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A STUDY ON TWO RUBBER PRODUCING SOILS OF CHITTAGONG

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Abstract

Study of some chemical properties of Ramu and Raozan rubber gardens were done. Influence of topography, climatic conditions and local effects on the growth of the Hevea and latex production were also studied. A possible means for the management of the gardens has been suggested.

Introduction

The cultivation of Hevea in Bangladesh dates back to as early as 1956 when some seedlings of this cash crop was planted experimentally in the Chittagong Hill Tracts area of the country. Since then, it has gained a momentum and at present it has proved its worth as a good money earner. It has been reported that the latex being produced in the country ranks equal to the RRS-1 in its quality. There is a bright possibility of its being one of the foreign currency earners provided a judicious and proper emphasis is given upon the cultivation of this crop. It is a pity that the rubber gardens in the country are not properly cared for and are ill managed. The apparent increase in latex yield due to the increase in girth size of the crop every year is not the ultimate solution. An increase in latex yield per unit area of the girth size (tapped area) should be aimed at in the cultivation of this crop. This could be achieved only through proper fertilization and management of the gardens and development of the best clone suitable to the local soil and climatic conditions. This necessitates the evaluation of the nutrient status of the rubber producing soils after which proper fertilizer recommendations could be made. Unfortunately, there is no data available in this regard, not to speak of any fertilizer recommendations even.

Taking into considerations these facts, an ambitious project was taken up to make a preliminary investigation of the two rubber gardens of Ramu and Raozan areas of Chittagang to :

i. make an on the spot survey of the conditions of the gardens as it relates to its management practices ;

ii. see the influence of topography, climatic conditions and local effects (if any) on the growth of the Hevea and latex production ;

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iii. evaluate the nutrient status by chemical methods and correlate it with crop growth, and,

iv. suggest a possible means of the physical management of the gradens.

Materials and Methods

Six soil samples of the two rubber gardens were included in the study. The soils represented tow depths (0-6" and 0-12") which varied in their physical and chemical properties (Table 1). Mechanical analysis was done by hydrometer method as outlined by Piper (1966), and the texture was determined by the U.S.D.A. (1951) method; pH of the soils was determined by a corning glass-electrode pH meter at a soil : water ratio of 1 : 2.5; organic carbon by wet-oxidation method (Walkley and Black 1934); nitrogen by microkjeldahl distillation method (Bremner 1965); phosphorus by using a Coleman Junior II spectrophotometer after the development of blue colour in chlorostannous-reduced molybdophosphoric blue colour method in HCI system (Jackson 1958); potassium by using a EEL flame photometer and Ca and Mg by EDTA titration. Total iron was determined colorimetrically by developing red colour with orthophenanthroline (Shapire and Brenneck 1956) and manganese by developing permanganate colour with potassium periodate (Jackson 1958).

Table 1. Some characteristics of the soils

Soil	pH	Texture	Org. C.	Total Nitrogen	C/N ratio	CEC
(a) Ramu rubber garden						
Hill top	5.35	Sandy loam	.4586	.081	6.13	5.38
Slope	5.35	Sandy loam	.3050	.084	3.63	6.31
Basin	5.26	Sandy loam	.3010	.075	5.32	2.56
(b) Raozan rubber garden						
Hill top	5.13	Sandy clay loam	.594	.077	7.76	16.38
Slope	5.25	Sandy loam	.457	.056	7.77	16.90
Basin	5.28	Sandy loam	.274	.042	6.52	18.43

Results and Discussion

Research and experience in other countries growing rubber have shown that the growth and yield of rubber can be maximised by discriminate use of fertilizers. This objective can fully be achieved if the nutrient status of the soils is known. The nutrient status of a soil depends very

much on its chemical properties. Soils with different chemical properties generally differ in their ability to supply nutrients to the plants. Hence, similar responses to fertilizer treatments would be unlikely for plants grown on different soils. Chemical metheds are used for the evaluation of nutrient status of soils. Generally more than one methods are used for the purpose. Six different methods of extraction were used in the evaluation of the nutrient status of the two rubber gardens of Ramu and Raozan. The values were correlated with plant uptake (growth in the greenhouse) and the methods best related has been used as the index for avilability (Table 3).

The general nutrient status of the soils as is evident from the Tables 2 and 3 show that the soils of Ramu garden is superior to the soils of

Table 2. Total nutrient contents of the rubber soils

Soil	Nitrogen (%)	Phosphorus (%)	Potassium (%)	Calcium (%)	Magnesium (%)	Iron (%)	Manganese (%)
(a) Ramu							
Hill top	.084	.208	.539	1.04	·73	1.62	.59
Slope	.081	.225	.790	0.95	.59	1.62	.50
Basin	.075	.195	.669	0.96	.65	1.50	.44
Average	.080	.209	.666	0.98	.66	1.58	.51
(b) Raozan							
Hill top	.077	.220	1.102	0.80	.64	1.89	.55
Slope	.056	.213	1.070	0.90	.52	1.76	.48
Basin	.042	.187	1.120	1.10	.73	1.69	.55
Average	.058	.207	1.097	0.93	.63	1.78	.53

Table 3. Available nutrient contents of the rubber soils as extracted by different methods

Soil	Nitrogen (%) (N NaCl)	Phosphorus (ppm) (Morgan's reagent)	Potassium (%) (Ac. NaCl)	Calcium (%) (Ac. NaCl)	Magnesium (%) (Ac. NaCl)
(a) Ramu					
Hill top	.014	1.3	.013	.01	.011
Slope	.011	1.0	.011	.01	.005
Basin	.009	1.2	.009	.009	.004
Average	.011	1.2	.011	.02	.007
(b) Raozan					
Hill top	.007	1.0	.008	.013	.007
Slope	.008	1.3	.011	.021	.008
Basin	.006	1.5	.012	.023	.009
Average	.007	1.3	.01	.019	.008

Raozan garden as it relates to the organic matter content, amounts of total nitrogen, phosphorus, calcium and magnesium content. But in Raozan soils, total content of potassium is higher than that of Ramu soils.

Total nitrogen content of the hill top soils of both the gardens are higher than that of slope and basin soils. Similarly available nitrogen content was found to be higher in the soils of Ramu garden than those of Raozan garden (Table 3). The soils of the hill top of the Ramu garden and slope of the Raozan garden contain maximum amount of available nitrogen than basin soils. Higher content of available nitrogen in the Ramu soil is possibly due to the comparatively higher organic matter content which is related to its better topographic conditions.

Though the total phosphorus content is higher in the soils of the Ramu garnden the status of the available form of it is better in the Raozan garden soils (Table 3). The hill top and basin soils of Ramu garden and the basin soils of Raozan garden contain higher amounts of available phosphorus in relation to other soils.

Total potassium content of the soils of the Raozan garden is higher than that of Ramu garden. The higher amounts of total potassium was observed in the basin soil of Raozan garden and slope soil of the Ramu garden. Ramu soil is superior to the Raozan soil as regards the available potassium content (Table 3). Higher amounts of available potassium was observed in the hill top soil of the Ramu garden and basin soil of the Raozan garden.

Ramu soils contain higher amounts of total calcium and magnesium. Hill top soil of the Ramu garden and basin soil of the Raozan garden contain higher amounts of total calcium and magnesium. The soil of the Ramu garden is richer in available calcium while that of the Raozan garden is in magnesium.

The topography of the two gardens are different in respect to the slopes. The Raozan gardens are at a relatively higher elevation than the Ramu gardens. The general conditions of the plants were found to be better in the Ramu gardens. It was informed by the local sources that increase in moisture contents helps to increase the latex yield and the yield decreases with the advent of summer (a decrease in moisture). The trees producing more latex sheds the leaves earlier. On the other hand, it was also informed that latex production continues until the leaves are shed. Shedding of leaves could be checked, that is, latex production could be continued for a longer period provided water supply could be maintained. This estab-

lishes the fact that water is prime requirement in the latex production. The availability of water is regulated by the topography. About 32 per cent of the trees were found to be in good condition in the hill tops. All the other plants were either completely bare or about to shed their leaves. The trees in the basins and on the slopes were relatively better off. Plants on the eastern side of the hills were found to be in relatively better condition. The trees on the western side of the hills shed their leaves earlier. This indicates the influence of day-time temperature on the biosynthesis of the trees. That seasonal variation is a regulatory factor in the latex production is apprehended by these facts. A fungal disease (Moulterot) of the crops was reported in the Rumu gardens. The incidence of the disease becomes prominent during the rainy season and disappears in the dry season. Incessant rainfall and damp weather in this region may be the cause for it.

Considering the above facts, it is suggested that conservation of water can be well achieved by considering bench terraces and planting cover crops to conserve the water. The future plantations should be concentrated on the eastern side of the hills as far as practiceable. It was reported that the grafted plants gave higher yield than the other type of trees. It is probable that this variety of trees are best suited to the local conditions. However, this needs further research.

Table 4. Nutrient contents in leaves collected from the rubber gardens

Plants	Nitogen (%)	Phosphorus (%)	Potassium (%)	Calcium (%)	Magnesium (%)	Manganese (%)
(a) Ramu						
Hill top	2.15	.295	.815	.85	.651	.38
Slope	1.95	.282	.695	.75	.70	.28
Basin	1.95	.261	.715	.80	.62	.30
Average	2.016	.279	.742	.80	.656	.32
(b) Raozan						
Hill top	2.0	.283	.715	.95	.85	.40
Slope	1.72	.267	.612	.85	.65	.35
Basin	1.85	.263	.73	.94	.80	.35
Average	1.856	.271	.685	.916	.767	.367

The condition of the Raozan garden showed a miserable condion of its physical management. Nature has taken its own course in managing the gardens of this area. The soils of this garden are in their initial stages

of formation and the hills are steep too. This has accentuated the erosion of the top soil. This could be checked to a greater extent if proper cover crops were there. In some places, especially in the terraces, two-thirds of the plant roots were found to be exposed. Terraces are not controlled either. There are no cut—off and take—off systems. Gullys upto 3-4 feet wide and 4 feet deep are present in the basins which have been made by the eroding water. As a whole, all the gardens of Raozan area were found to be ill managed and kept uncared for. If this continues, it is obvious that the cultivation of Hevea in this area has to be abandoned. Moreover, the steep slope of the hillocks and the soil condition are not quite suitable for cultivation of this crop.

However, cultivation could be continued in this area provided good management and conservation practices are taken up along with fertilizer practices immediately without fail.

The case is a bit different with the Ramu gardens. The soils of the area are of the type which are less succeptible to erosion and, in fact, rate of erosion was found to be in the minimum here. The land slope of this area is gentle which has also contributed to the natural conservation of the gardens. No cover crop was found to be planted in this garden also. Proper cover crops need to be planted for the conservation and management of the soils of this garden.

It may be suggested that legume creepers and special type of grasses suited to these regions be planted as cover crops to check soil erosion and improve soil conditions. These crop could be used as fodder as well.

Recommendations

Considering the above mentioned facts, the following suggestions as given in the tabular form may be put forward for the fertilization and management of the two gardens studied.

Recommended doses for fertilizer trials of the rubber producing soils of the Raozan and Ramu rubber fields and their management practices.

1,	For seed bed : use Cox's Bazar Sand for seed bed—6″ inches deep		
2.	For nursery fertilizer mixture	N.P.K. (per cent)	Rate of application
	Ammonium sulfate	50 lbs.	add 100 lbs of the mixture to plots of 25 by 20 yds., 10-15 days before transplantations, after 3 months of planting, go on adding at the same rate with an interval of 2-3 months. add composted cowdung at the rate of 1 cartload per plot (25 by 20 yds.). add lime in the form of Dolomite at the rate of 20 lbs/plots (25 by 20 yds.) during land preparation.
	T. S. P.	26.4 lbs.10-12-10	
	Muriate of potash	20 lbs.	
	Filler	3.6 lbs.	
3.	For new plantations		
	1st year		
	Ammonium sulfate	30 lbs. 6-10-8	
	T. S. P.	22.22 lbs.	
	Muriate of potash	16 lbs.	
	Filler	31.78 lbs.	add the mixture at the rate of 4½ lbs per tree per year in three split doses. add lime : 8 ozs./tree. add 1 lb per tree in the field around the rest house of Ramu.
	2nd year		
	Ammonium sulfate	40 lbs. 8-10-10	
	T. S. P.	22.22 lbs.	
	Muriate of potash	20 lbs.	
	Filler	17.78 lbs.	
	3rd year		
	Ammonium sulfate	50 lbs. 10-10-10	
	T. S. P.	26.4 lbs.	
	Muriate of potash	20 lbs.	
	Filler	3.6 lbs.	
	4th year		
	Ammonium sulfate	60 lbs. 12-8-8	
	T. S. P.	17.6 lbs.	
	Muriate of potash	16 lbs.	
	Filler	6.4 lbs.	

4. For Matured plants (both tapped and untapped) for Raozan garden			
Ammonium sulfate	50 lbs.		add 8 lbs of the mixture per
T. S. P.	13.33 lbs.	10-7.5-7.5	tree by micro terracing or
Muriate of potash	15 lbs.		by the help of fertilizer spacer.
Filler	21.6 lbs.		add lime or basic slag at the rate of 8 ozs./tree. use oil cakes if available.
For Ramu			
Ammonium sulfate	50 lbs.		add 5 lbs of the mixture per tree.
T. S. P.	22.22 lbs.	10-10-12	add lime or basic slag 8 ozs./
Muriate of potash	24 lbs.		tree. use oil cakes if available.
Filler	3.78 lbs.		

Note : The application of the fertilizers in the new plantations and matured plantations should be made twice a year, i. e., duriug April-May and Sept.—Oct. Off period must strictly be followed during wintering. Para grass could be planted in the basins which are to be fertilized with NPK. Leguminous creepers like *Puerarta thaseoloids* (Bon kalai) and *Phaseolus mungo* (Kalo Kalai) can be used as cover crops in the gardens. In addition *Mikanta scandeas* may also be used as cover crops where incidence of sun grass is prominent.

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