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INFLUENCE OF NPK FERTILIZERS ON EARLY GROWTH OF RRII 400 SERIES RUBBER CLONES IN TRIPURA

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Growth performance of high yielding RRII 400 series clones of rubber (*Hevea brasiliensis*) viz. RRII 417, RRII 429 and RRII 430 with RRIM 600 as the check clone, was studied during 2004-2011 under the agro-climatic conditions of Tripura. Influence of higher doses of NPK fertilizers on growth of these clones during immature phase of plantation was also investigated. At the end of the seventh year of planting, the clone RRII 429 registered highest girth (51.5 cm) followed by RRIM 600 (49.6 cm) and the clone RRII 417 (47 cm) was the lowest. Highest tappability was observed for the clone RRII 429 (67.1%), while on other three clones it ranged from 47.7 to 60.1 per cent. The clone RRII 429 showed significant response towards application of NPK fertilizers. At the end of sixth year of planting, the clone RRII 429 registered a mean girth of 50.6 cm and 73.3 per cent plants attained tappable girth when 150 per cent of recommended NPK doses were applied. The other three clones required seven years or more to attain a mean girth of 50 cm and 70 per cent tappability. The result showed that immaturity period of RRII 429 could be reduced by six months to one year by applying higher doses of NPK. Application of higher doses of NPK fertilizers in soils showed a significant improvement in organic carbon (OC) and available phosphorus, particularly in the surface layer; however a gradual decline in available potassium-balance was recorded in rubber soils indicating potassium vulnerability of soils under rubber in Tripura.

Keywords: Fertilizer dose, Growth, Rubber clones, Soil fertility, Tappability, Tripura

INTRODUCTION

In India, rubber is traditionally grown in south-western parts, mostly in the states of Kerala and Tamil Nadu (Kanyakumari district). However, due to the increased demand for natural rubber and non-availability of land in the traditional regions, rubber cultivation has been extended to north-eastern states of India, particularly in the state of Tripura (20-28^0 N Latitude) where large scale plantations were established, mostly by small holders, from1980s. Majority of the soils under rubber in Tripura were once subjected to shifting cultivation, which essentially involves burning of organic matter. As a result, organic carbon content of the soils is low and they are poor in nutrient status. Again due to high rain-fall, essential cations are leached out, which further reduces the soil fertility. Because of this reason, plant growth and crop yield in this location are low in comparison to the

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traditional rubber growing belt. Therefore, regular application of fertilizer is necessary for maintaining the soil fertility at desired levels and to obtain optimum growth and yield of rubber (Krishnakumar and Potty, 1989). However, adoption of a generalized fertilizer recommendation for rubber may cause imbalance in the available nutrients, mainly because of the inherent variation in soil nutrients in different locations (Potty *et al.*, 1976; Yogaratnam *et al.*, 1984; Singh *et al.*, 1999 and Meti *et al.*, 2002). Similarly, clonal differences also exist in the fertilizer requirement (Shorrocks, 1965; George *et al.*, 1997 and Mandal *et al.*, 2003). Since more and more marginal and degraded lands are brought under rubber cultivation in north-eastern states, gestation period of crop is often found longer than traditional rubber growing tract (Mandal *et al.*, 1999; Reju *et al.*, 2001). Recently, Rubber Board of India has released few more high yielding clones (RRII 400 series) developed by Rubber Research Institute of India (RRII) for commercial planting. Some of these clones are now planted in Tripura. Growth performance and nutrient management of these clones are under investigation. It is felt that nutrient requirement of these high yielding clones will be more than the existing clones. With this background, the present field experiment was initiated to evaluate the growth performance of three high yielding RRII 400 series clones of rubber *viz.* RRII 417, RRII 429 and RRII 430 under the agro-climatic condition of Tripura. Response of these clones towards application of higher doses of inorganic fertilizers was also investigated in order to ascertain their NPK requirement during early growth phase. Influence of fertilizer application on soil fertility status and leaf nutrient content was also investigated.

MATERIALS AND METHODS

The experiment was laid out in the research farm of Regional Research Station, RRII, Taranagar, Agartala ($23^0 57'$N & $91^0 28'$E) during 2004 with three clones of RRII 400 series *viz.* RRII 417, RRII 429, RRII 430 and the clone RRIM 600 as the check clone. The design of the experiment was factorial RBD, with 25 plants as the gross plot size. Spacing of plants was 4.9m x 4.9m and observations were taken from the inner nine plants leaving guard rows on all sides. Five NPK doses were tested and the treatments were designed based on the present recommended dose of fertilizer (RDF: Table 1). The details of the treatments are as under:

T1 = Control (no fertilizer)

T2 = 50% of recommended dose of fertilizer (RDF)

T3 = 100% of RDF

T4 = 150% of RDF

T5 = 200% of RDF

Urea, Mussori rock phosphate (MRP) and muriate of potash (MOP) were used as the sources of N, P_2O_5 and K_2O, respectively. Fertilizers were applied twice in a year during May and September. *Pueraria phaseoloides* was established in the field as

Table 1. **Recommended dose of NPK (kg ha^{-1}) during immature phase of rubber plantation in Tripura**

Year	N	P_2O_5	K_2O
First year	14	14 (7)*	7
Second year	50	50 (25)*	25
Third year	65	65	35
Fourth year	50	50	25
Fifth to seventh year	35	35	35

*during initial two years, MRP and SSP were applied in 1:1 as the source of phosphorus ground cover. Plant girth was recorded twice in a year at a height of 25 cm from bud union during the initial two years. Afterwards girth was recorded at a height of 150 cm from bud union. Before planting, soil samples were collected from two depths (0-30 cm and 30-60 cm) and analyzed for pH, OC, available P and K by standard analytical procedures. Soil and leaf samples were collected at the end of 5th and 7th year of planting and nutrient contents determined. The data were statistically analyzed using SPSS software.

RESULTS AND DISCUSSION

Growth of plants

Data pertaining to mean girth of the clones during immature phase of plantation (3rd to 8th year) are presented in Table 2. During the early stages of growth (up to 3rd year), no significant difference in girth was observed between the clones. Initial vigor in girth was observed for the clone RRII 417 which could be due to higher pre-treatment values. However, from 4th year onwards, a significant difference in girth was observed among the clones and the clone RRII 429 registered the highest mean girth. At the end of 7th year, mean girth of the clones ranged from 47.0 to 51.4 cm and the clone RRII 429 attained highest girth whereas RRII 417 registered the least. The difference in girth was in the tune of 4.4 cm. A significant difference in girth increment was also observed among the clones during the study period. The clone RRII 429 registered a mean girth increment of 48.2 cm over a period of

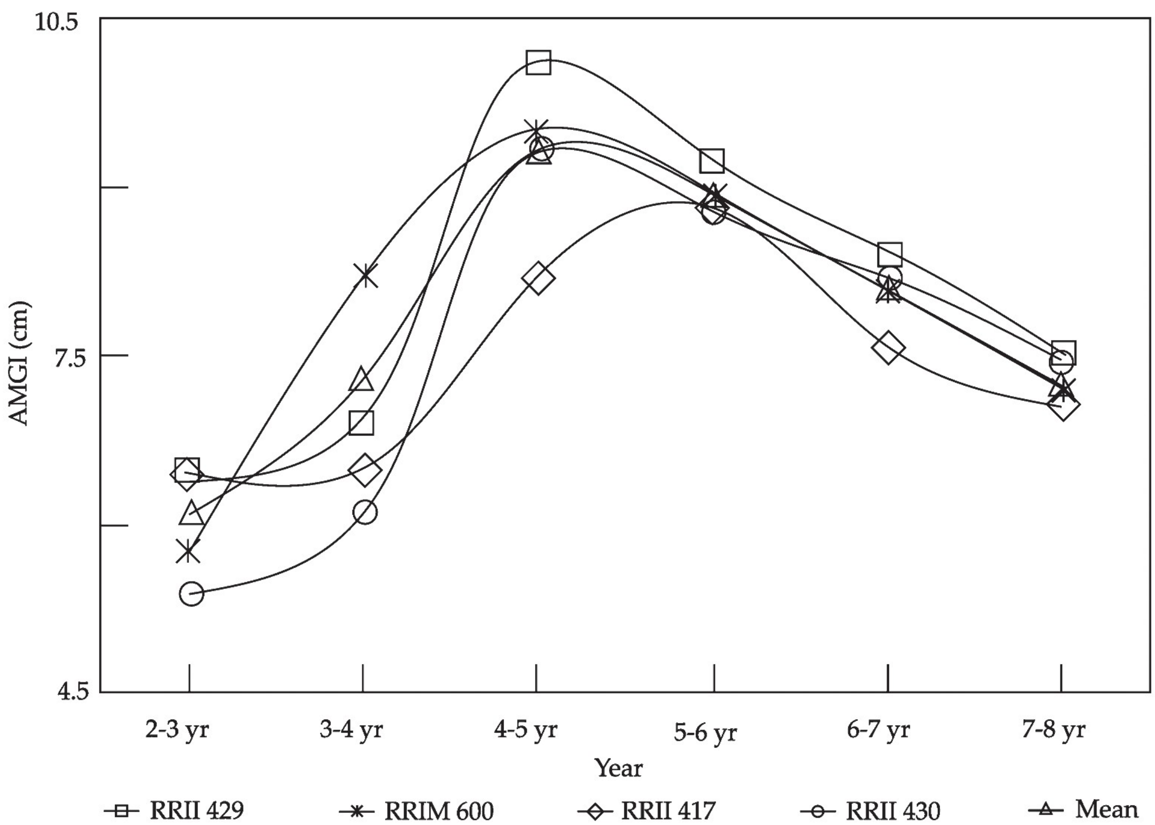

Fig. 1. Girth increment of the clones of rubber during immature phase

Table 2. **Influence of different fertilizer doses on girth of different clones of rubber during immature phase**

Clone	Fertilizer treatment	Girth of plants (cm)					
		3rd year	4th year	5th year	6th year	7th year	8th year
RRII 417	T1 (Control)	12.8	17.3	22.1	30.3	37.5	43.1
	T2 (50% RDF)	18.9	26.9	33.2	41.3	48.1	53.1
	T3 (RDF)	20.2	27.8	35.2	42.8	49.2	54.9
	T4 (150% RDF)	19.5	24.6	31.7	41.9	48.5	53.8
	T5 (200% RDF)	24.5	32.5	38.5	43.5	51.8	55.9
	Mean	19.2	25.8	32.1	39.9	47.01	52.1
RRII 429	T1 (Control)	14.9	23.8	30.8	40.1	46.8	52.3
	T2 (50% RDF)	17.5	25.7	35.1	43.7	48.6	53.8
	T3 (RDF)	21.4	29.7	37.5	44.9	51.5	55.6
	T4 (150% RDF)	23.4	35.2	41.4	50.6	55.9	60.5
	T5 (200% RDF)	25.7	33.9	40.8	48.4	54.4	57.6
	Mean	20.6	29.7	37.1	45.6	51.4	55.9
RRII 430	T1 (Control)	15.3	21.1	26.3	35.1	43.2	46.9
	T2 (150% RDF)	17.8	26.1	32.2	39.1	46.5	49.9
	T3 (RDF)	17.6	27.4	35.9	42.2	50.2	54.2
	T4 (150% RDF)	18.9	27.6	37.6	44.6	52.4	56.1
	T5 (200% RDF)	22.8	31.4	39.7	47.2	54.1	57.2
	Mean	18.5	26.7	34.3	41.6	49.2	52.8
RRIM 600	T1 (Control)	15.8	26.5	32.1	38.8	43.8	48.6
	T2 (150% RDF)	18.3	29.1	36.5	43.2	48.3	51.5
	T3 (RDF)	17.5	29.9	37.3	44.5	51.9	54.5
	T4 (150% RDF)	18.6	31.9	37.1	43.5	50.1	54.8
	T5 (200% RDF)	19.3	32.7	38.3	45.6	52.7	55.7
	Mean	17.9	30.01	36.2	43.1	49.6	52.9
CD(P<0.05)							
Clone(C)		NS	1.58	2.12	2.36	2.97	3.12
Fertilizer(F)		1.85	2.17	2.73	3.19	3.34	3.48
C x F		NS	NS	NS	NS	NS	NS

RDF - recommended dose of fertilizer

NS - Not significant

seven year. The corresponding values for RRII 417, RRII 430 and RRIM 600 were 42.6, 44.6 and 45.2 cm, respectively. The data also revealed that all the clones except RRII 429 attained tappable girth of 50 cm only after 8th year of plantation. The general trend in annual mean girth increment (AMGI) is presented in Fig. 1. The clone RRIM 600 showed an early peak in girth from 3rd to 4th year and continued a steady increment in girth up to 5th to 6th year. Thereafter, its annual mean girth increment began to decrease. The clone RRII 417 showed an early vigor in girth during juvenile period (1st to 2nd year). After that, its rate of girth increment was less compared to other three clones and showed a peak in girth during 5th to 6th year of plantation. The clone RRII 429 and RRII 430 showed a similar trend in AMGI and registered a peak in girth increment during 4th to 5th year and thereafter, a decline was observed. Incidentally after 8th year of plantation, annual girth increment of all the clones coincide in the same point of the graph indicating that once the canopy of the plants were closed, annual girth increment of the plants became stabilized, irrespective of clones.

Tappability

Tappability (%) of plants was computed based on the percent of plants attaining trunk girth of 50 cm at a height of 150 cm from bud union. A trunk girth of 50 cm is important for opening the plants for commercial exploitation and at least 70 per cent plants of a given population should attain 50 cm girth for this purpose. At the end of 6th year, tappability of clones ranged from 25.7 to 5.9 with a mean value of 39.2 per cent while at the end of 7th year, tappability of the clones varied from 47.8 to 67.1 with a mean value of 58.1 per cent. It

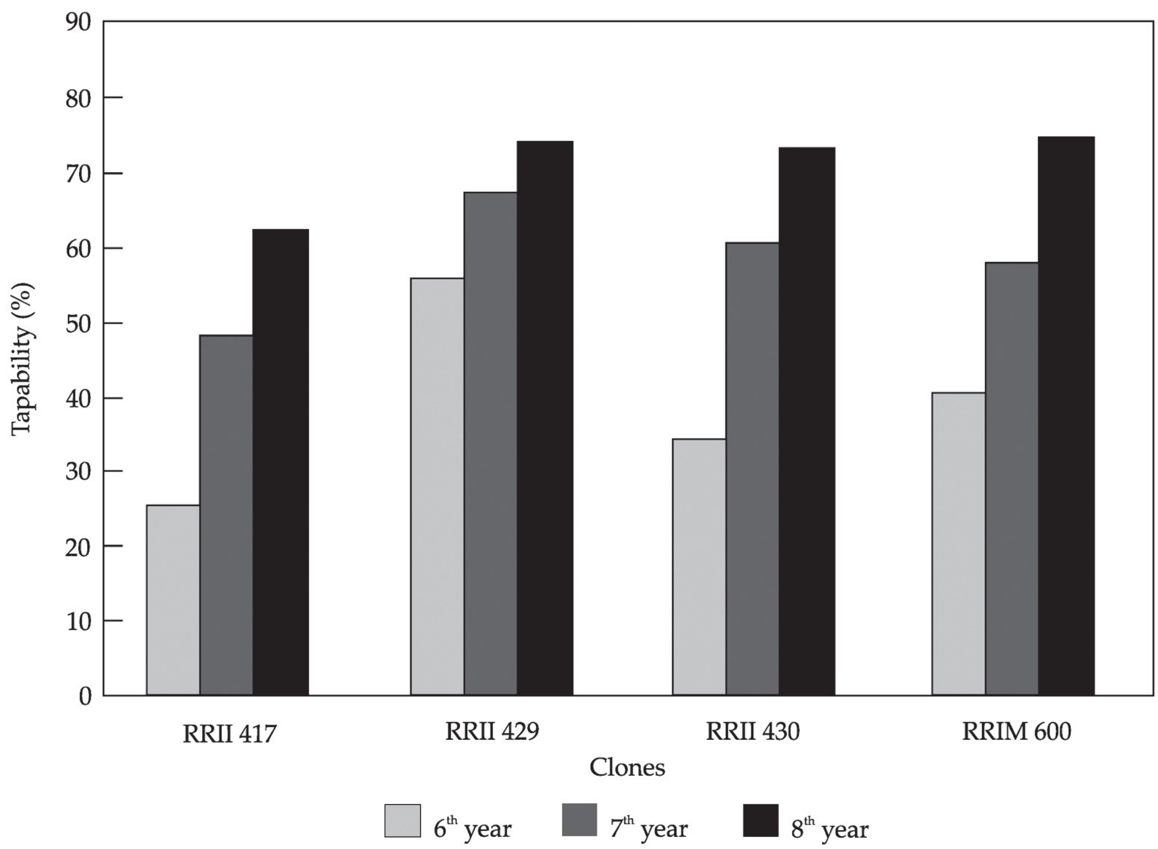

Fig. 2. Average tappable plants (%) of different clones of rubber (6th to 8th year after planting)

Table 3. **Influence of fertilizer doses on tappability of rubber clones**

Clone	Fertilizer dose	Tappability ((%)		
		6th year	7th year	8th year
	T1(Control)	2.0	21.8	32.3
	T2 (50% RDF)	23.7	42.5	63.4
RRII 417	T3 (100% RDF)	35.3	55.8	68.8
	T4 (150% RDF)	35.0	58.2	72.1
	T5 (200% RDF)	32.3	60.5	75.3
	T1(control)	32.7	45.4	57.6
	T2 (50% RDF)	48.0	56.8	64.3
RRII 429	T3 (100% RDF)	62.1	76.2	79.5
	T4 (150% RDF)	73.3	80.6	85.2
	T5(200% RDF)	63.6	76.5	82.6
RRII 430	T1(control)	14.3	42.5	54.3
	T2 (50% RDF)	28.4	51.7	66.3
	T3 (100% RDF)	34.6	67.5	77.1
	T4 (150% RDF)	46.2	68.8	80.0
	T5 (200% RDF)	48.6	70.2	87.6
	T1(control)	14.5	34.3	56.6
	T2 (50% RDF)	30.2	52.8	70.5
RRIM 600	T3 (100% RDF)	58.2	68.9	81.3
	T4 (150% RDF)	52.6	64.5	78.6
	T5 (200% RDF)	48.3	66.8	85.0

RDF = Recommended Dose of Fertilizer

was observed that the clone RRII 429 registered highest percentage of tappable girth (67.1%) among the clones within a period of seven years. The corresponding values for RRII 417, RRII 430 and RRIM 600 were 47.8, 60.1 and 57.4 per cent, respectively (Fig. 2). In the present study, no clone attained the benchmark of 70 per cent tappability for commercial exploitation of the trees, though the clone RRII 429 attained 67.1 per cent tappability in seven years. The reason could be attributed to poor soil nutrient status beside other abiotic stresses *viz.* low air temperature and soil moisture during winter months which warrants proper agro-management schedule. Due to this reason, immaturity period for rubber in this region is often found to be longer by six months to one year. In this experiment also, 71 per cent plants attained the tappable girth of 50 cm only after eight years of planting. The above result supported the previous findings of Mandal *et al.* (1999) and Reju *et al.* (2001).

Influence of fertilizer on girth of plants

A perusal of the pooled data on growth of rubber plants as influenced by different doses of NPK (Table 2) revealed that application of higher doses of fertilizer registered a significant increase in mean girth of the plants from 3rd year onwards. A mean girth difference of 10 cm was observed between the plants receiving highest doses of NPK (T5 = 53.1 cm) and control (T1 = 43.1 cm) over a period of seven years. Tappability of plants during this period ranged from 36.1 to 68.5 per cent. It was also observed that tappability of plants was not significantly improved due to application of higher doses of fertilizer (T4 and T5) over the recommended dose of fertilizer (T3). Hence, additional application of NPK may not be beneficial for the plants after a certain period of time (Mandal *et al*., 2011). It was also observed that the treatment T4 (150% RDF) and T5 (200% RDF) effected higher girthing of plants during 3rd to 5th year of planting but their effect on girth was subsidized during late immaturity period which could be attributed to improve soil fertility status under rubber through cover crop, leaf-litter addition and release of nutrients. The result suggested that nutrient demand for the crop is higher during early immaturity period (3-5 years). It was also observed when fertilizer was not applied (T1), growth of rubber plants was affected

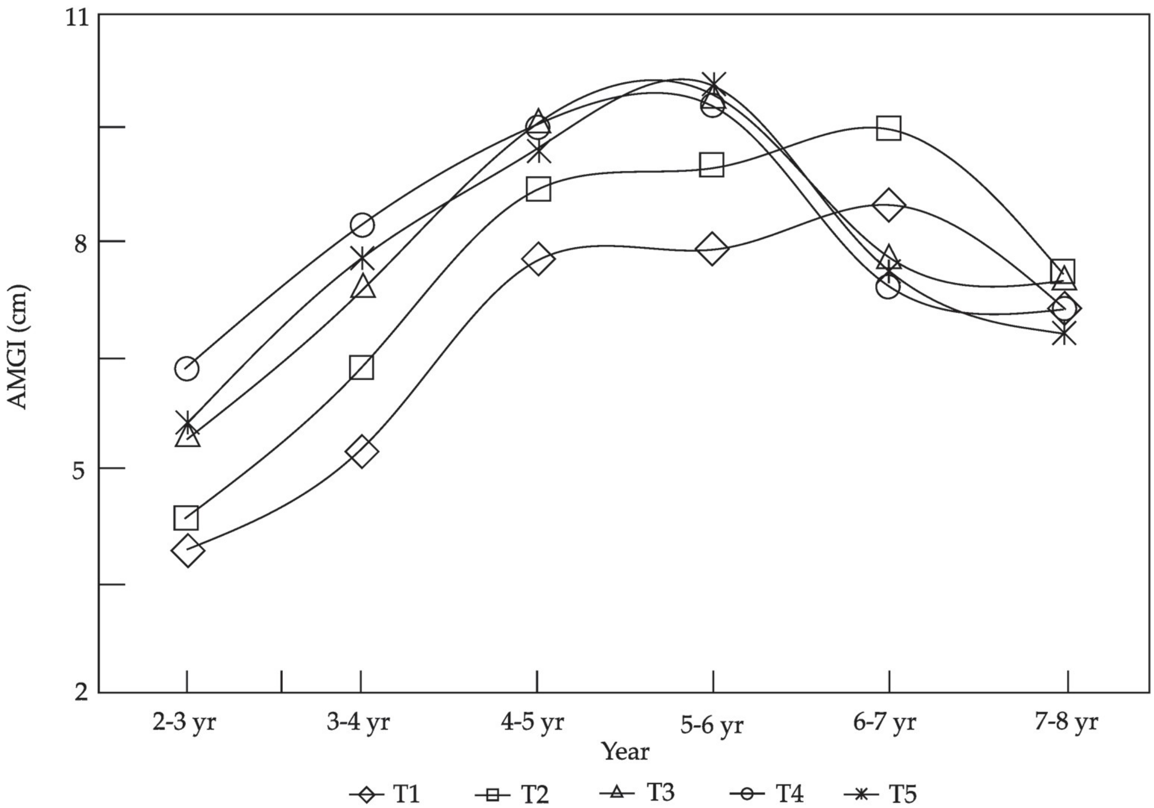

Fig. 3. Annual mean girth increment (AMGI) trend of rubber as influenced by fertilizer doses

and at the end of 8th year of planting, only 50 per cent plants attained tappable girth. Influence of fertilizer doses on AMGI of the plants is shown in Fig. 3. Data revealed that application of higher doses of fertilizer (T3-T5) effected higher girth increment from 4th to 6th year of planting and a peak in girth increment was also observed during this period. This period was considered as the active growth period of plants. Thereafter, a gradual decline in girth increment was recorded. From the above result, it could be inferred that plants need higher inputs of NPK during active growth period (3rd to 5th year). Once the canopy of the plants close, NPK demand of the crop reduces. Therefore, higher application of NPK may be needed during early growth period (3rd to 5th year) only which will give a boost to the growth of plants vis-à-vis higher tappability.

Clonal response to NPK fertilizer

Influence of different doses of NPK fertilizers on growth of individual clones are discussed in the light of 6th to 8th year girth data (Table 2) and tappability of plants (Table 3).

RRII 417: The clone RRII 417 showed significant response to NPK fertilizers. At the end of 6th year of planting, mean girth of the plants ranged from 30.3 to 43.5 for different treatments. None of the treatments could attain the bench mark tappable girth of 50 cm during this period. At the end of seven years after planting (YAP), mean girth

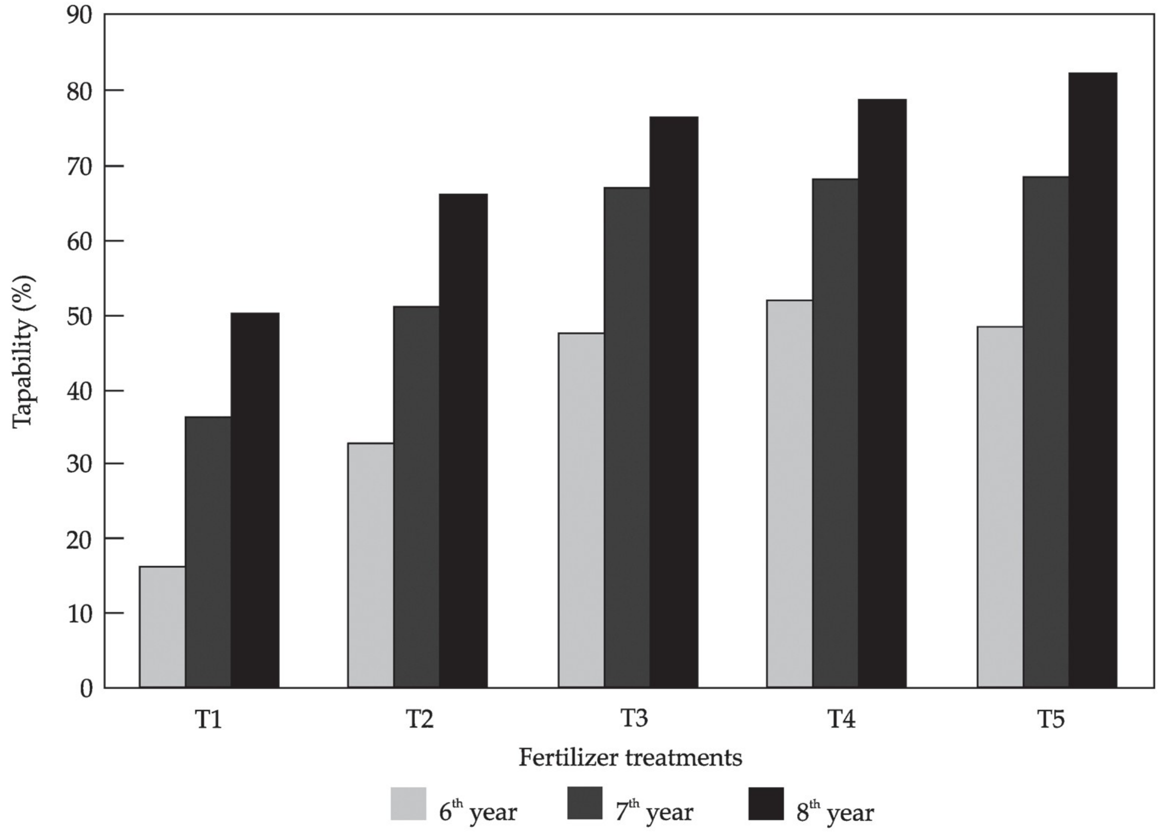

Fig. 4. Influence of fertilizer doses on percentage tappability of plants

of the plants varied from 37.5 to 51.8 cm in different treatments. A difference of 14.3 cm was recorded between plants receiving highest doses of NPK fertilizer (T5) and control (T1). It was also observed that among the fertilizer treatments (T3, T4 and T5), there was no significant difference in girth. Though application of 200 per cent RDF (T5) registered a highest mean girth of 51.8 cm, it resulted in only 60.5 per cent tappability. This could be attributed to wide variation in individual plant girth (CV= 68%). At the end of 8th year of plantation, under treatment T3, T4 and T5, 68.8, 72.0 and 75.3 per cent plants attained tappable girth respectively. Therefore, for the clone RRII 417, application of 100 per cent RDF will be economically beneficial.

RRII 429: The clone responded significantly towards application of NPK fertilizer. At the end of 6th year of plantation, mean girth of the plants ranged from 40.1 to 50.6 cm on different treatments. A mean girth of 50.6 cm was observed in T4 (150% RDF) which helped 73.3 per cent plants to attain tappable girth. Further increase in fertilizer dose (200% RDF) showed a decline in girth (48.4 cm) and effected only 63.6 per cent plants to attain tappable girth. The corresponding values for 100 per cent RDF (T3) were 44.9 cm and 62.1 per cent. At the end of 7th year of planting, girth of the plants ranged from 46.8 to 55.9 cm for the various treatments. During this period 80.6 per cent plants attained tappable girth in treatment T4 (150% RDF). The corresponding mean

Table 4. **Influence of fertilizer doses on soil fertility status**

Treatment	Soil depth (cm)	pH		Organic carbon (%)		Available P(kg ha^{-1})	
		Before	7 YAP	Before	7 YAP	Before	7 YAP
T1 (control)	0-30	4.56	4.54	0.91	1.16	5.1	5.5
	30-60	4.62	4.57	0.68	0.72	1.6	2.2
T2 (50% -RDF)	0-30	4.56	4.47	0.91	1.28	5.1	8.7
	30-60	4.62	4.51	0.68	0.83	1.6	2.8
T3 (100% -RDF)	0-30	4.56	4.43	0.91	1.32	5.1	12.3
	30-60	4.62	4.40	0.68	0.81	1.6	4.5
T4 (150% - RDF)	0-30	4.56	4.42	0.91	1.37	5.1	18.6
	30-60	4.62	4.37	0.68	0.79	1.6	5.1
T5(200% - RDF)	0-30	4.56	4.40	0.91	1.38	5.1	21.3
	30-60	4.62	4.42	0.68	0.73	1.6	6.1
CD (5%)	0-30	NS	NS	NS	0.11	NS	5.4
	30-60	(NS)	(NS)	(NS)	(NS)	(NS)	(2.2)

YAP= year after planting; in parenthesis CD values for lower depth are indicated

girth data for treatments T3 and T5 were 51.5 and 54.4 cm respectively and tappability were 76.2 and 76.5 per cent respectively. It was therefore quite evident that the clone RRII 429 showed significant response towards application of 150 per cent RDF and could effectively reduce the gestation period by six months to one year.

RRII 430: The clone showed significant response towards fertilizer application. At the end of 6th year of planting, mean girth of plants ranged from 35.1 to 47.2 cm. Highest girth was recorded in treatment T5 (200% RDF). The corresponding values for T3 and T4 were 42.2 and 44.6 cm respectively. During this period, highest doses of NPK fertilizer, T5, failed to attain mean girth of 50 cm or 70 per cent tappability. At the end of 7th year, all the three fertilizer treatments *viz.* T3, T4 and T5 registered a mean girth of 50.2, 52.4 and 54.1 cm respectively. In treatments T5, plants attained more than 70 per cent tappability but the corresponding values for the treatments T3 and T4 were 67.5 and 68.8 per cent respectively which were very close to bench mark figure of 70 per cent. Plants under treatment T1 (control) and T2 (50% RDF) attained only 42.5 and 51.7 per cent tappability during this period. The clone RRII 430 responded significantly towards application of NPK, however the response was restricted during early growth period of 3 to 5 years. Hence, it is worthwhile to apply higher doses of NPK during initial five years. Thereafter, application of 100 per cent RDF will be beneficial for optimum plant growth.

RRIM 600: In the present study, the clone RRIM 600 was taken as check clone as it is widely planted in different parts of Tripura. Therefore, the growth performance of RRII 400 series clones was compared with respect to this clone. It was reported earlier that, RRIM 600 responded significantly to application of NPK (Chaudhury *et al.*, 2001). In the present study also, similar result was observed. At the end of 6th year mean girth of the plants ranged from 38.8 to 45.6 cm.

Table 5. **Influence of fertilizer dose on available K-status (kg ha^{-1}) under rubber soils in Tripura**

Treatment	K-applied in soils (kg ha^{-1})	Initial K-status		K-status after 7th year		K-balance (+ve /-ve)	
		0-30 cm	30-60 cm	0-30 cm	30-60 cm	0-30 cm	30-60 cm
T1(control)	0	119.2	127.2	92.4	110.5	-26.8	-16.7
T2 (50% RDF)	81.5	121.4	128.3	99.2	116.4	-22.2	-11.9
T3 (100% RDF)	163	118.5	130.2	102.6	126.2	-15.8	-4.0
T4 (150% RDF)	247.5	117.8	122.6	114.2	130.8	-3.6	+8.2
T5 (200% RDF)	326	123.2	126.2	123.4	136.4	+ 0.2	+10.2
Mean		120.0	126.9	106.3	124.1	-13.7	-2.8

During this period, tappability varied from 14.5 to 58.2 per cent. At the end of 7th year, mean girth of plants ranged from 43.8 to 52.7 cm in different treatments with 34.3 to 68.9 per cent tappability. The corresponding values after 8th year of planting were 48.6 to 55.7 cm and 56.6 to 81.3 per cent respectively. It was observed that the highest girth was recorded by plants under treatment T5 (52.7cm). At the end of 7th year of planting, 68.9 per cent plants under T3 attained tappable girth and the corresponding values for the treatments T4 and T5 were 64.5 and 66.8 per cent respectively. It was also observed that at the end of 7th year of planting, girth of plants under T1 (control) and T2 (50% RDF) were 43.8 cm and 48.3 cm respectively. During this period only 34.8 and 52.8 per cent plants attained tappable girth. The application of correct doses of fertilizer is necessary for optimum growth of rubber plants in this region.

Soil nutrient status: Pre-treatment analysis of soil data of the experimental site showed (Table 4) that soils were acidic in reaction with a pH range of 4.56 to 4.62. Organic carbon content of soil is medium (critical values = 0.75-1.5%) with low available P (1.56-5.1kg ha^{-1}). Available K was marginally higher than critical values (>110 kg ha^{-1}). At the end of immature period of seven years, it was observed (Table 4) that pH of soils did not significantly vary due to applications of fertilizers. A significant improvement in organic carbon (OC) particularly in surface soil (0-30 cm) was observed in comparison to control plot. This could be due to the fact that a profuse growth of cover crops was observed in the treated plots which might have added more organic matter. Moreover, in the treated plots, higher microbial activity was expected due to increased soil fertility. A significant improvement in available P was recorded in

Table 6. **Influence of fertilizer dose on leaf nutrient content of rubber**

Treatments	N (%)		P (%)		K (%)	
	5th year	7th year	5th year	7th year	5th year	7th year
T1 (control)	2.78	2.82	0.15	0.15	0.70	0.75
T2 (50% RDF)	3.06	3.08	0.17	0.17	0.75	0.85
T3 (100% RDF)	3.09	3.15	0.19	0.20	0.85	0.92
T4 (150% RDF)	3.19	3.25	0.19	0.21	0.91	0.98
T5 (200% RDF)	3.24	3.31	0.20	0.21	0.96	1.11
CD (5%)	0.09	0.13	NS	0.03	0.15	0.16

both the depths of soil due to application of phosphatic fertilizers. This was more pronounced for the plants under treatment T4 and T5 where 150 to 200 per cent RDF was applied. However, available status of P was found still below critical level (< 22.4 kg ha^{-1} of soil). Application of higher doses of potassic fertilizer failed to increase the available K status of rubber soils in Tripura. A gradual decline in available K was recorded over time and this was more pronounced under the treatment T1, T2 and T3. A net negative K balance (Table 5) of -13.7 kg ha^{-1} was observed in the surface soil. The corresponding value for sub-surface soil was - 2.8 kg ha^{-1}. Application of higher doses of K (T4 and T5) resulted in K building in sub-surface soil indicating its leaching. However, considering the amount of K applied in soil, it was quite evident that a large amount of added K was either fixed (due to interstratifications) or leached out due to high rainfall. This warrants the adoption of proper K-management practices in rubber growing soils in Tripura.

Leaf nutrient status: Leaf samples were analyzed for N, P and K contents after 5th and 7th year after planting and the values are presented in Table 6. The data revealed a significant improvement in N and K content in rubber leaves due to fertilizer application. The critical value for leaf N for rubber is 3.0 to 3.5 per cent. In the present experiment, at the end of seven years, leaf N varied from 2.82 to 3.31 per cent. The critical values for leaf K is 1 to 1.5 per cent. After 7th year of planting, leaf K content varied from 0.75 to 1.11 per cent. Like N, significant improvement in leaf K was observed in treatment T5. Increased values of leaf N and K in T5 indicate higher uptake and better growth of plants over the control treatment. Influence of P-fertilizer on leaf P status was not pronounced. This could be due to the fact that rubber soils are predominantly acidic in nature which can immobilize a large amount of P. These P are slowly available to plants for a longer period of time.

CONCLUSION

The high yielding RRII 400 series clones of rubber showed significant response towards application of NPK fertilizer**.** Seven years after planting, the clone RRII 429 registered higher mean girth compared to other RRII 400 series clones under Tripura condition. The study showed that the immaturity period of the clone RRII 429 could be reduced at least by six months to one year with application of higher doses of NPK (150% RDF). Addition of higher doses of NPK fertilizer improved the organic carbon and available phosphorus status of soil though a decline in available K status particularly in surface soil was recorded.

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