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Comparative Merits of Phosphatic Fertilizers for Potatoes

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ABSTRACT

Field trials were conducted at Kuruthukuli, Nilgiris from 1970-1973 with the various sources of phosphatic fertilizers. The results revealed that plots which received phosphatic fertilizers gave significantly higher yields than the untreated control. Increased doses of phosphatic fertilizers gave significantly higher yields. Among the various sources of phosphates, Factamphos was superior to super phosphate, rock phosphate etc. and Thomasphosphate was on par with superphosphate and rock phosphate.

INTRODUCTION

Large amounts of phosphorus are needed for starch phosphorylation in potatoes. Only 20 per cent of the plant phosphorus forms part of the potato tubers in the initial stages, whereas its content in tubers raises to about 80 per cent during the later stages. High phosphate applications are particularly necessary in tropical and sub-tropical soils of lateritic and similar types which are as a rule very poor in phosphate. Considerable work has been done on the improvement of effectiveness of the phosphate application on laterite soils using different forms and sources of phosphatic fertilizers. Citric acid soluble Thomasphosphate was utilised better by potatoes than water soluble superphosphate (Schmitt, 1952). In a five-year trial, Agerberg (1957) found that superphosphate was more effective than basic slag in the first year, but basic slag showed a greater efficiency in the fifth (residual) year. For the five year period, basic slag was found to be more effective on limeless soils. Bell (1952) and Sinha *et al*. (1968) observed better results with basic slag than with superphosphate in acid soils. Devideson and Reichbuch (1964) found that hyperphosphate at 80 kg/ha P_2O_5 was more efficient than super for potatoes in the year of application and for sugarbeet the following year.

In the acid soils of Nilgiris, potato receives about 100 kg of P_2O_5 per acre from the Nanjanad Fertilizer Mixture. This exorbitantly high amount of P was applied for potatoes in the form of superphosphate and steamed bone meal because of the P fixation problem. Mathan and Raj (1967) estimated the P fixing capacity to be even 100 per cent in some soils of the Nilgiris. In the present study, different sources and levels of phosphatic fertilizers were

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tested in the pattern of classical permanent experiments at the Project Farm, Kuruthukuli, the Nilgiris.

MATERIALS AND METHODS

Of the various sources of phosphates included in the present study, superphosphate, Thomasphosphate, rockphosphate, Suphala, Factamphos, complex fertilizer 1 : 2 : 1 and complex fertilizer 11 : 52 were the indegenous ones. Granular and powder forms of hyperphosphate and Rhenania phosphate were imported from West Germany. Each source of phosphate was applied to potato crop at 120 and 160kg P_2O_5/ha. After the harvest of the potato crop, P_2O_5 at 40 and 60 kg/ha was applied in the respective plots and buckwheat was grown as a green manure crop and ploughed in at the blooming stage.

The trial was conducted during 1970-73 during autumn seasons (August -November) and 12 buckwheat during the main seasons (April-July). The trial consisted of 24 treatments inclusive of two control plots and the phosphate fertilizers in two levels. The statistical design adopted was randomised replicated blocks, replicated four times.

All the plots received 85 lb N/acre and 100 lb K_2O/acre as ammonium sulphate and muriate of potash respectively. Wherever Thomasphosphate was a treatment, ammonium sulphate was applied 10 days after planting or soon after sprouting which ever is earlier to avoid loss of ammoniacal nitrogen due to the presence of free calcium in Thomasphosphate. The N content in Factamphos and N and K in Suphala

TABLE. Yield data in kg/plot (28 sq. m.)

Treatments	1970		1971		1972		1971	
	P_2O_5 / ha							
	12 kg	16 kg	12 kg	16 kg	12 kg	16 kg	12 kg	16 kg
Control (Mean of two)	22.3	—	14.3	—	33.7	—	5.1	—
Superphosphate	55.3	27.8	13.9	11.3	29.5	26.0	6.8	5.4
Thomasphosphate	26.1	32.8	14.2	16.7	29.0	30.0	6.5	5.8
Rock phosphate	21.4	20.6	15.6	16.4	22.2	43.0	6.4	6.6
Suphala	28.7	33.2	15.8	18.3	23.3	31.7	6.8	5.2
Factemphos	34.7	38.3	20.6	17.8	31.0	23.8	5.5	6.8
Complex fertilizer 1 : 2 : 1	18.5	28.0	14.8	18.3	23.9	35.8	5.2	5.7
Complex fertilizer 11 : 51	32.9	25.4	16.7	17.0	23.8	33.7	5.2	5.1
Hyperphosphate (Granular)	27.7	31.0	16.4	18.2	23.5	27.5	5.7	5.2
Hyperphosphate (Powder)	29.7	26.6	18.0	15.9	33.4	37.7	7.7	6.6
Rhenaniaphosphate (Granular)	20.9	30.3	15.3	13.0	22.6	33.8	6.0	7.1
Rhenaniaphosphate (Powder)	29.1	31.0	13.3	18.8	30.2	39.3	5.2	5.7
	C. D. (P=0.05)							
Control vs. rest	0.67							
P_2O_5 sources	0.68							
P_2O_5 levels	0.33							

have been taken into account while adding N and K to the plots.

RESULTS AND DISCUSSION

The mean yield data of all the four seasons are furnished in Table I. The four seasons data were combined to find out the average response for the various treatments and to compare their efficiency in improving the yield.

Autumn 1970: The plots which received phosphatic fertilizers recorded significantly higher yield than the control plots. Among the phosphatic sources, Factamphos was better than the rest of phosphatic fertilizers except Suphala. Higher doses of phosphorus application (160 kg P_2O_5/ha) gave significantly higher yields than the lower dosage of 120 kg P_2O_5/ha.

Autumn 1971: The results of the trial were statistically non-significant. Due to drought conditions that existed during the period, the general stand of the crop was poor and the yield was also poor. The plant nutrients supplied through various sources might not have been fully utilised by the potato crop to the extent of exerting their influence on the yield.

Autumn 1972: Plots treated with phosphatic fertilizers recorded significantly higher yield than the untreated control plots. Though there were variations in the yield due to the various sources of phosphorus, the differences were not statistically significant. Further, significantly increased yield was obtained by increasing the dosage of phosphorus.

Autumn 1973: During this period also, the crop was affected by drought conditions and not even 25 per cent of the expected normal yield was obtained. The yield differences were again non-significant.

The yield data of all the four season trials were pooled and subjected to statistical scrutiny. The results of the analysis showed that application of phosphatic fertilizers significantly increased the tuber yield. Among the phosphorus sources, Factamphos gave significantly higher yield than superphosphate, rockphosphate, complex 1 : 2 : 1 fertilizer, rhenaniaphosphate (granular) and hyperphosphate (granular). The difference in yield among other fertilizers was not significant. Both powder and granular forms of hyperphosphate gave similar yields whereas powder form of rhenaniaphosphate was found to be significantly better than its granular form.

The yield difference from year to year was statistically significant. Significant interaction was observed between phosphorus, sources and year, and between doses and years.

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OBITUARY

The President and Members of the Madras Agricultural Student's Union deeply regret the sad demise of Thiru A. K. D. Balarama Raja, Patron of MASU, at Madras on January 28, 1977. They offer their heart-felt condolences to the members of the bereaved family.

May his soul rest in peace.

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