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EFFECT OF ELEMENTAL SULPHUR ON CROP GROWTH AND CHEMICAL COMPOSITION OF DESERT SANDY SOIL

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Until recently (Ergle and Eaton, 1951; Randhawa, 1973; Das and Datta, 1973; Aulakh *et al.*, 1977 a & b) little attention was paid towards sulphur deficiency and crop response to sulphur fertilization. The light textured desert soils are generally deficient in available sulphur. The present study was undertaken in *kharif*, 1979, to investigate the effect of elemental sulphur on the dry matter yield, nutrient uptake by cowpea (*Vigna-vexillata* (L.) A. Rich and chemical composition of the desertic sandy soil from the Central Research Farm, CAZRI, Jodhpur. The soil was alkaline in reaction (pH 8.4) and low in organic carbon (0.20%), available nitrogen (120 kg/ha) and available sulphur (6.5 ppm), and medium in available phosphorus (9.5 ppm).

The experiment was conducted under green house conditions. Air dried soil passed through 2 mm sieve was filled in earthen pots (soil capacity 8 kg) lined with polyethylene sheet. Four levels (0,10, 20 and 40 ppm) of elemental sulphur powder were applied to the pot soil, 21 days before sowing, in three replications. Basal doses of 10 ppm N as urea, 20 ppm P_2O_5 from KH_2PO_4 and 10 ppm K_2O from KCl were given. Six seeds of cowpea (var. FS-68), were sown in each pot. A uniform plant population of three plants per pot was maintained. After 45 days of sowing, plants were harvested, washed successively with dilute HCl and then with distilled water. The dry matter yields of plants were recorded and then analysed for nitrogen by micro-kjeldahl method. Sulphur and phosphorus, in the aqueous extracts of di-acid digested samples were estimated, respectively by the turbidimetric method (Chesnin and Yien, 1950) and by vanadomolybdate phosphoric yellow colour method (Jackson, 1967). After harvest, soil samples were collected from the pots and analysed for pH, available phosphorus and sulphur after Black (1965).

EFFECT OF APPLIED SULPHUR ON DRY MATTER YIELD AND NUTRIENT UPTAKE

Cowpeas recorded significant increase in the average dry matter yield with 10 ppm sulphur (Table 1). With higher levels (20 or 40 ppm) of sulphur, a significant decrease in yield was noticed, but the yield was comparable with that of the control treatment. With higher doses, it appears that the sulphur content in soil exceeds the need of plants and that the crop is unable to utilize the whole of applied sulphur. Dhillon and Dev (1978) also reported decrease in per cent utilization of appli-

ed in the elemental sulphur level above 10 ppm. The decrease in yield with high doses of elemental sulphur has also been reported by Saggar and Dev (1974). The sulphur uptake also showed a maximum increase upto 10 ppm sulphur level and thereafter it decreased, but the decrease was non-significant at 20 ppm level. The decrease was significant at 40ppm level and was comparable with that in the control treatment. Similar trends in the uptake of nitrogen and phosphorus were also observed.

EFFECT OF APPLIED SULPUR ON THE AVAILABILITY OF SULPHUR AND PHOSPHORUS IN SOIL

The soil pH decreased with increasing level of elemental sulphur with the maximum decrease at 40 ppm application of sulphur (Table 2). Available phosphrous and sulphur contents of the soil showed progressive increase with increasing levels of sulphur application and were inversely related to soil pH as indicated by significant correlation of pH with available phosphorus ($r=-0.767^{**}$). Similar results have been reported by Clement (1978) and Aggarwal and Sharma (1983). Available sulphur content in soil increased significantly with the increasing level of sulphur application. The maximum increase in available sulphur was observed at 40 ppm sulphur fertilization. The difference was, however, non-significant between 20 ppm and 40 ppm sulphur level. It appears, therefore, that higher dose of sulphur application builds up available sulphur status of the soil and this may be beneficial to the succeeding crop. From the results on dry matter yield, sulphur uptake by cowpea and build up of available sulphur and phosphorus in soil, it appears that 10-20 ppm sulphur in the form of elemental sulphur is quite appropriate for the desert sandy soils.

Table 1. Effect of sulphur application on the dry matter yield (g/pot) and nutrient uptake (mg/pot) of cowpea

Sulphur (ppm)	Dry matter yield	Nutrient uptake		
		Sulphur	Nitrogen	Phosphorus
0	3.57	11.57	84.40	8.22
10	4.92	22.79	115.57	11.40
20	3.62	19.32	91.23	9.15
40	2.92	11.85	63.94	6.56
LSD at 5%	0.75	6.32	29.58	1.54

Table 2. Effect of sulphur application on pH, sulphur and phosphorus status of soil after the harvest of cowpea

Sulphur (ppm)	Soil pH	Available nutrients (ppm)	
		Sulphur	Phosphorus
0	8.25	6.47	6.22
10	8.10	8.89	6.32
20	7.95	12.93	8.19
40	7.70	15.35	8.45
LSD at 5%	0.10	2.45	NS

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