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RESPONSE OF *HEVEA* TO PHOSPHATIC FERTILIZERS IN ASSAM

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ABSTRACT

A field experiment was conducted at Regional Research Station, Sarutari, Guwahati in 1986 to study the relative performances of water-soluble and water insoluble forms of phosphatic fertilizers on growth and yield of *Hevea*. Single Super Phosphate (SSP), Mussori Rock phosphate (MRP) and their mixture (1:1) were tried with no phosphorus as control. Recommended dose of N & P were applied in all the plots. No significant differences in growth were observed among the treated plants both in the immature and mature phase of study. Similarly, no significant increase in yield was observed between the treated and control plants during first three years of yield recording. However, MRP effected a significant increase in yield from fourth year of tapping (1998). Crop efficiency (g/cm) was found higher under the plants receiving MRP. Numerical increase in leaf nutrient content was noticed among the plants receiving P-fertilizers. A building up of soil available phosphorus status was noticed due to P-fertilization with respect to control plot. Rock phosphate could be used as a desirable fertilizer for rubber grown in the acid soils of Assam.

Key words: *Hevea*, Non-traditional region, Phosphatic fertilizers, and Crop efficiency.

INTRODUCTION

The cultivation of rubber (*Hevea brasiliensis*) in N.E. Region of India in general and Assam in particular are relatively new. In order to meet the domestic need of natural rubber, a large area are brought into cultivation of rubber in this non-traditional rubber growing state having immense potential to grow the crop. The soils in this region are highly withered and essential cations are leached out due to high rainfall (Talukder, 1997). However, rubber responses well to fertilizer application, particularly where soils are deficient in nutrients. In a field experiment at Nayekgaon, Kokrajhar, Assam it was observed that rubber responded significantly to the higher doses of N and K but did not respond to P-fertilisation (Singh *et al.*, 1999). This is probably due to acidic nature of the soil, which is rich in aluminum and iron oxide, and thereby fixes the phosphorus as insoluble aluminum phosphate and iron phosphate. As a result, efficiency of P-fertiliser vis-à-vis availability of phosphorus to plants are reduced considerably. It was reported from the traditional rubber growing area that rubber needed regular dressings of P-fertilizers from the time of planting (Ananth *et al.*, 1966 and Potty *et al.*, 1976) for optimum plant growth and yield. Therefore, application of P-fertiliser is becoming an established essential agro-management practice for rubber cultivation. In acid soils, P-fixation capacity of soil could be minimized for economic crop production by applying insoluble forms of P-fertiliser like Mussorie Rock Phosphate (MRP) as it releases P very slowly but steadily. Response of *Hevea* towards application of different P-sources in this region has not been documented so far. So a field experiment was undertaken to study the effect of different source and combination of phosphatic fertilizers on growth and yield of *Hevea* grown in the hills of Assam.

MATERIALS AND METHODS

The field experiment was initiated in the year 1986 at the Sarutari farm (105msl, latitude 26°35',

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longitude 90°52' and average annual rainfall 1520 mm) of Regional Research Station, Rubber Research Institute of India, Guwahati using polybag plants of the clone RRIM 600 as the study material. The soil was deep, acidic in reaction and sandy clay loam in texture. The experiment was carried out with four treatments with five replications. The treatments were:

1.T1 = MRP; **2**.T2= MRP:SSP (1:1); **3**.T3 = SSP and **4**.T4 = No P (Control). The recommended doses of P (anon) were applied during the course of the study. A uniform dose of N and K were applied to all the plants. The design of the experiment was simple RBD. The net plants /plot were 15 with gross plant size 35. The field was partially mentioned with cover crops (*Pueraria phaseoloides*) and fertilizers were applied in two split doses i.e in April/May and September. Pre treatment girth data were recorded and soil samples were analyzed for nutrient content. After imposing the treatments, girth data at the height of 150 cm from bud union were recorded twice in a year. Composite soil and leaf samples from the treated plots were collected and analyzed for NPK content using standard analytical procedures. Though the plants were opened for tapping during 1995 but systematic yield recording were done from 1996. Cuplump Yield (g/t/t) under each treatment was recorded twice in a month and crop efficiency (g/cm) of the plants was calculated dividing length of tapping cut by mean yield (g/t/t).

RESULTS AND DISCUSSION

Mean girth data and girth increment of *Hevea* from 1986 to 1998 in different age groups are given in Table 1 and Table 2, respectively. A perusal of the data showed that no significant difference in girth increment was noticed for the phosphatic fertilizers tried in different form and combinations. Karthikakutty Amma (1980) also reported the similar observations from traditional rubber growing tract. The establishment of cover crops, mulching, litter accumulation and increased microbial activity under rubber plantation, may enhance the P-release from native soil. As a result, influence of P-fertilizer on growth was not reflected in this study period.

Effect of P-sources on yield is given Table 2. No significant increase in yield was noticed during first three years of tapping though treatment T1(MRP) was found numerically superior over other treatments and control. However, from 4th year of tapping, MRP (T1) effected a significant increase in yield over control and among the treatments. The reason can be

Table 1. Influence of Treatment on girth increment (cm).

Treatment	Juvenile period (1986-88)	Immature period (1988-94)	Mature period (1994-98)
T1	11.56	37.38	10.58
T2	12.07	37.69	10.81
T3	12.27	36.84	9.91
T4	11.64	35.88	10.13
SEm+	0.53	2.08	0.81
C.D.(5%)	NS	NS	NS

Table 2. Effect of P-sources on yield (g/t/t) of *Hevea*.

Treatment	1996	1997	1998	Mean yield (kg/ha/yr)	Crop efficiency (g/cm)
T1	40.38	43.10	57.03	1263	1.29
T2	40.87	40.02	50.26	1180	1.21
T3	38.41	39.41	52.83	1175	1.21
T4	37.07	35.47	45.61	1076	1.14
SEm+	1.28	2.35	2.39	40.76	0.03
C.D.(5%)	NS	NS	7.36	118.2	0.10

attributed to the fact that Rock Phosphate released the phosphorus very slowly but steadily. So, plants get the soil available phosphorus for a longer period of time. The data suggested that crop efficiency was significantly improved under treatments T1 (MRP) compared to other treatments, which could be attributed for higher yield. A progressive increase in yield (%) was noticed under MRP fertilization over control plot and among the treatments also, percentage increase in yield was found higher under treatment T1. From pretreatment soil data, it has been observed that soil available-P was found to be very low (0.12 mg/100gms of surface soils and 0.03 mg/ 100gms of sub-surface soils). Application of P-fertiliser increased the available-P status of soil irrespective of P-sources over control plots. The soil available-P value for surface soil was increased from 0.12 to 0.68 mg/ 100gms of soil and for sub-surface soil the value was increased from 0.03 to 0.26 mg/ 100gms of soil while the corresponding values under control plot were found 0.21mg and 0.08mg per 100 gms of soil respectively. However, a steady building up of soil available phosphorus was noticed due to continuous application of P-fertilizer but these values are still lower than the critical level fixed for rubber, which definitely call for proper P-fertilization for this non-traditional region. Data showed no significant difference in nutrient content with regard to P-fertilization both in the immature and mature period. Higher leaf nitrogen values were noticed under treated plants compared to control plants. This may be due to complimentary effect of phosphorus on nitrogen. However, leaves P & K content under treated plants were marginally higher than control plants.

The present study revealed that no significant difference in growth of rubber was obtained due to P-fertilizer application over control. Application of MRP (T1) effected higher yield during 4th year of tapping and increased the crop efficiency as well. Continuous application of P-fertilizer increased the soil available phosphorus. Rock phosphate can be used as a desirable fertilizer for rubber grown in the acid soils of Assam.

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