

Short Communications

Response of Sulphur to Wheat and its Influence on Nutrient Composition

V K Gupta, B S Potalia and S P Gupta

Department of Soil Science, Haryana Agricultural University, Hisar - 125 004 India

Response of crops to S application in Haryana soils is inconclusive. Therefore, a pot culture study was conducted to investigate the influence of S application on the yield and nutrient composition of wheat in coarse textured soils of Haryana, low in available sulphur.

The experiment was carried out in pots, each containing 4 kg coarse textured soils varying in available S (Table 1). Sulphur @ 0,10,20 and 40 mg S kg⁻¹ soil was added through (NH₄)₂SO₄ in solution form. Each treatment was replicated thrice. A basal dressing of 100 mg N, 50 mg P, 62 mg K, 10 mg Mn, 5 mg Zn and 10 mg Fe kg⁻¹ soil were applied

Table 1 Physico-chemical characteristics of the experimental soils

Soils Location	Texture	pH(1:2)	EC (dS m ⁻¹)	OC%	Available S mg kg ⁻¹
Chindar	ls	8.3	0.19	0.08	2.5
Sadalpur	ls	8.5	0.15	0.10	5.0
Gangwa	ls	8.2	0.20	0.32	8.3
Kaimari	ls	8.3	0.29	0.35	11.3

Table 2 Effect of S application on the grain and straw yield (g pot⁻¹) of wheat

Soils Location	Applied S mg kg ⁻¹ soil				Mean
	0	10	20	40	
	Grain yield				
Chindar	9.9	22.5	24.0	26.6	20.8
Sadalpur	18.5	24.0	24.4	25.8	23.2
Gangwa	27.6	29.2	26.9	25.2	27.2
Kaimari	21.9	22.7	23.6	21.6	22.5
Mean	19.5	24.6	24.7	24.8	-
	Straw yield				
Chindar	37.0	81.0	86.5	84.3	72.2
Sadalpur	66.9	88.5	88.6	89.7	83.4
Gangwa	82.8	88.9	78.7	71.7	80.5
Kaimari	74.0	76.5	80.0	83.0	78.3
Mean	65.1	83.7	83.4	82.1	
CD (P = 0.05)		Grain		Straw	
S levels		1.2		0.78	
Soil		1.2		0.78	
S level x Soil		2.4		1.56	

through analytical grade chemicals in solution form. Variation in N added through $(\text{NH}_4)_2\text{SO}_4$ as a source of S was compensated through urea. Wheat variety WH 147 was grown upto maturity and grain and straw yields were recorded. The physico-chemical characteristics of soils (Table 1) and elements in plants were determined by the standard procedure. Sulphur was extracted by 0.15% CaCl_2 (Williams & Steinbergs 1959) and determined by turbidimetric method. The crop was irrigated with deionized water as and when the need arose.

Yields : Data (Table 2) indicated that soils having less than 11 mg S kg^{-1} soil (CaCl_2 extractable) responded to sulphur application. According to Tandon (1991) for available S, the critical limits are usually in the range of 11-13 ppm for field crops. The grain and straw yield increased with the application of S. However, 10 mg S kg^{-1} soil increased grain yield by 127, 30.6 and 4% in Chindar, Sadalpur, Gangwa and Kaimari soils, respectively. Chindar and Sadalpur soils, low in available S responded favourably upto 10 mg S kg^{-1} soil. The response of wheat to sulphur is in full agreement with the find

Table 3 Effect of S application and Soil on mean values of nutrient concentration in wheat grain and straw

S levels	Nutrient concentration (mg kg^{-1})							
	S	Mg	Ca	P	Zn	Mn	Fe	N%
S (mg kg^{-1})	Grain							
0	72	175	385	304	24.4	28.8	56.2	1.38
10	97	139	379	280	22.9	26.5	60.4	1.43
20	137	135	354	277	22.9	26.5	63.5	1.58
40	178	130	353	263	21.9	27.0	76.5	1.69
CD5%	4	3	NS	15	NS	NS	NS	0.12
Soil								
Chindar	105	133	342	316	24.4	27.0	72.0	1.39
Sadalpur	137	191	437	271	23.3	25.0	64.5	1.49
Gangwa	126	134	369	282	26.0	25.5	61.8	1.64
Kaimari	123	122	313	264	20.5	30.2	58.1	1.62
CD 5%	4	3	59	15	2.0	3.2	12.4	0.1
S levels mean	Straw							
S (mg kg^{-1} soil)								
0	207	139	880	111	18.8	29.9	314	0.35
10	254	148	890	80	16.0	31.6	370	0.42
20	307	158	920	78	15.4	34.1	472	0.46
40	382	153	890	66	15.4	33.7	453	0.46
CD5%	12.0	1.0	NS	8	1.7	3.7	20.0	0.05
Soil								
Chindar	248	149	820	81	19.6	30.0	370	0.46
Sadalpur	333	147	970	95	15.4	29.5	370	0.35
Gangwa	282	154	940	78	19.6	28.4	387	0.46
Kaimari	283	149	850	81	15.8	40.4	452	0.41
CD5%	12.0	1.0	8.5	8.0	1.7	3.7	20.0	.05

ings of Gupta *et al* (1989) who have reported an increase in wheat yield due to S application in coarse textured soils.

Nutrient concentration : Tissue N concentration increased significantly as a result of S application (Table 3). The highest N concentration in grain and straw was recorded in Kaimari and Gangwa soils high in available S. This is attributed to better utilization of N caused by S application (Tandon 1991).

Application of S significantly alleviated P, Ca and Zn concentration in grain and straw of wheat (Table 3). The results are contrary to the findings of Morak and Dev (1980) who observed positive effect of S on P in wheat and Singh and Karwasra (1987) observed S on Zn. The depressing effect of S on P in mustard and green gram (Aulakh *et al.* 1977) support the present findings.

Application of S enhanced the mean concentration of S and Fe in grain and straw of wheat significantly (Table 3). However, Mg concentration in grain decreased while in straw it increased. The mean S and Mg concentration was highest in Sadalpur soil whereas Fe, was higher in Chindar soil. This may be due to synergistic effect of S with Mg and Fe (Aulakh & Dev 1978). The data indicated a non significant depressing effect of S on Mn content of wheat grain whereas there was an increase in straw. The highest Mn concentration was however, found in Kaimari soil high in available S.

The nutrient concentration of wheat grain and straw was influenced significantly by soil means and there were differences when soils were compared with each other (Table 3).

References

- Aulakh MS & Dev G 1978 Interaction affect of calcium and sulphur on the growth and nutrient composition of Alfalfa (*Medicago sativa* L. Pers.) using S 35. *Plant and Soil* **50** 125-134
- Aulakh MS Pasricha NS & Dev G 1977 Response of different crops to sulphur fertilization in Punjab *Fertilizer News* **22** 32-36
- Gupta VK, Raj H, Karwasra SPS & Gupta SP 1989 Response of mustard and wheat to sulphur carriers in Aridisoi ls. *Crop Research* **2** 159- 162
- Morak AS & Dev G 1980 Phosphorus, sulphur relationship in berseem (*Trifoleum alexandrinum*) as measured by yield and plant. *Journal Nuclear Agriculture Biology* **9** 54-56
- Singh K & Karwasra SPS 1987 S-Zn interaction in wheat in a Typic Ustipsamment soil *Haryana Agricultural University, Journal of Research* **17** 251-255
- Tandon HLS 1991 *Sulphur Research and Agricultural Production in India* 18-70
- Williams CH & Steinbergs A 1959 Soil sulphur fractions as chemical indices of available sulphur in some Australian soils *Australian Journal of Agricultural Research* **10** 340 352

(Received February 1991 Accepted March 1992)