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Response of Lowland Rice to Different Sources and Levels of Sulphur Fertilization

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ABSTRACT

Sulphur sources had no significant and consistent response on growth and yield parameters of rice. Plant height, tiller number and drymatter accumulation increased significantly with increase in sulphur levels from 0 to 40 kg S ha^{-1} in both the years. Higher level of 40 kg S ha^{-1} recorded significantly higher number of grains per panicle and 1000 grain weight as compared to 0 and 20 kg S ha^{-1} in both the years. Sulphur application at 40 kg S ha^{-1} recorded the higher grain yield of 5273 kg ha^{-1}, which was significantly superior to the remaining two levels in the first year, while in the second year, it was at par with that of 30 kg S ha^{-1}.

Key words : Growth,Rice, Sulphur Sources,Yield

Sulphur deficiency has become wide spread over several decades in most of the agricultural areas of the world. Sulphur deficiency is fast emerging as an important yield-limiting factor in intensively cultivated irrigated lowland rice soils. Response to applied sulphur is more in *kharif* rice due to non-availability of native sulphate, as a result of its conversion to insoluble FeS and ZnS coupled with leaching losses of negatively adsorbed sulphate ions under flooded conditions. Response to applied sulphur was reported in rice grown in alluvial soil at Maruteru and other parts of Andhra Pradesh during *kharif* season.

MATERIAL AND METHODS

The investigation was conducted at the Agricultural College Farm, Bapatla during *kharif* season of 1995-96 and 1996-97. The soil was sandy loam in texture, slightly alkaline in reaction, low in organic carbon (0.36%) and available nitrogen (220 kg ha^{-1}), medium in available phosphorus (22 kg ha^{-1}), high in available potassium (285 kg ha^{-1}) and low in available sulphur (9 ppm). The treatment consisted of five sources of sulphur *viz.,* ammonium sulphate, single super phosphate, ammonium phosphate sulphate, gypsum and elemental sulphur at four levels *viz.,* 0, 20, 30 and 40 kg S ha^{-1}, which were applied to preceding *kharif* rice crop. The experiment was laid in randomized block design with factorial concept with three replications. The experiment was also continued in respective *rabi* seasons to test the residual effect on *rabi* pulse and oil seed crops.

RESULTS AND DISCUSSION

Response of rice to different sulphur sources

Response of growth attributes of rice to different sulphur sources was not consistent during both the years of study (Table) . Plant height and drymatter accumulation at harvest differed with application of elemental sulphur, which was significantly superior to all other sources except gypsum in the first year only. Where as gypsum was proved to be the better source during tiller production and recorded value maximum number of tillers m^{-2} during second year at 60 days after transplanting.

The maximum number of panicles m^{-2} was produced by the application of sulphur through elemental sulphur which was significantly superior to all other sources except gypsum. However, the number of grains per panicle, test weight and grain yield were not influenced by source of sulphur. Whereas single superphosphate was the most effective source of sulphur in increasing the straw yield, however, it was on par with the application of elemental sulphur in both the years. Similar absence of significant and consistent response to sulphur sources was also reported earlier in rice by Alam *et al*. (1985) and Malaravizhi *et al*. (1990)

Response of rice to different levels of sulphur

Among the levels, 40 kg S ha^{-1} produced significantly taller plants over other two levels *i.e.,* 30 and 20 kg S ha^{-1}. Number of tillers, drymatter accumulation at harvest and number of panicles increased significantly with increase in sulphur levels

Table. Growth and yield parameters of rice as influenced by sources and levels of sulphur

Treatments	Plant height of rice (cm)		Number of tillers m^{-2}		Drymatter accumulation at harvest (g m^{-2})		No. of panicles m^{-2}	
	1995-96	1996-97	1995-96	1996-97	1995-96	1996-97	1995-96	1996-97
Sources of sulphur								
Ammonium sulphate	108.1	106.0	353.4	327.8	1104.1	1143.1	244.5	206.9
Single super phosphate	108.2	105.9	358.8	324.5	1142.8	1161.3	250.7	212.1
Ammonium phosphate sulphate	110.4	108.0	352.1	322.6	1137.0	1143.1	229.6	199.6
Gypsum	110.8	108.1	367.2	324.0	1142.0	1213.6	254.4	193.8
Elemental sulphur	113.4	106.5	363.0	315.9	1191.0	1223.3	263.3	207.4
SEm ±	1.4	1.3	9.5	7.1	15.9	28.4	5.9	6.6
CD (0.05)	2.8	NS	NS	NS	32.4	58.1	12.1	NS
Levels (kg S ha^{-1})								
0	100.5	100.9	327.0	282.1	860.0	822.5	217.3	172.0
20	108.3	105.5	347.2	312.4	1031.5	1091.5	237.8	185.7
30	109.7	106.9	360.6	324.0	1157.5	1183.4	247.0	208.9
40	112.6	108.3	368.8	331.9	1241.3	1255.9	261.0	217.3
SEm ±	1.0	1.0	7.3	5.5	11.0	22.0	4.6	5.0
CD (0.05)	2.2	2.0	15.0	11.2	25.0	45.0	9.4	10.3
Interaction (SxL)	NS	NS	NS	NS	NS	NS	NS	NS

Treatments	No. of grains $panicle^{-1}$		Test weight (g)		Grain yield (kg ha^{-1})		Straw yield (kg ha^{-1})	
Sources of sulphur	1995-96	1996-97	1995-96	1996-97	1995-96	1996-97	1995-96	1996-97
Ammonium sulphate								
Single super phosphate	130.0	130.8	23.3	23.3	4889	4786	4877	4533
Ammonium phosphate	129.7	130.1	23.4	23.3	5000	5126	5377	5655
sulphate	132.5	132.5	23.6	23.6	4647	4830	5133	5005
Gypsum								
Elemental sulphur	133.3	132.2	23.4	23.4	4963	4927	5200	5162
SEm ±	139.4	134.3	23.0	23.1	4968	4973	5266	5267
CD (0.05)	3.5	3.0	0.5	0.5	70	157	130	153
Levels (kg S ha^{-1})	NS	NS	NS	NS	NS	NS	266	312
0								
20	118.6	119.3	22.1	22.0	4328	4181	4033	4000
30	129.5	129.4	22.8	22.8	4738	4524	4813	4920
40	132.7	132.6	23.5	23.3	4846	5125	5193	5171
SEm ±	136.7	137.0	24.0	24.1	5273	5136	5507	5498
CD (0.05)	2.6	2.6	0.4	0.4	54	121	100	118
Interaction (SxL)	5.4	5.4	0.8	0.7	111	248	206	241
	NS	NS	NS	NS	NS	NS	NS	NS

from 0 to 40 kg ha^{-1} with maximum response at 40 kg S ha^{-1}. However, the difference between 30 and 40 kg S ha^{-1} was not significant during the second year. These results are in agreement with Ponnamperuma (1972), Gonzales *et al.* (1989) regarding stunted growth and reduced tillering in sulphur deficient soils.

A significant increase to a maximum number of 136.7 and 137.0 grains $panicle^{-1}$ was obtained during first and second years, respectively with the highest level of 40 kg S ha^{-1} which was on par with the application of 30 kg S ha^{-1}. The test weight and grain yield of rice increased progressively with increase in the level of sulphur from 0 to 40 kg ha^{-1}, however, the increase was on par with that of the application of 30 kg S ha^{-1} in the first year. Similar increase in straw yield with 40 kg S ha^{-1} level over remaining other levels was observed during both the years. However, similar increase in all the yield components in rice due to sulphur application was also reported by Choudhury and Mazumdar (1994).

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