"Integrated Effect of Sulphur Nutrition and Mulching on the Response of Rain Fed Green Gram (*Vigna radiata* L. Wilczek)"

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Abstract

The experiment was carried out at the Agricultural Research Farm of the Rajeev Gandhi South Campus, Banaras Hindu University, Barkachha, Mirzapur (U.P.). The treatment were planed with three levels of sulphur ($S_{15,}$ $S_{30,}$ S_{45} kg ha^{-1}) and five levels of mulch ($M_{0,}$ $M_{1,}$ $M_{2,}$ $M_{3,}M_4$) in the factorial randomized block design. Sulphur applied through bentonite sulphur and five types of mulching *viz.* no mulch, legume mulch, wheat straw mulch, paddy straw mulch and green weed mulch applied respectively. Results indicated that grain and straw yield, uptake of nitrogen and sulphur increased with increase in the rate of application of sulphur with different mulching individually as well as in various combinations. Increasing levels of Sulphur with different mulching enhanced the growth, Plant height, yield attributes like Number of nodules $plant^{-1}$, Dry weight $plant^{-1}$ Number of pods $plant^{-1}$, Number of grains pod^{-1}, 1000-grain weight, grain yield, and straw yield q ha^{-1} showed maximum increase at 45 kg sulphur ha^{-1} with legume mulch, respectively although 30 kg S ha^{-1}exhibited at par results in the several parameters of growth and yield. The increase in grain and straw yield with successive increase in sulphur levels was upto 45 kg S ha^{-1} with legume mulch.

KEYWORDS: Green gram, Sulphur, mulching

INTRODUCTION

In India, the pulse crops have been valued for their food, feed and fodder and have played a vital role in agricultural economy of the country as a precious component of major farming system, since centuries. It contains 24.7% protein, 0.6% fat, 0.9% fiber and 3.7% ash. Besides being a rich source of protein, it maintains soil fertility through biological nitrogen fixation in soil and thus plays a vital role in sustainable agriculture (Kannaiyan, 1999). Green gram fixes 63-342 Kg N ha^{-1} per season in soil by biological nitrogen fixation. Role of sulphur in Indian agriculture is now getting importance because of the recognition of its role in increasing crop production, not only of oil seeds, pulses, legumes and forages but also of many cereals (Singh *et al*., 2000). Above fact mulches have a numbers of benefits such as increasing of organic matter content in soil, improving the soil structure, improving earth warm activities, increasing nutrient content, increasing nutrient availability to crop and conserving soil moisture.

MATERIALS & METHODS

The experiment was carried out at the Agricultural Research Farm of the Rajeev Gandhi South Campus, Banaras Hindu University, Barkachha, Mirzapur (U.P.). The soil was sandy loam in texture having pH (5.8), EC (0.12 dS m^{-1}), organic carbon (0.48%), bulk density (1.50 Mg kg^{-1}), particle density (2.68 Mg kg^{-1}), available nitrogen (210.33 kg ha-^{1}), phosphorus (21.26 Kg ha^{-1}), potassium (218.22 Kg ha^{-1}) and sulphur (16.54Kg ha^{-1}). The experiment was laid out in factorial randomized block design with three levels of sulphur (15, 30 and 45 Kg S ha^{-1}) and five levels of mulching (no mulch, legume mulch, wheat straw mulch, paddy straw mulch, green weed mulch) with three replication. The Mung bean variety *Samrat* sown in row 30 cm apart using 20 kg ha^{-1} for maintenance of plant to plant spacing 10 cm A common dose of nitrogen, phosphorus and potassium @ 20, 40 and 30 Kg ha^{-1} was applied through urea, DAP and murate of potash, respectively. The sulphur was applied through bentonite sulphur.

RESULTS & DISCUSSION

Growth and yield attributes (plant height, number of branches $plant^{-1}$, number of nodules $plant^{-1}$, number of pods $plant^{-1}$, number of seeds pod^{-1}) and yield of seed and straw yield q ha^{-1} significantly increased with application of sulphur (Table-1). The maximum plant height (42.6 cm), number of trifoliate leaf $plant^{-1}$(7.6), number of branches $plant^{-1}$ (6.1), number of nodules $plant^{-1}$ (23.3), number of pods $plant^{-1}$ (19.2), number of seeds pod^{-1} (10.3), and seed yield (10.5 q ha^{-1}) and straw yield (26.4 q ha^{-1}) was obtained at 45 Kg S ha^{-1}. However, 30 Kg S ha^{-1} was statistically at par with 45 Kg S ha^{-1} in respect of growth and yield attributes, seed yield and straw yield. The process of tissue differentiation from somatic to reproductive meristematic activity and development of floral primordial might have increased with increasing sulphur levels resulting in more flowers and pods, longer pods and higher grain yield. Increase in growth and straw yield can be ascribed to cell division, enlargement and elongation resulting in overall improvement in plant organs associated with faster and uniform vegetative growth of the crop under the effect of sulphur application. Similar findings were also reported by Singh *et al.* (1997), Verma and Yadav (2004) and Srivastava *et al.* (2006).

Table -1 : Effect of sulphur levels and various types of mulches on plant growth and growth attributes yield and yield attributes

Treatment	Plant growth and growth attributes				Yield and Yield attributes				
Sulphur level	**Plant height (cm)**	**Number of trifoliate leaf plant^{-1}**	**Number of branches plant^{-1}**	**Number of nodule plant^{-1}**	**No. of pod plant^{-1}**	**Pod length plant^{-1} (cm)**	**Grains count (No./pod)**	**Grain yield (q ha-^{1})**	**Straw yield (q ha-^{1})**
15 Kg S ha^{-1}	40.2	6.2	5.2	21.7	16.4	7.0	9.3	9.2	23.9
30 Kg S ha^{-1}	42.4	7.4	6.0	23.1	18.9	7.6	10.1	10.3	26.2
45 Kg S ha^{-1}	42.6	7.6	6.1	23.3	19.2	7.9	10.3	10.5	26.4
SEm±	**0.10**	**0.10**	**0.09**	**0.08**	**0.13**	**0.11**	**0.08**	**0.07**	**0.10**
CD (P=0.05)	**0.30**	**0.28**	**0.26**	**0.23**	**0.37**	**0.32**	**0.23**	**0.21**	**0.28**
Mulches									
No mulch	41.4	5.7	4.6	20.5	14.7	6.6	8.7	8.7	22.8
Legume mulch	42.2	7.8	6.4	24.0	19.8	8.4	10.6	10.8	26.7
Wheat straw mulch	42.0	7.6	6.1	23.5	19.3	7.8	10.3	10.4	26.3
Paddy straw mulch	41.7	7.2	6.0	23.0	18.8	7.5	10.1	10.2	26.0
Green weed mulch	41.5	6.9	5.8	22.5	18.3	7.2	9.8	9.9	25.2
SEm±	**0.13**	**0.13**	**0.12**	**0.10**	**0.17**	**0.14**	**0.10**	**0.10**	**0.27**
CD (P=0.05)	**0.39**	**0.36**	**0.33**	**0.29**	**0.48**	**0.41**	**0.30**	**0.28**	**0.80**

Table -2 : Intraction effect of sulphur levels and various types of mulches on plant growth and growth attributes yield and yield attributes

Treatment	Plant growth and growth attributes				Yield and Yield attributes				
Interaction Sulphur level * mulching	Plant height (cm)	Number of trifoliate leaf plant^{-1}	Number of branches plant^{-1}	Number of nodule plant^{-1}	No. of pod plant^{-1}	Pod length plant^{-1} (cm)	Grains count (No./pod)	Grain yield (q ha-^{1})	Straw yield (q ha-^{1})
s_0m_0	39.43	5.40	4.30	20.30	14.33	6.27	8.37	8.37	22.53
s_0m_1	40.67	6.63	5.77	22.50	17.73	7.57	9.87	9.83	24.60
s_0m_2	40.47	6.53	5.50	22.07	17.30	7.37	9.63	9.47	24.40
s_0m_3	40.30	6.30	5.37	21.83	16.60	7.07	9.43	9.27	24.17
s_0m_4	39.93	5.93	5.17	21.70	16.13	6.77	9.27	9.13	23.93
s_1m_0	42.23	5.77	4.63	20.60	14.70	6.70	8.80	8.77	22.87
s_1m_1	42.73	8.30	6.63	24.60	20.73	8.67	10.80	11.20	27.57
s_1m_2	42.60	7.93	6.37	23.80	20.23	7.80	10.60	10.87	27.20
s_1m_3	42.40	7.60	6.23	23.50	19.63	7.53	10.37	10.53	26.83
s_1m_4	42.13	7.37	6.03	22.87	19.27	7.37	9.93	10.27	26.53
S_2m_0	42.43	5.93	4.83	20.70	15.07	6.87	9.07	9.07	23.07
s_2m_1	43.07	8.60	6.80	24.80	21.07	8.93	11.07	11.50	27.87
S_2m_2	42.80	8.20	6.50	24.50	20.50	8.20	10.77	10.97	27.40
S_2m_3	42.53	7.63	6.33	23.60	20.07	7.77	10.60	10.73	27.03

S_2m4	39.43	7.50	6.13	23.07	19.47	7.53	10.20	10.40	26.87
Sem	0.22	0.210	0.066	0.058	0.096	0.089	0.059	0.055	0.072
Cd	0.07	0.210	0.192	0.168	0.278	0.239	0.172	0.159	0.211

Growth and yield attributes (plant height, number of branches plant^{-1}, number of nodules plant^{-1}, number of pods plant^{-1}, number of seeds pod $^{-1}$) and yield of seed and straw yield q ha^{-1} significantly increased with application of mulching (Table-1). The maximum plant height (42.2 cm), number of trifoliate leaf plant^{-1}(7.8), number of branches plant^{-1} (6.4), number of nodules plant^{-1} (24.0), number of pods plant^{-1} (19.8), number of seeds pod^{-1} (10.6), and seed yield (10.8 q ha^{-1}) and straw yield (26.7 q ha^{-1}) was obtained at legume mulch followed by wheat straw mulch, paddy straw mulch, green weed mulch and no mulch.

Interaction effect on growth and yield attributes (plant height, number of branches plant^{-1}, number of nodules plant^{-1}, number of pods plant^{-1}, number of seeds pod $^{-1}$) and yield of seed and straw yield q ha^{-1} significantly increased with application of 45 kg ha^{-1} sulphur with legume mulching (Table-2). The maximum plant height s_2m_1 (43.07 cm), number of trifoliate leaf plant^{-1}(8.6), number of branches plant^{-1} (6.80), number of nodules plant^{-1} (24.80), number of pods plant^{-1} (21.07), number of seeds pod^{-1} (11.06), and seed yield (11.50 q ha^{-1}) and straw yield (27.87 q ha^{-1}) was obtained at legume mulch and 45 kg sulphur ha^{-1}.

On the basis of results described above it can concluded that the application of 30 kg S ha^{-1} with legume straw is more economic and can be adopted by the farmers of the regions. The study is only for one year therefore, the confirmation of the result it should be repeated once more in same piece of land.

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