Indian Journal of Natural Rubber Research, **13**(1&2) : 111-113, 2000

RESPONSE OF YOUNG *HEVEA* TO NPK FERTILIZERS IN THE EAST GARO HILLS OF MEGHALAYA

The rubber tree (*Hevea brasiliensis*) is known to respond well to fertilizer application (Dijkman, 1951; Owen *et al.*, 1957; Bolton, 1960). In India, traditional rubber growing tract extends from Kanyakumari District in Tamil Nadu (8°N) to Dakshin Kannada District in Karnataka (12°N). Of late, more and more marginal and depleted lands are being brought under rubber cultivation warranting proper soil and nutrient management for optimum plant growth and productivity. This is particularly important for the north-eastern region where the soil is highly depleted and deficient in nutrients due to the shifting cultivation practised over several years. The situation is further aggravated by the routine practise of cutting and removal of thatch grass (Laskar *et al.*, 1983). Leaching loss of essential cations due to high rainfall also results in low soil nutrient status. Application of NPK fertilizers improves growth during immature phase and reduces the gestation period (Dijkman, 1951; Owen *et al.*, 1957). The present investigation was taken up to monitor the influence of different levels and combinations of nitrogen (N), phosphorus (P) and potassium (K) on growth of *Hevea* during immature phase of rubber trees grown in Meghalaya.

A field experiment was laid out in Mendipather, East Garo Hills, Meghalaya, 150 km away from Guwahati during 1986. The area is situated at an elevation of 105 m above msl and receives about 2000 mm rainfall annually. Nine month-old polybag plants of the clone RRIM 600 were used as the planting material. The trial was laid out in a factorial RBD having twenty-seven treatments with two replications. The treatments consisted of three levels each of N (0, 30 and 60 kg N per ha), P (0, 30 and 60 kg P_2O_5 per ha) and K (0, 20 and 40 kg K_2O per ha) in two splits. The fertilizers were applied during May and September and routine cultural operations were carried out as per standard recommendations. Girth recordings were carried out periodically.

The data on girth during the initial five years are presented in Table 1. There was significant increase in girth of the tree with increasing doses of N for all the five years. A significant difference in girth of 9.7 cm was observed in the fifth year between plants which received highest doses of N and those without N. The plants registered an average girth increment of 18.5 cm over five years while the corresponding values for plants receiving 0, 30 and 60 kg N per ha were 15.42, 18.13 and 22.55 cm respectively. This indicates that a high dose of added N was beneficial during early establishment of *Hevea*. Similar results have also been reported by Krishnakumar and Potty (1989) and Punnoose *et al.* (1994).

Beneficial effects of the application of P and K were observed only during the initial two years. The response to P application in the initial two years might

Table 1. Effect of fertilizers on girth of young rubber trees in Meghalaya

Treatment (kg/ha)	Mean girth (cm) at the end of First year	Second year	Third year	Fourth year	Fifth year	Girth increment (cm)
Nitrogen (N)						
0	9.90	13.09	15.81	20.37	25.32	15.42
30	10.81	14.10	17.89	22.75	28.94	18.13
60	12.44	16.90	22.22	28.69	34.99	22.55
Sem ±	0.13	0.27	0.49	0.81	1.02	0.55
CD (P ≤ 0.05)	0.36	0.74	1.36	2.25	2.85	1.56
Phosphorus (P_2O_5)						
0	10.74	14.21	18.23	24.17	30.26	19.52
30	11.13	14.83	18.52	24.02	28.68	17.55
60	11.29	15.04	19.18	24.63	30.68	19.39
Sem ±	0.13	0.27	0.49	0.81	1.02	0.55
CD (P ≤ 0.05)	0.36	0.74	NS	NS	NS	1.56
Potassium (K_2O)						
0	10.66	14.20	18.37	24.34	29.18	18.32
20	11.12	14.72	18.85	25.63	30.99	19.88
40	11.19	14.97	18.72	25.26	29.66	18.77
Sem ±	0.13	0.27	0.49	0.81	1.02	0.55
CD (P ≤ 0.05)	0.36	0.74	NS	NS	NS	1.56
NP, NK & PK						
Sem ±	0.11	0.09	0.31	0.78	0.90	1.05
CD (P ≤ 0.05)	0.31	0.24	NS	NS	NS	NS

be due to the water soluble nature of the P fertilizer as observed earlier by Krishnakumar and Potty (1989). After the initial period of two years an overall improvement in P status in soil was observed. In the initial two years response to K application was statistically significant and highest mean girth was recorded at 40 kg K_2O per ha (14.97 cm). But afterwards the effect of K application on girth was not significant and numerically higher girth values were recorded at 20 kg K_2O per ha level. Interactions of NxP, NxK and PxK on growth were found significant only for the first two years and were non-significant in the following years.

The pre-treatment soil analytical data (Table 2) showed that the available P status was very low. Organic carbon and available K were found medium to high. After five years, soil analysis from individual plots showed that with P application, the status of available P increased significantly, especially in surface soil. The organic carbon and available K status remained at the same level while available Ca and Mg status improved. Soil pH was found to increase marginally. Besides the effect of nutrient application, improved nutritional status of soil can also be attributed to accumulation of good amount of litter and its subsequent decomposition as reported earlier (Krishnakumar and Potty, 1989).

The present results indicated a response to N application up to 60 kg per ha. Since the response to application of P and K were not continuous, an insurance dose of 30 kg P_2O_5 and 20 kg K_2O per hectare can be recommended

Table 2. Effect of N, P and K on available nutrient status and pH over five years

Treatment (kg/ha)	Organic carbon (%)		Available nutrient (mg/100 g soil)								pH (1:2.5)	
			P		K		Ca		Mg			
	A	B	A	B	A	B	A	B	A	B	A	B
Pre-treatment	1.18	0.97	0.15	0.10	9.2	12.5	8.8	7.8	2.55	3.04	4.52	4.42
Nitrogen (N)												
0	1.22	0.94	0.72	0.19	13.87	11.32	12.11	6.04	4.48	3.38	5.08	4.95
30	1.31	0.96	0.30	0.16	12.00	11.01	5.92	5.09	3.46	3.21	4.91	4.82
60	1.38	0.98	0.59	0.20	11.88	10.52	7.06	4.47	3.81	3.13	4.90	4.82
Sem ±	0.012	0.014	0.13	0.015	0.25	0.11	0.23	0.018	0.25	0.08	0.43	0.46
CD (P ≤ 0.05)	0.038	0.043	0.38	0.043	0.72	0.30	0.69	0.053	0.72	0.25	NS	NS
Phosphorus (P_2O_5)												
0	1.19	0.87	0.26	0.13	12.23	11.08	6.78	4.71	3.63	6.17	4.92	4.86
30	1.20	0.90	0.50	0.16	12.29	10.14	8.96	5.38	4.36	3.41	5.09	4.96
60	1.37	1.09	1.32	0.46	13.23	11.63	9.35	5.52	3.76	3.14	4.95	4.78
Sem ±	0.012	0.014	0.13	0.015	0.25	0.11	0.23	0.018	0.25	0.08	0.43	0.46
CD (P ≤ 0.05)	0.038	0.043	0.38	0.043	0.72	0.30	0.69	0.053	0.72	0.25	NS	NS
Potassium (K_2O)												
0	1.22	0.86	0.21	0.13	10.08	8.99	8.50	5.59	3.96	3.36	5.05	4.97
20	1.26	0.96	0.62	0.18	12.78	10.84	7.84	4.71	3.96	3.12	4.92	4.86
40	1.28	1.02	0.84	0.22	14.88	13.02	8.64	5.30	3.82	3.24	4.94	4.77
Sem ±	0.012	0.014	0.13	0.015	0.25	0.11	0.23	0.018	0.25	0.08	0.43	0.46
CD (P ≤ 0.05)	0.038	0.043	0.38	0.043	0.72	0.30	0.69	0.053	0.72	0.25	NS	NS

A : 0-30 cm depth; B : 30-60 cm depth

during the immature phase of rubber grown in East Garo Hills of Meghalaya.

We wish to record our deep appreciation to Dr. Y.A. Varghese, former Project Co-ordinator, NERC, Agartala for encouragement and Dr. K.I. Punnoose, Deputy Director (Agronomy/Soils), RRII, Kottayam for helpful discussion.

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