

## Effects of Soil and Foliar application of Potassium on Gradewise and Total Yield of Potato

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Effect of soil and foliar application of  $K_2O$  on potato yield was studied during *rabi* 1976-77 and 1977-78 as well as *kharif* 1977 and 1978 in red sandy loam soil. Compared to yields from *rabi* crops, higher yields were obtained from two *kharif* crops. Although the differences among treatments were non-significant, increases in yield were obtained due to application of  $K_2O$ . The highest yield (449.19 q/ha) was recorded when  $K_2O$  was applied at 100 kg/ha, half of which was given as two foliar sprays (40 days after planting and 15 days thereafter) during *kharif*, 1978. Application of 50 kg  $K_2O$ /ha to the soil at planting + 50 kg  $K_2O$ /ha to the foliage in two sprays appeared to be superior to the other treatments. It was also observed that whenever the yields were high, higher proportions of large size tubers were recorded, and such situations could be seen during *kharif* seasons rather than in *rabi* seasons. Higher proportions of medium size tubers were obtained from the *rabi* crops.

Potato is extensively grown in red loamy soils of Karnataka on a commercial scale, particularly during *kharif* (May-September) under rainfed conditions and to a small extent during *rabi* (November-April) as an irrigated crop. Any saving on the cost of fertilizers, without sacrificing the yield and quality, will be beneficial to the grower, since the quantities of nutrients required largely depend on soil conditions, crop rotation and other agroclimatic situations (Rajat De and Singh, 1959; Grewal, 1974). Studies were carried out during four different seasons in red sandy loam soil of Bangalore to assess the yield responses of potato, cv. *Kufri Chandra-mukhi*, to soil and foliar application of  $K_2O$ .

### MATERIAL AND METHODS

Trials involving soil and foliar application of  $K_2O$  were carried out during *rabi* 1976-77 and 1977-78 as well as *kharif* 1977 and 1978 in red sandy loam soil at the University of Agricultural Sciences, Bangalore. Data on chemical analysis of the soils are given below.

Constituents	Kharif, 1977	Rabi, 1977-78	Kharif, 1978
Organic carbon (%)	0.49	0.45	0.45
Available P (kg/ha)	7.50	4.50	8.00
Available K (kg/ha)	257.60	235.00	268.80
Ecc (mmhos/cm)	0.01	0.04	0.04
pH	6.2	6.8	6.8

A total of six treatments was tested adopting a randomised block design with four replications during *rabi*, 1976-

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TABLE I: Effects of soil and foliar application of varying levels of  $K_2O$  on the yield of potato, cv. Kufri Chandramukhi

Treatments	Yield (q/ha)				Mean of 4 seasons	Increase over control (%)
	<i>Rabi</i> , 1976-77	<i>Kharif</i> , 1977	<i>Rabi</i> , 1977-78	<i>Kharif</i> , 1978		
K0	179.16	271.60	276.08	419.11	286.49	
K1	222.21	317.04	327.31	434.99	325.39	13.58
K2	221.52	371.36	318.67	449.14	340.17	18.74
K3	195.28	318.11	286.88	434.77	309.01	7.86
K4	225.00	366.35	298.77	435.58	331.43	15.69
K5	214.11	347.74	308.18	438.54	327.14	14.19
C.D. at $P = 0.05$	N.S.	N.S.	N.S.	N.S.	N.S.	
C.V. (%)	14.80	10.70	6.47	5.00		

N.S. – Non-significant

77 and *kharif*, 1977 and with six replications during *rabi*, 1977-78 and *kharif*, 1978. The net plot size was  $3.6 \times 3.6m^2$ , and the following were the six treatments.

Control (without  $K_2O$  application)  $K_1$  50 kg  $K_2O/ha$  to the soil at planting,  $K_2$  50 kg  $K_2O/ha$  to the soil at planting plus 50 kg  $K_2O/ha$  in two equal sprays, first spray 40 days after planting, and second spray 12-15 days later,  $K_3$  50 kg  $K_2O/ha$  in two equal sprays, first spray 40 days after planting, and second spray 12-15 days later,  $K_4$  100 kg  $K_2O/ha$  to the soil at planting, and  $K_5$  50 kg  $K_2O/ha$  to the soil at planting plus 50 kg  $K_2O/ha$  as top-dressing, 30 days after planting.

N and  $P_2O_5$  were applied at the rate of 100 kg/ha each; 50 per cent of N

and whole of  $P_2O_5$  were applied at the time of planting, while  $K_2O$  was applied as per treatment schedule. The remaining 50 per cent of N and  $K_2O$ , wherever relevant, were applied at the time of earthing up, 30 days after planting. Application of fertilizers was done in furrows so as to place the fertilizers about 10 cm away from the planted seed tubers. Whole tubers (Breeders seed) of uniform size were planted with spacings of 60 cm between rows and 20 cm between the tubers. Protective irrigations were given to the *kharif* crops whenever rains failed, but during *rabi* the crops were grown under irrigated conditions. Plant protection measures were taken up as and when found necessary. Data on gradewise and total yield were recorded per net plot and were analysed.

TABLE II Effects of soil and foliar application of varying levels of K<sub>2</sub>O on the gradewise yield of potato cv. Kufri Chandramukhi

Treatments	Yield (q/ha)				
	Rabi 1976-77	Kharif 1977	Rabi 1977-78	Kharif 1978	Mean of 4 seasons
<b>A. Tuber diameter 51 mm and above</b>					
K <sup>0</sup>	38.19	190.97	99.00	224.73	138.22
K <sup>1</sup>	49.53	242.59	138.12	250.64	170.22
K <sup>2</sup>	59.18	272.68	131.56	290.32	188.44
K <sup>3</sup>	50.23	231.86	106.55	267.75	164.10
K <sup>4</sup>	56.79	251.85	110.42	255.02	168.52
K <sup>5</sup>	45.29	248.91	106.64	265.50	166.59
C. D. at P=0.05	NS	NS	NS	48.30	
<b>B. Tuber diameter 26-50 mm</b>					
K <sup>0</sup>	133.64	77.70	175.61	193.09	145.01
K <sup>1</sup>	162.19	71.52	187.72	183.06	151.12
K <sup>2</sup>	156.71	95.37	185.80	157.73	148.90
K <sup>3</sup>	136.18	83.17	179.08	166.80	141.31
K <sup>4</sup>	157.41	111.11	187.50	179.08	158.78
K <sup>5</sup>	160.72	96.60	200.46	171.75	157.38
C. D. at P=0.05	NS	NS	NS	16.74	
<b>C. Tuber diameter below 25 mm</b>					
K <sup>0</sup>	7.33	2.93	1.47	1.29	3.25
K <sup>1</sup>	10.49	2.93	1.47	1.29	4.04
K <sup>2</sup>	5.63	3.31	1.31	1.09	2.83
K <sup>3</sup>	8.87	3.08	1.25	1.22	3.50
K <sup>4</sup>	10.80	3.39	0.85	1.48	4.13
K <sup>5</sup>	8.10	2.23	1.08	1.29	3.17
C. D. at P=0.05	NS	NS	NS	NS	

NS=Non-significant

## RESULTS AND DISCUSSION

Potato yields were invariably influenced by levels of nutrients supplied to them, whether available in the soil in sufficient quantities or supplemented by application, either through soils or

by foliar spray. Higher yields were obtained from *kharif* crops compared to *rabi* crops irrespective of treatments (Table I). Variations in yields of potato due to certain agro-climatic conditions were evident from earlier work (Grewal, 1974). The better crops in *kharif* might

be due to favourable moisture ranges in the soil combined with more equitable temperature situations which are congenial for initial growth, initiation of tubers and their development under similar soil fertility situations (Kristan and Vrkoč, 1970; Murti *et al.*, 1976).

The differences in yield recorded during all the four seasons and the mean of those were non-significant. Applied  $K_2O$ , either through soil or by foliar spray, did not markedly affect yields when the soil status of available  $K_2O$  was fairly high. Parvathappa and Raj, 1970; McDole, 1978; McDole *et al.*, 1978). However, compared to control (without  $K_2O$ ), application of  $K_2O$  at 50 kg/ha or more enhanced yield to certain extent even in red loam of Bangalore. Although the differences due to treatments were non-significant, partial application of  $K_2O$  in soil at planting and substituting remaining half of  $K_2O$  by foliar application was highly beneficial. The situation was better expressed in *kharif* compared to *rabi* crops. Further application of  $K_2O$  at 50 to 100 kg/ha either to the soil, wholly at planting or in split doses, or otherwise applying a part of the quantity as foliar spray enhanced tuber yields by 13.6 to 18.7 per cent (38.90 to 53.68 q/ha) over the control.

Wherever high yields were obtained they were mainly due to higher proportions of large size tubers (diameter 51 mm) and higher proportions

of large size tubers were obtained from the two *kharif* crops than from the two *rabi* crops (Table II). But, higher proportions of medium size tubers ( $d=26$  to 50 mm) were obtained from the two *rabi* crops compared to the two *kharif* crops. Whenever lower yields were obtained higher proportions of small tubers ( $d=25$  mm) were recorded. Thus, optimum conditions of growing that favoured early vigorous growth and early tuber initiation and development markedly influence the production of higher proportions of large size tubers, thereby contributing to the higher yields (Krishnappa and Gowda, 1979).

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