion. A typical counseled dose of atomic number 7 and phosphorus (20 kg N and 40 kg P_2O_5/ha) was uniformly applied to any or all the plots through carbamide and DAP, Sulphur ($CaSO_4.2H_2O$) was incorporated within the soil before sowing in various plots as per treatments. Observations on growth and dry matter yield of mungbean and sesame were recorded. The mungbean equivalent yield was calculated by changing the seed yield of sesame into mungbean yield on the premise of existing market costs of the crops [12].

Table-1 *Effect of sesame and mungbean to different sulphur levels under intercropping system*

	Mungbean (*Vigna radiate* L.)						Sesame (*Sesamum indicum* L.)							
	Plant stand (per metre row length)		Plant height (cm)		Dry matter accumulation per metre row length (g)		Plant stand (per metre row length)		Plant height (cm)			Dry matter accumulation per metre row length (g)		
	40 DAS	At harvest	40 DAS	At harvest	40 DAS	At harvest	20 DAS	At harvest	30 DAS	60 DAS	At harvest	30 DAS	60 DAS	At harvest
Intercropping systems														
Mungbean sole	11.3	11.3	24.83	49.26	36.59	113.22	10.65	10.3	20.92	105.53	110.43	9.95	97.17	130.06
M + S (2: 1)	11.56	10.89	27.04	53.28	32.7	102.27	10.48	10.21	21.99	103.53	106.89	10.81	107.58	141.03
M + S (3: 1)	11.64	11.21	25.33	52.13	34.07	105.77	10.9	10.54	21.23	102.7	105.91	10.42	104.07	138.13
M + S (4: 1)	11.48	11.31	25.03	51.09	34.43	108.69	11.06	10.63	21.46	101.22	105.79	10.39	102.37	136
SEm±	0.28	0.26	0.59	0.89	0.86	1.89	0.26	0.18	0.42	1.52	1.57	0.39	1.88	2.25
CDP=0.05)	NS	NS	1.7	2.56	2.47	5.47	NS	NS	1.21	NS	NS	NS	5.43	6.49
Sulphur (S Kg /ha)														
Sulphur- 0	12.02	10.72	22.06	46.47	29.44	96.93	10.48	10.3	20.99	96.5	100.35	9.88	92.66	124.63
Sulphur -15	10.27	10.97	24.62	50.43	33.52	105.27	10.4	10.3	21.39	101.37	105.81	10.45	99.95	132.91
Sulphur- 30	11.7	11.47	26.93	53.36	36.47	111.55	11.07	10.46	21.56	105.96	110.42	10.57	106.32	140.68
Sulphur -45	11.99	11.55	28.62	55.5	38.35	116.19	11.15	10.63	21.66	109.16	112.44	10.67	112.26	147
SEm±	0.28	0.26	0.59	0.89	0.86	1.89	0.26	0.18	0.42	1.52	1.57	0.39	1.88	2.25
CD P=0.05)	NS	NS	1.7	2.56	2.47	5.47	NS	NS	1.21	4.39	4.53	NS	5.43	6.49

NS= Non significant, M + S= Mungbean + Sesame

Results and Discussion

Intercropping and growth attributes of mungbean

Sole planting of mungbean and sesame gave considerably higher plant stand compared to 3:1 (mungbean and sesame) ratios [Table-1]. The only sole mungbean and sesame made 18.0 and 11.5 per cent and 17.7 and 24.5 per cent a lot of pods/ plant and seeds/ pod compared to 2:1 magnitude relation, respectively [13]. The plant stand is given in [Table-1] indicated that different intercropping systems with increase in sulphur levels influence the mungbean plant stand per meter row length considerably at twenty DAS and at harvest. Highest Plant height of mungbean was recorded at 2:1 row magnitude relation followed by 3: 1 and lower at sole planting at 40 DAS. Whereas, at harvest 2:1 row magnitude relation was on par with 3:1 and 4:1 recorded considerably higher plant height compare to sole mungbean [14]. Plant height in 2:1 row magnitude relation accumulated 8.8 and 8.1 per cent at 40 DAS and at harvest over sole crop. The application of accelerating levels of sulphur up to 30 kg/ha considerably recorded the plant height to the extent of 22.6 and 9.7 per cent at 40 DAS and 4.8 and 5.9 per cent at harvest over management and 15 S/ha [15]. A reference of information [Table-1] indicated that among the various intercropping systems, sole mungbean (113.22 kg/ha) recorded higher dry matter accumulation followed by 4:1 row magnitude relation (108.69 kg/ha) at harvest over 2:1 and 3:1 row ratio. The rise in dry matter beneath sole mungbean was 11.66 and 7.25 per cent at 40 DAS and 10.15 and 6.92 per cent at harvest over 2:1 and 3:1 row ratio, respectively.

With increase in accumulation of sulphur with increased in application of sulphur. The application of various levels of sulphur considerably accumulated the dry matter accumulation at 40 DAS (38.55 kg S/ha) and at harvest (116.19 kg S/ha). The per cent increase in dry matter accumulation 29.44 to 38.55kg S/ha was 23.36 and 8.63 per cent at 40 DAS and 14.76 and 5.84 per cent at harvest over the management and 15 S/ha, respectively. Similar results reported by [16].

Growth parameters of intercrop (Sesame)

Different intercropping systems and sulphur levels didn't influence the sesame plant stand per meter row length considerably at 20 DAS and at harvest. Plant height given in [Table-1] showed that completely different intercropping systems couldn't influenced the plant height of sesame considerably at 30 DAS growth stages. Based on the experimental results [Table-1] indicated that variable sulphur levels didn't bring perceptible variation in plant height at 30 DAS. However, sulphur application up to30 kg/ha considerably influenced the plant height at later stages i.e., 60 DAS and at harvest. The treatments receiving Sulphur recorded higher plant height at 60 DAS and At Harvest compared to treatment not received Sulphur. Similar results were also reported by [17]. Higher plant height recorded by 9.7 and 4.5 per cent at 60 DAS and 9.9 and 4.3 per cent at harvest over non sulphur receiving treatment and 15 S/ha, respectively [18].

At early stage (30 DAS) the various intercropping systems couldn't influence the dry matter accumulation considerably. However, 4:1 row magnitude relation, being on par with 3:1 and 2:1. Considerably higher dry matter accumulation of sesame was recorded by 10.46 and 9.36 per cent at 60 DAS and at harvest, respectively over sole sesame treatment. Data given in [Table-1] indicated that application of accelerating levels of sulphur couldn't bring any vital variation in dry matter accumulation at 30 DAS. Whereas, increasing levels of sulphur up to45 kg/ha resulted in higher dry matter accumulation considerably over non-Sulphur treatment. Whereas at harvest, increasing levels of sulphur recorded considerably higher dry matter accumulation up to 30 kg S/ha that was 14.35 and 6.47 per cent higher over management [19]. Application of increasing levels of sulphur up to 30 kg S/ha recorded significantly highest seed yield of mungbean. However, significant improvement in seed yield of sesame, total uptake of nitrogen and sulphur by mungbean and sesame, protein content in seed of mungbean, oil content in seed of sesame, mungbean equivalent yield and land equivalent ratio were observed up to 45 kg S/ha [20].

Conclusion

The planting of mungbean in 2:1 row quantitative relation recorded considerably higher plant height at 40 DAS. Whereas, mungbean in 2:1 row quantitative relation, remaining at par with 3:1 and 4:1 row ratio, considerably higher plant height at harvest of mungbean was recorded as compared to sole crop treatment. The sole mungbean, remaining at par with 4:1 row magnitude relation, made considerably higher dry matter accumulation per meter row length at 40 DAS and at harvest as compared to 2:1 and 3:1 row ratio.

Application of research: The plant height of sesame was affected considerably due to totally different planting patterns. Dry matter accumulation per meter row length of sesame in 2:1 row magnitude relation, remaining at par with 3:1 and 4:1 row ratio was considerably higher as compared to sole sesame treatment at 60 DAS and at harvest.

Research Category: Agronomy

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Study area / Sample Collection: Agriculture Farm, O.P.J.S. University, Churu, Rajasthan

Cultivar / Variety / Breed name: Mungbean (*Vigna radiate* L.) and Sesame (*Sesamum indicum* L.)

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