SUGARBEET GROWTH ON A MODERATELY PHOSPHORUS DEFICIENT SOIL

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ABSTRACT

In a moderately P-deficient soil (24 kg P_2O_5/ha available phosphorus), the sugarbeet plants responded in increased composition of phosphate at early stages but yields were not commensurate with composition indicating luxury feeding. Optimum yields were harvested at 40 kg P_2O_5/ha.

INTRODUCTION

In the initial trials conducted on fertilisation of sugarbeet under Indian conditions, emphasis has mostly been laid on its nitrogen requirement. Phosphate fertilization of sugarbeet has not been considered important because at most of the places where sugarbeet is being grown in India, soils are claimed to be rich in phosphate. Notwithstanding the present restricted area, there are places where response of P has been indicated. Therefore, there is a need to assess the expected range of response of sugarbeet to phosphate on yield and quality at varying fertility levels. This communication reports the initial findings on the nature of benefits to be expected from phosphate fertilization in an alluvial soil somewhat deficient in phosphate.

MATERIAL AND METHODS

Four phosphate levels 0, 40, 80, and 120 kg P_2O_5/ha were taken for experimentation. Eighty kg K_2O/ha was given at the time of sowing. One hundred and twenty kg N/ha was also given as a uniform dose of nitrogen in three equal split applications. The initial Olsen's P value of the soil was 24 kg P_2O_5/ha. Sugarbeet variety Maribo Resistapoly was sown and harvested after about six months for yield records. The sucrose content in beet roots was determined by the method reported by GILL (1965). Phosphate content in leaf samples was determined by the vanado-molybdate yellow method (JACKSON, 1958).

RESULTS AND DISCUSSION

In the initial stage of crop growth, lack of adequate phosphate in the soil was a limiting factor which affected the final yield. The data recorded on green matter of beet tops and its phosphate composition, after 60 days of mowing (Table 1), revealed that the production of green tops was significantly low in the non-fertilized plots than the plots treated with highest dose of phosphate fertilizer and this subsequently affected the root weights. In the beginning, the tops utilized each increment of phosphate dose first in building up green matter weight then the roots as evidenced by top : root ratio. Once the optimum foliage was established, the effects of phosphate applications were seen more on roots than on tops as indicated by wide variation in top : root ratios, recorded after 60 and 120 days of sowing sugarbeet (Table 2). Visually, a more significant difference in the foliage was observed between phosphate treated and non-treated plots after 60 days of sowing. The phosphate

Table 1—Effect of phosphate on green-matter weight* and phosphate composition of leaves

P levels (Kg P_2O_5/ha)	60 days after sowing			120 days after sowing		
	Green wt. of top (g)	Green wt. of root (g)	P per cent (tops)	Green wt. of top (g)	Green wt. of root (g)	P per cent (tops)
0	6.6	0.7	0.21	234.3	281.1	0.14
40	16.1	1.9	0.34	407.9	430.6	0.19
80	24.0	3.4	0.44	517.2	686.8	0.23
120	44.6	6.3	0.42	581.2	772.5	0.24

**wt. of single plant.*

composition of leaves at this stage was almost half in the non-fertilized plots in comparison to plots receiving highest dose of phosphate. The differences in phosphate composition were not so wide after 120 days of sowing indicating the enhanced need for phosphate in the early part of plant growth.

The increase in top: root ratio with increasing levels of nitrogen has indicated the need of this nutrient more for the production of tops (AGARWAL, *et al.*, MS). In the present study, the application of phosphate decreased the top: root ratio considerably (Table 3), especially in the later part of the growing period of sugarbeet crop which might be due to better utilization of applied phosphate by roots than tops. Thus, application of nitrogen and phosphate in judicious combination for giving maximum root yields needs to be worked out.

Table 2—Effect of phosphate on top: root ratio (T/R ratio)

P levels (Kg P_2O_5/ha)	T/R ratio		
	After 60 days	After 120 days	At harvest
0	9.4	0.83	0.71
40	8.4	0.95	0.68
80	7.1	0.76	0.64
120	7.1	0.75	0.59

The final data on sucrose per cent and root and sugar yields are recorded in Table 3. The phosphate application increased the root yield significantly. The effect of phosphate on sucrose per cent and sugar yield was insignificant.

Table 3—Effect of P levels on sucrose per cent, root and sugar yields

P levels (Kg P_2O_5/ha)	Root yield (M. ton/ha)	Sucrose per cent	Sugar yield (M. ton/ha)
0	22.8	17.8	4.06
40	29.0	18.5	5.37
80	28.6	19.0	5.43
120	30.5	15.5	5.95
SE	±1.51	N.S.	N.S.
CD	4.83		

REFERENCES

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JACKSON, M. L. (1958). *Soil Chemical Analysis.* Constable & Co., London.