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Effect of sulphur on yield and quality of potato under North Gujarat conditions

ASHA PRAJAPATI[1], C. K. PATEL[2] AND R. N. PATEL[3]

Potato Research Station,
S. D. Agricultural University, Deesa - 385 535 (Gujarat)

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Potato (*Solanum tuberosum* L.) plays a vital role in food security for ever increasing world population (Scott and Sourez, 2012). It is highly capital and labour intensive crop (Khushwah and Singh, 2011). Presently India is the second largest potato producer in the world, which has got an unlimited potentiality of its cultivation in Gujarat State. For achieving higher productivity, balance fertilization of utmost important. In potato cultivation, some elements like Zn, B, S and Mg can help in increasing the foliage coverage at initial growth stages and in the later stages, the translocation of assimilate which is responsible for higher yield (Trehan and Grewal,1981). Many workers are of the opinion that application of minor nutrient in addition to major elements can play a good role in increasing the yield of potato (Mahmood *et al.*, 1995; Tiwari, 1995; Rybost *et al.*, 1993; Taya *et al.*, 1994).

Sulphur is one of the 16 essential plant nutrients. It is now considered as the fourth major nutrient in fertilizer management after N, P and K. It is absorbed by plants in amounts comparable to P. It plays major role in increasing protein and oil content . Therefore it is a key component of balanced nutrient application for top yields and superior quality produce. Its deficiencies are spreading in more and more areas due to intensive cropping with high yielding hybrids varieties, scare use of organic manure, use of high analysis S free fertilizers, depletion of soil sulphur due to less sulphur added to soil as compared to crop removals, which ultimately results in negative sulphur balances. Distinct possibility of sulphur losses through leaching and runoff with the spread of flood irrigation to large areas. Keeping this in view, the present investigation was undertaken to study the effect of sulphur application on growth, yield and economics of potato production under loamy sand soils of North Gujarat.

[1] Ex. Junior Research Fellow, [2] Associate Research Scientist, Main Cotton Reseach Station, NAU, Navsari, [3] Assistant Research Scientist

MATERIALS AND METHODS

A field experiment was conducted during *rabi* seasons of 2011-12 and 2012-13 at Main Potato Research Station, Sardarkrushinagar Dantiwada Agricultural University, Deesa (Gujarat) on loamy sand soil having pH 8.2, organic carbon(0.32 %) low in available N, available P (31.2 kg/ha) and K (282.5 kg/ha). The four treatments *i.e.*, T_1 : control (No Sulphur), T_2 : 25 kg S (Bensulf) /ha , T_3 : 37.5 kg S (Bensulf) /ha and T_4 : 50 kg S (Bensulf) were laid out in randomized block design with six replications. Seed tubers were planted on 18th November in both the years at the spacing of 50 x 20 cm. Recommended dose of N:P:K *i.e.*, 275:140:275 kg/ha were applied. Half dose of nitrogen and full dose of P_2O_5 and K_2O were applied as a basal at the time of planting. Remaining half dose of nitrogen was applied at 30 days after planting. Other cultural operations and plant protection measures were followed as per package of practices recommended for potato crop in the region. Haulm was removed at 100 days after planting and crop was harvested next day. The tubers were graded into three categories *i.e.*, A grade(>125g), B grade (25-125g) and C grade(<25g) and weighed. Stastical analysis was carried out by following standard analysis of variance as described by Gomez and Gomez(1984).

RESULTS AND DISCUSSION

The results a presented in Table 1 revea-d that different levels of sulphur failed to exert sig-ficant effects on a A grade tuber yield of potato uring 2012-2013 and in pooled results. However grade tuber yield increased significantly with increas- level of sulphur in year 2011-12. Significantly high- tuber yield (301.94 q/ha) was recorded with the ap- cation of 50 kg S /ha as compared to rest of the treatments. The pooled result showed non significant differences in A grade tuber yield. Similarly, B grade tuber yield was also in pooled not affected significantly due to

Table 1 Effect of levels of sulphur on grade wise tuber yield (q/ha) of potato

Treatments	A grade tuber yield			B grade tuber yield			C grade tuber yield			Total tuber yield		
	2011-12	2012-13	Pooled	2011-12	2011-12	Pooled	2011-12	2012-13	Pooled	2011-12	2012-13	Pooled
Sulphur levels (kg/ha)												
00.0	275.00	276.90	276.00	129.24	34.04	81.60	24.19	33.58	28.90	428.43	344.52	386.48
25.0	285.28	286.05	285.70	142.50	33.85	88.20	22.78	30.27	26.50	450.56	350.17	400.37
37.5	294.44	272.02	283.20	142.22	36.17	89.20	22.64	39.94	31.30	459.31	348.14	403.73
50.0	301.94	279.41	290.70	137.78	36.63	87.20	21.94	32.28	27.10	461.67	348.31	404.99
SEm ± (For T)	1.57	13.12	6.88	5.64	2.11	2.96	2.78	3.43	3.04	5.64	11.67	6.72
CD(0.05)	4.62	NS	NS	NS	NS	NS	NS	NS	NS	16.66	NS	NS
SEm ± (For Y X T)	-	-	9.33	-	-	2.00	-	-	2.58	-	-	8.99
CD(0.05			NS			6.03			NS			NS
C. V. %	1.22	11.67	4.03	9.04	17.0	5.05	6.52	24.66	11.53	2.76	8.22	2.76

S treatments during both the years as well as in pooled results. However, numerically treatment receiving 37.5 kg S/ha produced higher B grade tuber yield. This also ture for yield of C grade potato.

In the case of total tuber yield, it was aftected significantly due to treatment only during first year. Among the treatments, significantly higher total tuber yield (461.67 q/ha) was recorded with the application of 50 kg S/ha was at par with treatments receiving 37.5 and 25 kg S/ha. Treatment receiving no S recorded significantly the lowest total tuber yield. During 2012-2013 and in pooled analysis, total tuber yield did not very significantly due to S treatments. In contract, the results of Sud and Sharma (2002) showed that these was increase in tuber yield with increasing levels of S application. This was attributed to its role in better partitioning of the photosynthates in the shoot and tubers. Similarly , Lalitha *et al.*, (2002) have also reported significant effect on grade wise tuber yield and increase in bulking rate with sulphur application. Absence of significant response to S application by potato grown on loamy sand soil seems to be due to medium status of available S in soil and Dia ammonium phosphate used as source of P fertilizer in control.

There was an appreciable increase in net realization due to sulphur application up to 25 kg S/ha as shown in Table 2. The highest net return of 115120 /ha was obtained with treatment T_4 (50 kg S/ ha) followed by ₹ 114672 /ha) with T_3 (37.5 kg S/ ha). The lowest returns of ₹108240/ha was accured under treatment T_1(O kg S/ha).

Thus, it is concluded that application of sulphur in addition to recommended dose of nitrogen, phosphorus and potash were more effective for higher net returns of potato

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Table 2 Effect of sulphur on economics of potato

Treatments	Tuber yield (q/ha)	Cost of cultivation (₹/ha)	Cost of Sulphur (₹/ha)	Total cost (₹/ha)	Gross income (₹/ha)	Net return (₹/ha)
Sulphur levels (kg/ha)						
00.0	386.48	85000	0	85000	193240	108240
25.0	400.37	85700	875	86575	200185	113610
37.5	403.73	85860	1333	87193	201865	114672
50.0	404.99	85925	1750	87375	202495	115120
Control V/S Treatment	403.03	85828	1319	87047	201515	114467

Selling price of potato ₹ 500/q

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