Indian J. Hill Farmg. 14 (2) : 76 — 80 2001

AVAILABLE NUTRIENT STATUS OF THE RUBBER *(Hevea brasiliensis)* GROWING SOILS OF MEGHALAYA, MIZORAM, MANIPUR AND SOUTHERN PARTS OF ASSAM

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ABSTRACT

Available nutrient status of soil was studied for the rubber growing districts of Meghalaya (East Garo Hills, West Garo Hills and Ri Bhoi), Mizoram (Kolasib), Manipur (Churachandpur) and southern part of Assam (Karimganj, Cachar and Karbi Anglong). Soil test results were categorized as low, medium and high based on soil fertility ratings for rubber. Results revealed that the soil reaction (pH) ranged from very strong (4.50) to medium acidic (5.33). Nutrient index values showed that organic carbon content of Cachar (1.34) and Churachandpur (1.63) were low while it was medium for Karimganj (1.96), Karbi Anglong (1.82), Kolasib (2.14), Ri Bhoi (2.00) and East Garo hills (2.19) disricts. West Garo hills (2.38) showed high organic carbon content. Nutrient indices and fertility ratings for available phosphorus revealed that its status was low in all the places studied and its value ranged from 1.00 to 1.14. Available potassium status was medium for soils of the region and the nutrient indices varied from 1.72 to 2.28.

INTRODUCTION

The growing demand for natural rubber (NR) all over the world has emphasized the need for substantial increase in the total production of NR. Productivity enhancement alone cannot bridge the gap between production and consumption and the only alternative has been expansion of the area under the crop. In India, rubber cultivation till 1960s, was confined to the south west, mostly Kerala state, Kanyakumari district of Tamil Nadu and Andaman and Nicobar island, located between 8 to 12°N. Scope for expansion of the crop in this traditional belt is little due to non-availability of land. The only practical solution, therefore, has been extending rubber

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cultivation to non-traditional region like North East. The present area under rubber cultivation in Assam, Meghalaya, Manipur and Mizoram are 11644, 3863, 1610 and 543 hectares respectively (Rubber board, 2001). For establishment of rubber plantations and maintenance of yield at a sustained level, utmost care should be taken and adequate agro-management practices should be strictly followed. For adequate application of fertilizer and maintenance of good soil health. knowledge of soil fertility status of the area is of utmost importance. In this paper an attempt has been made to evaluate the available nutrient status of soils in the rubber growing districts of Meghalaya, Mizoram, Manipur and southern parts of Assam.

MATERIALS AND METHODS

Soil samples were collected from two depths (0.30 and 30-60cm) from the areas under ruber cultivation in Meghalaya (East Garo Hills, West Garo Hills and Ri Bhoi), Mizoram (Kolasib), Manipur (Churachandpur) and southern districts of Assam (Karimganj, Karbi Anglong and Cachar. Standard methods were followed for analysis of the soil samples (Jackson, 1973). After analyzing the samples, soil test values were categorized as low, medium and high for organic carbon, available phosphorus and potassium based on fertility ratings fixed for rubber as given in Table 1. Nutrient indices for organic carbon, available phosphorus and potassium were calculated using the formula given by Parker *et al* (1951). For interpretation of nutrient indices the limits suggested by Ramamoorthy and Bajaj (1969) were adopted.

RESULTS AND DISCUSSION

Soil reaction is acidic for all the places studied and ranged from very strong to medium (Table 2). Top layer (0.30cm) showed higher pH values than bottom layer (30-60cm) of soils for all the places studied. Soils from Meghalaya were less acidic compared to rest of the areas. Lowest pH was observed in the soils from Karimganj district of Assam. Organic carbon content of soils showed wide variation from place to place as well as with depth. The mean maximum organic carbon content of soil was observed in East Garo Hill district (1.82%) while Cachar district showed the minimum value (0.69%). Orgaic carbon content was observed as decreasing with increasing depth. Majority of soil samples from Cachar district (65.91%) tested low while in East Garo Hills disrict 58.47% samples tested medium and 30.51% tested high organic carbon content.(Table 3) Nutrient indices and fertility ratings (Table 4) showed that organic carbon content was low in Cachar and Churachandpur, medium in Karimganj, Karbi Anglong, Kolasib, Ri bhoi and East Garo Hills and high in West Garo Hills district. Places with previous history of *jhum* cultivation (shifting cultivation) showed lower range of organic carbon (Datta *et al*, 2001). Good cultural management practices including maintenance of leguminous cover crop (*Puereria phaseoloides, Mucana bracteata* etc.) in the immature phase of rubber cultivation was the reason for building up of organic matter in surface layer of soil (Krishna kumar *et al*, 1990).

Similar to organic carbon, available phosphorus too was observed to be higher in surface layer compared to subsurface layer (Table 2). Soil samples from all the places tested low for available phosphorus (Table 3 and 4). In most of the places

hundred per cent samples tested low in available phosphorus status. Only few samples from Karbi Anglong (7.55%), Silchar (4.54%), Ziribam (13.89%) and West Garo Hills (2.22%) showed medium level of available phosphorus. The low status of available phosphorus may be attributed to the acidic nature of the soil of the region with high iron and aluminum content and prone to fixation of applied phosphorus (Battacharya *et al,* 1998). Available potassim content in soils from all the places showed wide variations (Table 2). Though the nutrient index and fertility ranges lie in the medium ranges (Table 4) for all the places studied, still the variation was very wide in terms of per cent soil samples sowing low, medium and high available potassium content (Table 3). In Karimganj district, 44.30% samples showed low level of available potassium content followed by Silchar (34.09%) Majority of the samples from the region except Kargimganj showed medium level of available potassium. Highest percentage of samples showing high level of available potassium content was observed in Ziribam (38.89%) followed by East Garo Hills (32.20%). Dominance of 1:1 type of clay mineral (Kaolinite) in the soils of the region and the resultant leaching loss of native as well as applied potassium may be the reason for low available potassium content of the soil (Das *et al,* 1976).

Keeping in mind the wide variation in organic carbon, available phosphorus and potassium status of soils of the region, soil fertility management practices should be adopted with utmost care. Maintenance of leguminious ground cover crop should be encouraged during the immature phase of the crop for build up of soil organic matter as well as prevention of soil erosion due to rain water.

REFERENCES

Bhattacharya, T., Sarkar, D., Gangopadhyay, S.K., Dubey, P.N., Baruah, U., Chamuah, G.S., Mukhopadhyay, S., Nayak, D.E., Maji, A.K., Saxena, R.K., Arthwal. A. K. Krishna, N.D.R., Mandal, C., Sehgal, J., Bhowmik, K.K., Sinha, K., Chakrabarty, R., Nandi majumdar, S., Pal, P.K., Krishnakumar, A.K. and Seturaj, M.R. (1998). Soils of Tripura. I. Characterization and Classification.*Agropedilogy.* 8:47-54.

Das, D.K., Das, B. and Naskar, G.C. (1976). Acid soils of India, their genesis, characteristics and management. *Indian Society of Soil Science Bulletin,* 11:134-144.

Datta, M., Battacharya, B.K. and Saikh, H. (2001). Soil fertility-A case study of shifting cultivation sites in Tripura. *Journal of the Indian Society of Soil Science.* 49:104-109.

Jackson, M.L. (1973). Soil Chemical Analysis, Prentice Hall of India Private Ltd., New Delhi. PP 484

Krishnakumar, A.K., Gupta, C., Sinha, R.R., Sethuraj, M.R., Potty, S.N., Eappen, T. and Das, K. (1990). Ecological impact of rubber *(Hevea brasiliensis)* plantations in North East India. 2 Soil properties and biomass recycling. *Indian Journal of natural Rubber Research.* 3:53-63.

Parker, F.W., Nelson, W., Winter, E. and Miles, I.E. (1951). The broad interpretation and application of soil test information. *Agronomy Journal,* 43:105-112

Ramamoorthy, B. and Bajaj, J.C. (1969) Soil fertility maps of India. *Fertilizer News.*. 14:25-36.
Rubber Board (2001). Rubber and its cultivation. P74.

Table 1- Soil fertility ratings for rubber

Nutrient	Low	Medium	High
Organic Caron (%)	<0.75	0.75-1.50	>1.50
Phosphorus (mg/100g)	<1.00	1.00-2.50	>2.50
Potassium (mg/100g)	<5.00	5.00-12.50	>12.50

Table 3 - Percent soil sample categorized as low (L), medium (M) and high (H)

Location	Depth	Organic Carbon			Phosphorus			Potassium		
	(cm)	L	M	H	L	M	H	L	M	H
Karimganj	0.30	13.92	75.95	10.13	100	0	0	44.30	39.24	16.46
	30-60	65.82	30.38	3.80	100	0	0	59.49	24.05	16.46
Cachar	0.30	65.91	34.09	0	95.45	4.50	0	34.09	45.45	20.45
	30-60	84.09	15.91	0	100	0	0	43.18	38.64	18.18
Karbi Anglong	0-30	29.24	59.43	11.32	92.45	7.55	0	13.21	54.72	32.08
	30-60	50.00	44.34	5.66	96.23	3.77	0	19.81	64.15	16.04
Churachandpur	0-30	44.44	48.61	6.94	86.11	13.89	0	22.22	38.89	38.89
	30-60	65.28	34.72	0	97.22	2.78	0	27.78	36.11	36.11
Kolasib	0.30	1.16	83.72	15.12	100	0	0	0	79.07	20.93
	30-60	16.17	81.40	2.33	100	0	0	4.65	84.88	10.47
Ri Bhoi	0-30	5.88	88.24	5.88	100	0	0	11.76	64.71	23.53
	30-60	47.05	52.94	0	100	0	0	0	76.47	23.53
East Garo Hills	0-30	11.02	58-47	30.51	100	0	0	4.24	63.56	32.20
	30-60	12.71	77.73	13.56	100	0	0	7.63	72.88	19.49
West Garo Hills	0-30	2.22	57.78	40.00	97.78	2.22	0	7.77	66.67	25.56
	30-60	18.89	65.56	15.56	100	0	0	12.22	65.56	22.22

Table 4 Nutrient indices and fertility ratings

Locaton	Nutrient Index			Fertility Rating		
	O.C.	P	K	O.C.	P	K
Karimganj	1.96	1.00	1.72	M	L	M
Cachar	1.34	1.05	1.86	L	L	M
Karbianglong	1.82	1.08	2.19	M	L	M
Churachandpur	1.63	1.14	2.17	L	L	M
Kolasib	2.14	1.00	2.21	M	L	M
Ri Bhoi	2.00	1.00	2.12	M	L	M
East Garo Hills	2.19	1.00	2.28	M	L	M
West Garo Hills	2.38	1.02	2.18	H	L	M

Table 2. Mean values and ranges of soil available nutrients and pH

Location	NO.	Depth	O.C. (%)	P (mg/100g)	K (mg/100g)	pH
Location	224	0.30	1.03 (0.42-2.19)	0.20(0.01-0.68)	8.36 (3.00-32.25)	4.58 (4.13-5.05)
		30-60	0.72 (0.21-1.75)	0.15(0.01-0.50)	7.54 (2.70-29.00)	4.50 (4.17-5.10)
Cachar	216	0-30	0.69 (0.32-1.52)	0.32 (0.01-1.50)	9.08 (3.10-24.50)	4.61 (4.12-5.17)
		30-60	0.50 (0.31-1.01)	0.24 (0.01-0.60)	8.38 (3.10-26.00)	4.65 (4.12-5.23)
Karbi Anglong	172	0.30	1.00(0.20-1.95)	0.39(0.01-1.25)	11.22 (3.40-31.75)	4.92 (4.20-5.90)
		30-60	0.79 (0.20-1.95)	0.25 (0.01-1.20)	10.19(3.00-29.00)	4.76(3.94-5.75)
Churachandpur	196	0-30	0.85(0.41-1.82)	0.50 (0.01-1.58)	10.10(3.10-22.50)	4.77(4.08-5.70)
		30-60	0.64(0.30-1.50)	0.36(0.01-1.14)	9.26(3.10-20.50)	4.57(4.03-5.70)
Kolasib	172	0-30	1.24(0.75-2.27)	0.31(0.01-1.30)	10.20(5.50-18.00)	4.80(4.13-5.72(
		30-60	1.00(0.41-1.55)	0.22(0.01-0.90)	8.54(4.80-16.20)	4.76(4.30-5.90)
Ri Bhoi	112	0-30	1.03(0.57-1.59)	0.10(007-0.15)	10.89(4.20-19.50)	5.19(4.75-5.73)
		30-60	0.72(9.45-0.91)	0.05(0.01-0.08)	9.58(5.80-13.60)	5.07(4.85-5.36)
East Garo Hills	236	0-30	1.82(0.98-2.57)	0.25(0.01-0.68)	12.50(7.70-19.60)	5.33(4.54-5.97)
		30-60	1.25(0.60-2.04)	0.14(0.01-0.67)	9.64(5.50-18.50)	5.01(4.42-5.83)
West Garo Hills	248	0-30	1.42(0.68-2.90)	0.34(0.01-1.10)	10.32(3.00-20.00)	5.03(4.15-5.86)
		30-60	1.11(0.44-2.40)	0.27(0.01-0.98)	9.17(3.60-20.00)	4.94(4.34-5.92)