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Role and requirement of sulphur in growth and tuber yield of potato (*Solanum tuberosum*)

J P SINGH[1] and O P SRIVASTAVA[2]

Banaras Hindu University, Varanasi, Uttar Pradesh 211 005

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Potato (*Solanum tuberosum* L.) responds to sulphur application on sulphur-deficient soils (Singh and Srivastava 1993 a,b). However, information on the effect of sulphur on the yield attributes of potato is scanty. Hence an experiment was conducted to study the role of sulphur in potato growth and yield.

The field experiment was conducted during 1989–90 at Varanasi. The soil of the experimental site was sandy loam, having *p*H 7.8, electrical conductivity 0.165 dS/m, organic carbon 0.37%, cation-exchange capacity 6.5 cmol (P^+)/kg and available N 250 kg/ha, P 17 kg/ha and K 134 kg/ha. The soil was deficient in sulphur, with 9.6 kg S/ha (0.15% $CaCl_2$-extractable). There were 12 treatments (T_1, NS_0; T_2, NS_{25}; T_3, NS_{50}; T_4, NPS_0; T_5, NPS_{25}; T_6, NPS_{50}; T_7, NKS_0; T_8, NKS_{25}; T_9, NKS_{50}; T_{10}, $NPKS_0$; T_{11}, $NPKS_{25}$; T_{12}, $NPKS_{50}$), consisting of combination of fertilizer nutrients and levels of S (0, 25 and 50 kg/ha). The treatments were replicated 3 times in randomized block design. Plot size was 4.2 m x 2.8 m (7 rows of 14 tubers each). N, P and K were applied @ 180, 35 and 126 kg/ha respectively through sulphur-free fertilizers. Sulphur was applied through gypsum. Nitrogen was applied in 2 equal splits, at planting and 25 days after planting; and P, K and S were applied at planting. Tubers (50–55 g) of 'Kufri Badshah' potato were planted in the last week of October. The crop was irrigated with water containing low amount of sulphur (1.5 ppm SO_4–S) drawn from a deep tube-well. Data were recorded on plant height, number of main shoots and compound leaves/plant. Leaf-area index and dry matter of whole plant were recorded at 10-day intervals starting from 30 days after planting to 90 days. These observations were taken on 3 random plants per plot. Physiological growth indices of leaf-area duration, net assimilation rate, relative growth rate and crop-growth rate were calculated from the periodical dry-matter data (Watson 1952).

Interactions between fertilizer–nutrient combinations and levels of sulphur were not significant for any of the growth and yield attributes. In the presence of N, sulphur increased the growth and yield attributes independently of fertilizer nutrients P and K (Table 1). Tuber yield increased significantly up to 25 kg S/ha, but the differences between the 2 levels of S were not significant. Sulphur fertilization significantly increased the height of plants up to 25 kg/ha (Table 1), but it did not significantly affect the number of main shoots and compound leaves (data not presented).

[1]Senior Scientist (Soil Science), Central Potato Research Station, Central Potato Research Institute, Jalandhar, Punjab 144 003

[2]Professor, Department of Soil Science and Agricultural Chemistry

Table 1 Effect of combination of fertilizer nutrients and level of sulphur on growth and tuber yield of potato

Main effect	Tuber yield (tonnes/ha)	Haulms yield (tonnes/ha)	Maximum leaf-area index	Plant height (cm)	Leaf-area duration	Crop-growth rate ($g/m^2/day$)
Sulphur (kg/ha)						
0	34.2	1.36	4.03	69.6	203	13.66
25	38.1	1.58	4.71	73.3	233	14.75
50	38.6	1.59	4.73	73.3	235	14.99
CD (< 0.05 P)	1.16	0.08	0.25	1.5	11	0.89
Nutrient						
N	33.8	1.33	3.40	69.1	176	13.40
NP	35.7	1.50	4.60	73.5	223	14.01
NK	35.9	1.53	4.62	72.5	229	14.32
NPK	42.6	1.66	5.35	73.1	268	16.12
CD (< 0.05 P)	1.35	0.09	0.29	1.7	13	1.04

Sulphur did not increase the relative growth rate and net assimilation rate (data not presented), but significantly increased the leaf-area index, leaf-area duration and crop-growth rate (Table 1). This showed that increase in tuber yield was mainly due to increase in the size of the photosynthetic system. The result corroborates the finding of Friedrich and Schrader (1978).

It was concluded that sulphur increases the plant height, leaf size and duration in potato, leading to increased tuber yield.

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