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# GROWTH AND INITIAL YIELD OF SOME *HEVEA* CLONES IN MEGHALAYA

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A trial composed of ten *Hevea* clones was established at 600 m altitude in 1986 at Tura in Meghalaya, North East India, to evaluate their growth and yield performance. Results showed that maximum growth (44%) and yield (36%) occurred during the monsoon and the post-monsoon seasons respectively. The lowest growth of 5 per cent was noted during the winter season succeeded by 11 per cent in the summer while the lowest yield of 19 per cent was accounted for in the summer followed by 22 per cent in the winter and 23 per cent during monsoon. The growth was vigorous in the clones RRIC 105, PB 311, PB 310 and RRII 118 but low in PR 255, RRII 105 and RRII 5. While the highest yield was recorded in PB 311 followed by RRII 208 and RRII 118 the lowest was recorded for RRIC 105 and RRIC 102. Growth and initial yield performance of the ten clones under the agroclimatic conditions of the region are discussed.

Key words : Growth, *Hevea*, India, Meghalaya, Non-traditional region, Yield

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## INTRODUCTION

Rubber (*Hevea brasiliensis*) cultivation has been extended to the non-traditional regions of India to meet the increasing demand and in spite of the adverse climatic conditions the cultivation has been successful in the north eastern states. Normally *Hevea* clones attain maturity by the seventh year of planting in the traditional zone where environmental conditions are favourable. However, in non-traditional areas like Assam, Tripura and Meghalaya, nine to ten years are required for maturity due to adverse atmospheric conditions that prevail in the region during the winter season. Some reports are available on the growth and yield accomplishment of *Hevea* clones in the north eastern regions of India (Sethuraj *et al.*, 1989; Meenattoor *et al.*, 1991; Vinod *et al.*, 1996; Reju *et al.*, 2000). The present experiment was to study the responses of different *Hevea* clones under the prevailing environmental conditions of Meghalaya.

## MATERIALS AND METHODS

The experiment was conducted at the Regional Research Farm of Rubber Research Institute of India at Tura, Meghalaya (latitude 25°-26°N, longitude 90-91°E, altitude 600 m above msl). Ten clones of *Hevea brasiliensis* viz. RRII 5, RRII 105, RRII 118, RRII 208, RRIC 102, RRIC 105, PB 260, PB 310, PB 311 and PR 255 were planted in 1986 in single tree single plot completely randomized design with forty replications. The spacing adopted was 6m x 3m. All the clones were opened for tapping during 1997-98 and exploited under $^1/_2$Sd/2 system. Data collected during the years 1999 and 2000 were analyzed for the present study. The rubber yield (g/tree/tap) was recorded two times a month by cup coagulation method. Growth in terms of girth increment at 150 cm height was recorded at monthly intervals.

Meteorological data such as maximum and minimum temperature, rainfall, relative

Table 1. **Performance of *Hevea* clones in Tura**

| Clone | Tappability (%) at | | Yield (g/tree/tap) | Girth (cm) |
|---|---|---|---|---|
| | Nine years | Ten years | | |
| PB 311 | 74 | 96 | 36.8 (1) | 72.9 (2) |
| RRII 208 | 41 | 73 | 30.9 (2) | 68.5 (5) |
| RRII 118 | 69 | 83 | 28.7 (3) | 71.6 (3) |
| PB 310 | 50 | 70 | 26.8 (4) | 71.6 (3) |
| RRII 105 | 25 | 43 | 25.3 (5) | 63.3 (7) |
| PB 260 | 8 | 50 | 22.5 (6) | 61.5 (8) |
| RRII 5 | 11 | 44 | 21.8 (7) | 57.7 (9) |
| PR 255 | 9 | 41 | 21.4 (8) | 65.0 (6) |
| RRIC 102 | 42 | 73 | 20.3 (9) | 69.1 (4) |
| RRIC 105 | 65 | 85 | 18.8 (10) | 74.4 (1) |
| Mean | 39.4 | 65.8 | 25.3 | 67.6 |
| SE | 8 | 6.3 | 1.8 | 1.7 |
| CD (P≤0.05) | | | 6.9 | 1.1 |
| CD (P≤0.01) | | | 9 | 1.4 |

Numbers in parentheses are ranking of clones

humidity, sunshine hours, evaporation, wind velocity and soil temperature were collected from the agrometeorological observatory at the Regional Research Farm. Based on the climatic variations in the region, four seasons were identified such as winter (December to February), summer (March to May), Monsoon (June to August) and post-monsoon (September to November). Data on yield and girth increment were subjected to statistical analysis (Rangaswamy, 1995).

## RESULTS AND DISCUSSION

Ranking of clones based on girth showed that RRIC 105 was the most vigorous clone and PB 311, PB 310 and RRII 118 followed closely. However, RRII 105, RRII 5, PB 260 and PR 255 showed poor growth (Table 1). During the winter season higher growth was recorded in PR 255, RRIC 102, RRII 5 and PB 311 while it was negligible in PB 260, RRII 208 and RRII 118 (Fig. 1). Highest growth was observed for PB 310, PB 311, RRIC 102 and RRII 5 during the monsoon season. The growth recorded for all the clones was higher from June to November and lower from December to April (Fig.3). Contribution of growth in terms of percentage girth increment during different seasons namely winter, summer, monsoon and post-monsoon was 5, 11, 44 and 40 per cent respectively. The low growth observed during the winter season as compared to the other seasons may be attributed to unfavourable climatic factors. Lower atmospheric and soil temperatures, low humidity and other stress conditions experienced in the region during the winter inhibit the physiological processes and retard the growth of *Hevea* (Chandrasekhar *et al.*, 1990; Rao and Vijayakumar, 1992; Sethuraj *et al.*, 1989). In Garo Hills of Meghalaya, conducive climatic conditions for the growth and development of *Hevea* are observed in the monsoon and post-monsoon seasons.

A significant positive correlation was observed between growth and minimum temperature, soil temperature, humidity and rainfall (Table 2). The positive relation with maximum temperature and evaporation was not significant. *Hevea* requires mean monthly temperature in the range of 25 to 28°C for its growth (Rao and Vijayakumar, 1992). Thus the growth of all clones were adversely affected during the low temperature period and the immaturity period was prolonged from seven to nine or even ten years. Wind velocity and bright sunshine hours exhibited a negative correlation with growth, which indicate that these environmental parameters might have

Table 2. **Correlation between yield, girth increment and agrometeorological parameters**

| | Yield | T max | T min | T soil | Humidity (13.20 IST) | WV | Rainfall | BSSH | Evapo-ration |
|---|---|---|---|---|---|---|---|---|---|
| Monthly yield | 1 | 0.09 | 0.21 | 0.09 | 0.48 | -0.7* | -0.06 | -0.32 | 0.21 |
| Girth Increment | 0.5 | 0.45 | 0.76* | 0.75** | 0.84** | -0.16 | 0.59* | -0.79** | 0.34 |

* Significant at 5% level ** Significant at 1% level T max : Maximum temperature; T min : Minimum temperature; T soil : Soil temperature; WV : Wind velocity; BSSH : Bright sunshine hours

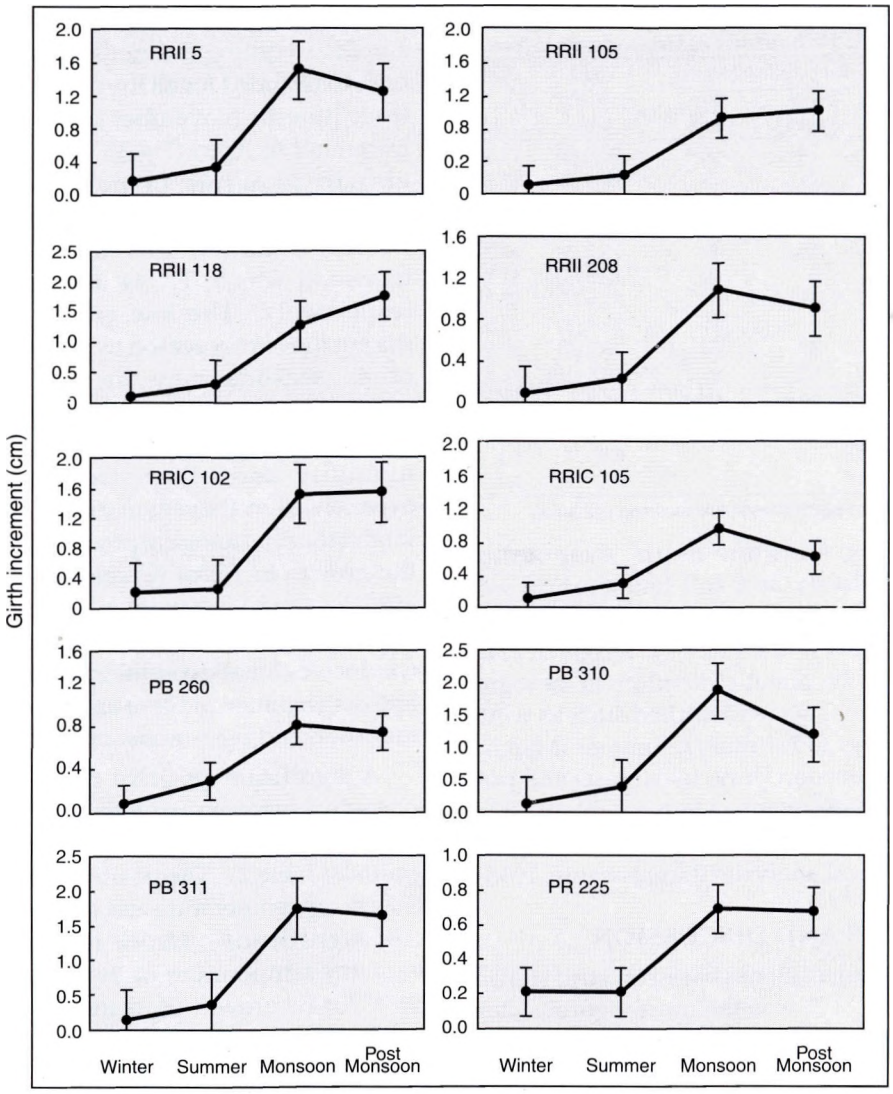


Fig. 1. Seasonal girth increment pattern of ten *Hevea* clones

inhibited photosynthetic activity and affected the growth of plants.

The initial yield recorded showed the superiority of PB 311 over all other clones. RRII 208 ranked second followed by RRII 118, PB 310 and RRII 105 while RRIC 105 had the lowest yield followed by RRIC 102, PR 255 and RRII 5 (Table 1). The yielding pattern of different clones exhibited a uniform trend over the seasons (Fig. 2). Mean monthly yield pattern showed considerable variation (Fig. 3) and the contribution of yield during winter, summer, monsoon and post-monsoon seasons were 22, 19, 23 and 36 per cent respectively. The seasonal variation in the yield may be ascribed to the environmental conditions (Fig. 4), altitude and characteristics of the clones, which influence the latex flow (Milford *et al.*, 1969; Sethuraj, 1977). The low yield observed during the winter may be due

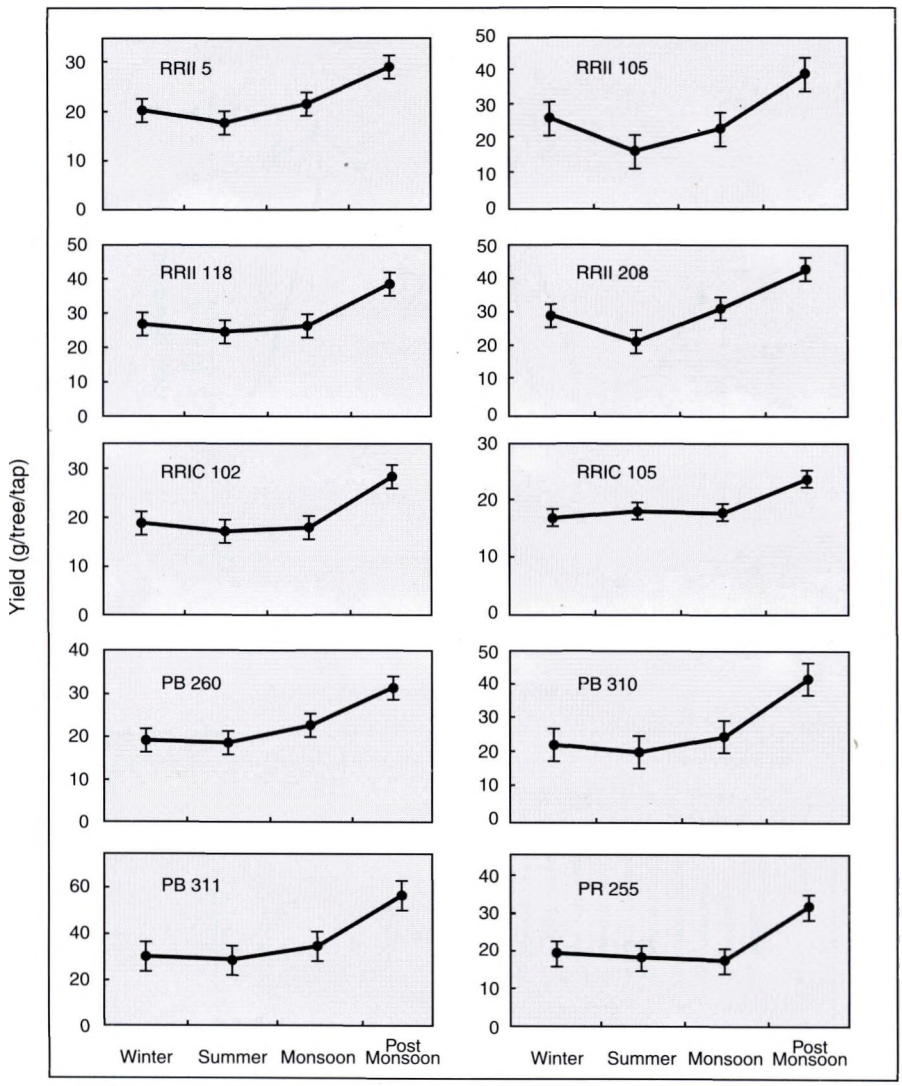


Fig. 2. Seasonal yield pattern of ten *Hevea* clones

to the low temperature, humidity and rainfall prevailing in the region (Buttery and Boatman, 1976; Sethuraj and Raghavendra, 1984). Maximum yield was recorded during the post-monsoon season and it contributed 36 per cent of the total yield, which may be attributed to the favourable environmental factors that prevails from September to November (Shangpu, 1986; Reju *et al.*, 2000). Low yield during the monsoon (25%) as compared to the post-monsoon (36%) season may be attributed to high rainfall, high humidity and high soil moisture, which leads to the dilution of latex (Reju *et al.*, 2000). Bright sunshine hours, high wind velocity, low rainfall and the emergence of new flushes might have affected the yield during the summer season as reported from China (Chua, 1970; Hu Yao Hua and Xie Hai Sheng, 1985).

Yield pattern displayed a negative correlation (Table 2) with wind velocity, rainfall and sunshine hours, which implied that these environmental factors adversely

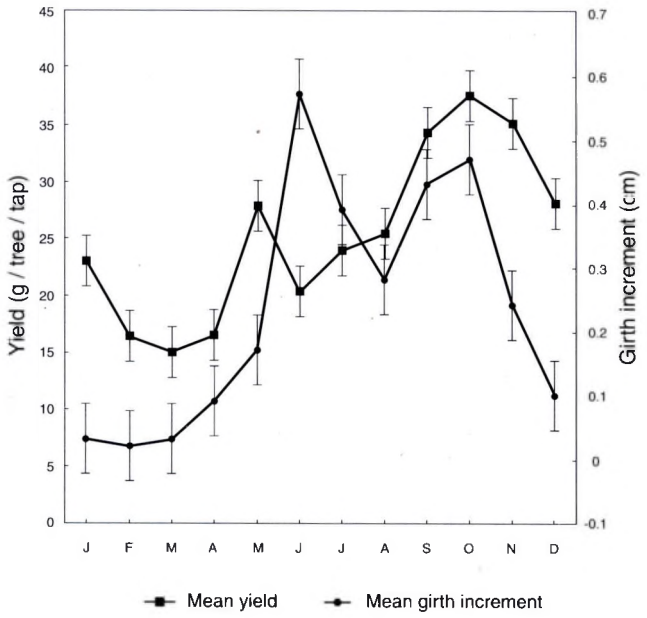


Fig. 3. Monthly growth and yield pattern

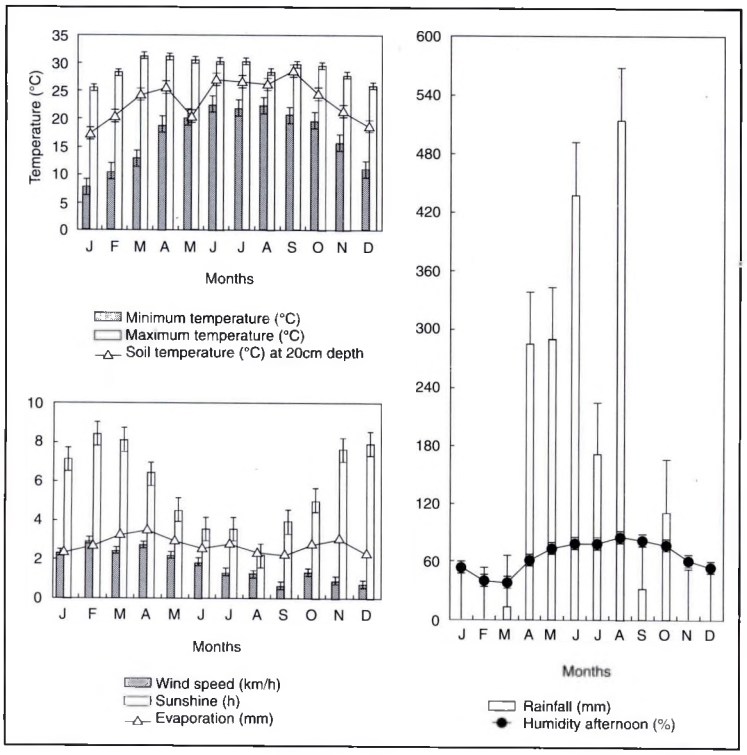


Fig. 4. Environmental parameters recorded at Tura

affect the yield. Air temperature, humidity and soil temperature showed a positive but non-significant association indicating that these parameters are beneficial for latex flow (Shangpu, 1986). A positive correlation between yield and growth was also apparent.

The growth and yield of *Hevea* clones were low during the winter and summer seasons due to low temperature and other adverse climatic conditions prevailing in the region. Nevertheless, good growth and yield were observed during the monsoon and post-monsoon seasons respectively. Among the ten clones, RRIC 105 registered the highest growth but the clone was ranked lowest based on yield. The highest yield was exhibited by PB 311, which ranked second in growth followed by RRII 208, RRII 118 and PB 310. The growth performance of these clones was also superior to that of the other clones.

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