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Recent Advances in Plantation Crops Research, 2000, pp.138-143.

YIELD AND YIELD COMPONENTS OF CERTAIN *HEVEA* CLONES AT HIGHER ELEVATION

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A non-traditional area of Garo hills, Meghalaya has been identified as one of the potential areas for extension of rubber cultivation. A study was conducted to evaluate the performance of seven clones of *Hevea brasiliensis* under the agroclimatic conditions of Tura. Data on girth increment (GI), dry rubber yield (RY), plugging index (PI), dry rubber content (DRC), soil moisture (SM) and all relevant agrometeorological parameters were correlated with each other. Among the seven clones, RRIM 600 recorded highest dry rubber yield (26.4g/tree/tap) over the first three years of tapping followed by RRII 118 and RRII 105. However, variation in dry rubber yield was not significant. Although RRII 105 the highest yielding clone in the traditional region does not top the list with respect to the yield pattern in this region. GI, RY, and SM had a positive correlation while PI showed negative correlation with RY.

INTRODUCTION

Traditionally, rubber cultivation is limited to humid tropics within 10^{o} N and South of equator where agroclimatic conditions are suitable for *Hevea*. But with the increase in global demand for natural rubber, its cultivation has been extended too less suitable regions beyond the traditional latitudes (Sethuraj *et al.*, 1989). In India, availability of land in traditional areas for expansion is a limiting factor. Therefore, to achieve self sufficiency, rubber cultivation has been extended to non-traditional regions (Sethuraj *et al.*, 1989). Eventhough, limited reports are available on the effect of low temperature stress on growth, yield and yield components of *Hevea* (Gururaja Rao *et al.*, 1988; Chandrashekhar *et al.*, 1990), such information is not available from this region. Keeping this in view, the present study was initiated to evaluate the performance of certain *Hevea* clones with respect to growth, yield and yield components under the agroclimatic conditions of Garo hills.

MATERIALS AND METHODS

The study had been carried out at Ganolgre Research Farm, West Garo hills which is situated at an altitude of 600 m above MSL and within latitude 25^{0}-26^{0} N and longitude 90^{0}-91^{0} E. The annual rainfall varied from 1900 to 3000 mm and mean minimum ambient air temperature was less than 10^{0}C between December to February. Seven *Hevea* clones (RRII 118, RRII 203, RRII 105, RRIM 600, RRIM 605, PB 235

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and PB 86) selected for this study were planted in 1985. The experiment was laid out in a completely randomised block design. Trees were opened for tapping in 1995 and exploited under 1/2 s d/2 system. Five trees of each clone of uniform girth were selected randomly for yield and yield component analysis. Rubber yield (RY) was recorded three times in a month by cup coagulation method. Dry rubber content (DRC) was recorded at fortnightly interval by gravimetric method and plugging index (PI) was recorded at monthly interval following the method of Milford *et al.* (1969). Girth increment (GI) was recorded at monthly interval for all the clones.

Soil moisture content (SM) at three depths (0-15, 15-30 and 30-60 cm) was determined by gravimetric method. Soil sampling was done at random irrespective of the clones and three replications were taken from each depth. Weather parameters were recorded from the meteorological observatory and the data were analysed statistically. Relationship between girth increment (GI), rubber yield (RY), plugging index (PI), dry rubber content (DRC) and soil moisture (SM) were worked out after pooling the monthly mean values recorded for the seven clones.

RESULTS AND DISCUSSION

Comparatively higher girth increment was recorded from May to September and thereafter fall in girth increment was observed between January to March in all the seven clones (Fig.1). This may probably be due to severe cold stress during winter when the ambient air temperature falls below 10^0C during December to February. Among the seven clones, the highest girth increment was attained by PB 235 which was closely followed by RRIM 600 (Table 1). However, the difference in girth increment among PB 235, RRIM 600, RRII 118 and RRII 203 was statistically not significant. Threshold temperature for growth increment, however, is believed to be in

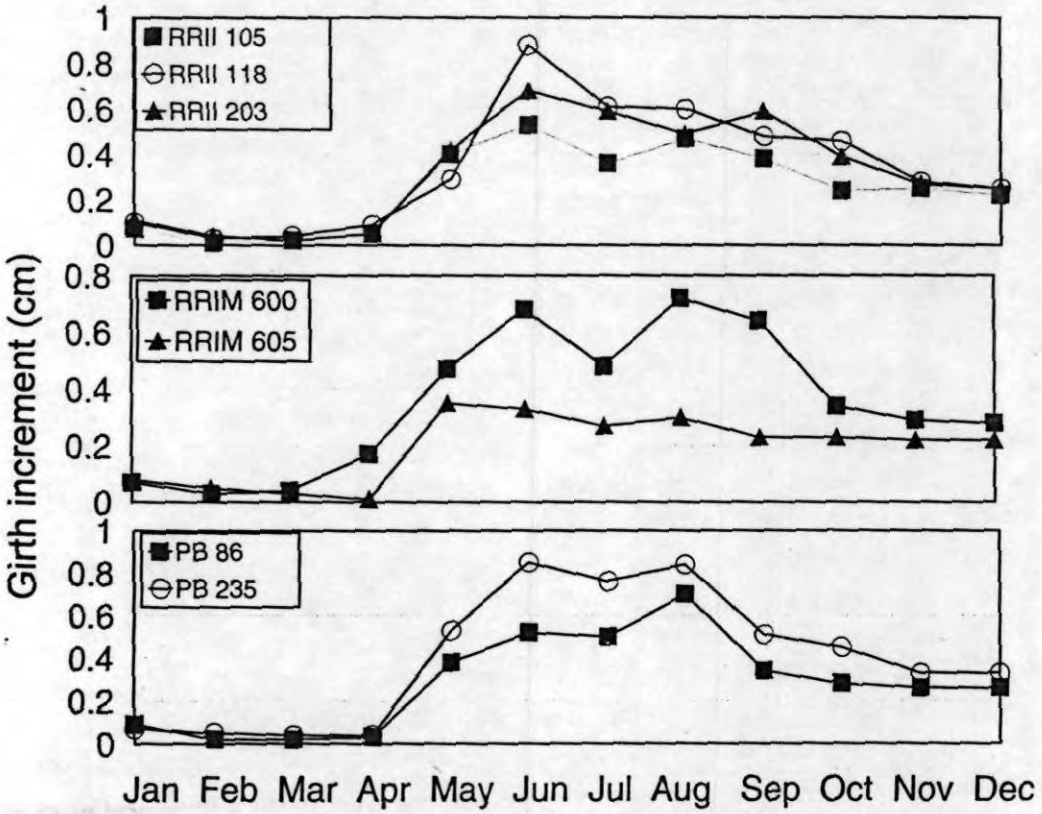

Fig. 1. Clonal variation in monthly girth increment over the three years of tapping

Table 1. Annual mean of different parameters over three year of tapping

Clone	GI (cm)	RY (g/tree/tap)	DRC (%)	PI
RRII 105	0.25	14.86	34.29	3.68
RRII 118	0.34	16.06	32.57	3.47
RRII 203	0.33	10.75	32.90	2.72
RRIM 600	0.35	17.08	33.62	3.61
RRIM 605	0.19	9.72	33.14	4.19
PB 86	0.28	11.77	31.95	3.72
PB 235	0.40	13.11	30.94	3.79
C.D. P=0.05:	0.10	3.00	1.10	0.90
P= 0.01:	0.15	5.60	1.60	-

the range of 20^0C (Jiang, 1988). Since growth of the tree was restricted from December to March, the plants attained the tappable girth only after eight to nine years of planting in this region (Sethuraj *et al.*, 1989).

Rubber yield less than 10 g/tree/tap was recorded during January to April while highest yield was registered between June and November with an intermittent fall during July/August (Fig.2). Lower yield from January to April may be attributed to low temperature and prolonged winter which led to defoliation thereby affecting the yield. There was a rise in temperature from March onwards, still the yield remained to be low. This was probably being due to lesser contribution by the immature new flushes (Hu Yaohua and Xie Haisheng, 1985). Fall in rubber yield during July/August may be attributed to high soil moisture status (Fig. 3) which led to dilution of latex in all the clones studied. Higher yield was registered by RRIM 600 followed by RRII 118 (Table 1). Under the agroclimatic conditions of Tripura, PB 235 topped the list followed by RRIM clones, 600, 105 and 105 (Vinod *et al.*, 1996). Variation in the yield

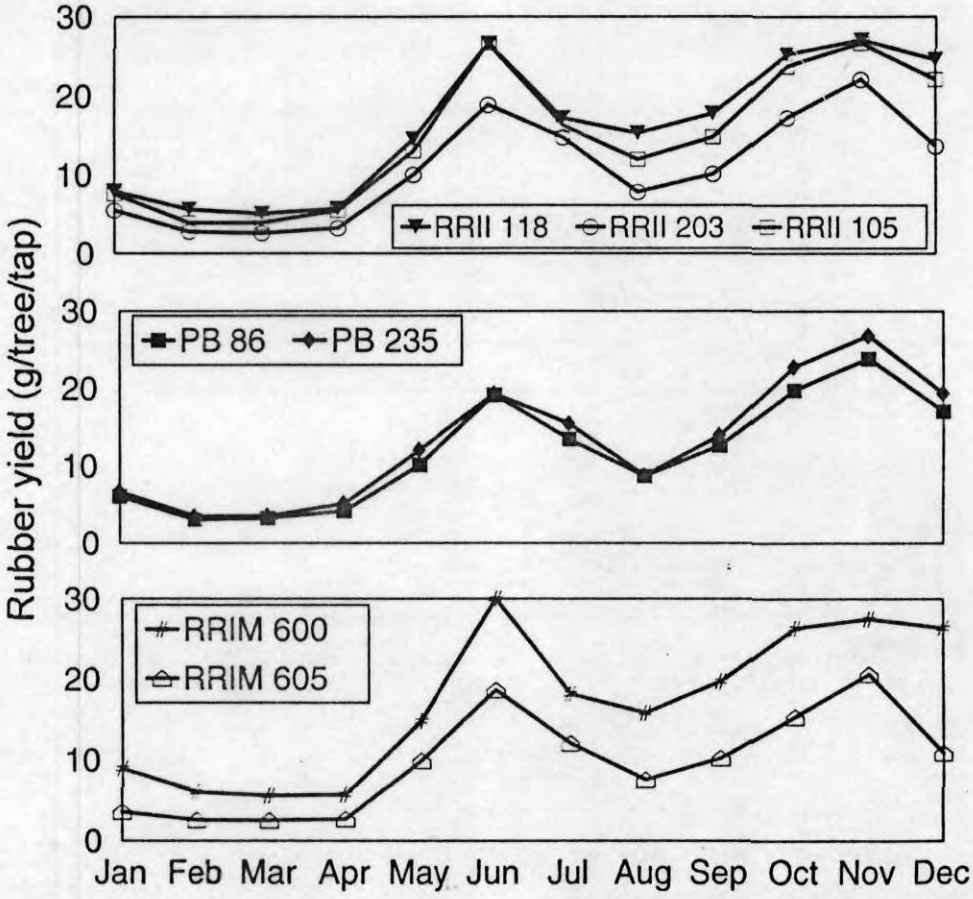

Fig.2. Monthly dry rubber yield of seven *Hevea* clones

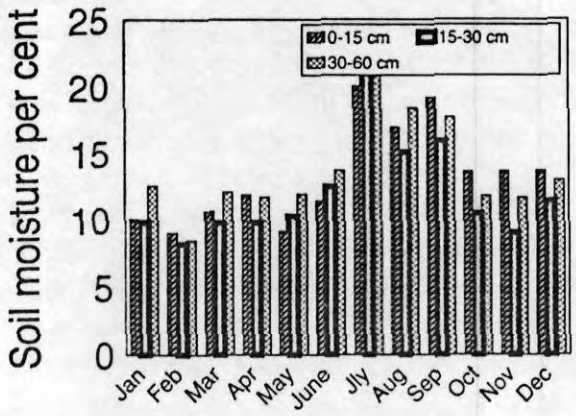

Fig. 3. Monthly mean of soil moisture content at different depths over three years

of rubber clones (Fig. 4) may be attributed to climatic conditions, altitude and clonal characteristics which affect both initial flow rate and plugging index (Milford *et al.*, 1969).

Plugging index increased gradually from January to April and then decreased till December (Fig 5). Increasing trend of PI may be (ue to low temperature which coincides with defoliation and refoliation of rubber trees. High plugging index was recorded in RRIM 605 followed by PB 235 (Table 1). Yield depression just after winter may be accompanied by marked increase in plugging index (Paardekoopar, 1989). In the present study, minimum ambient air temperature and soil moisture status also appeared to have an adverse effect on the rubber yield and duration of latex flow. This is in conformity with the findings of Sethuraj and Raghavendra (1984).

Dry rubber content exhibited an increasing trend from January to July and thereafter it declined gradually, maintaining a plateau till December. Among the seven clones, RRII 105 registered higher DRC followed by RRIM 600, 605, RRII 203, 118, PB 86 and 235. Statistically no significant differences were observed between RRII 105, 203 and RRIM 600; but these clones had an edge over RRII 118, PB 86 and 235. In the present study, girth increment showed a significant positive correlation with the rubber yield,

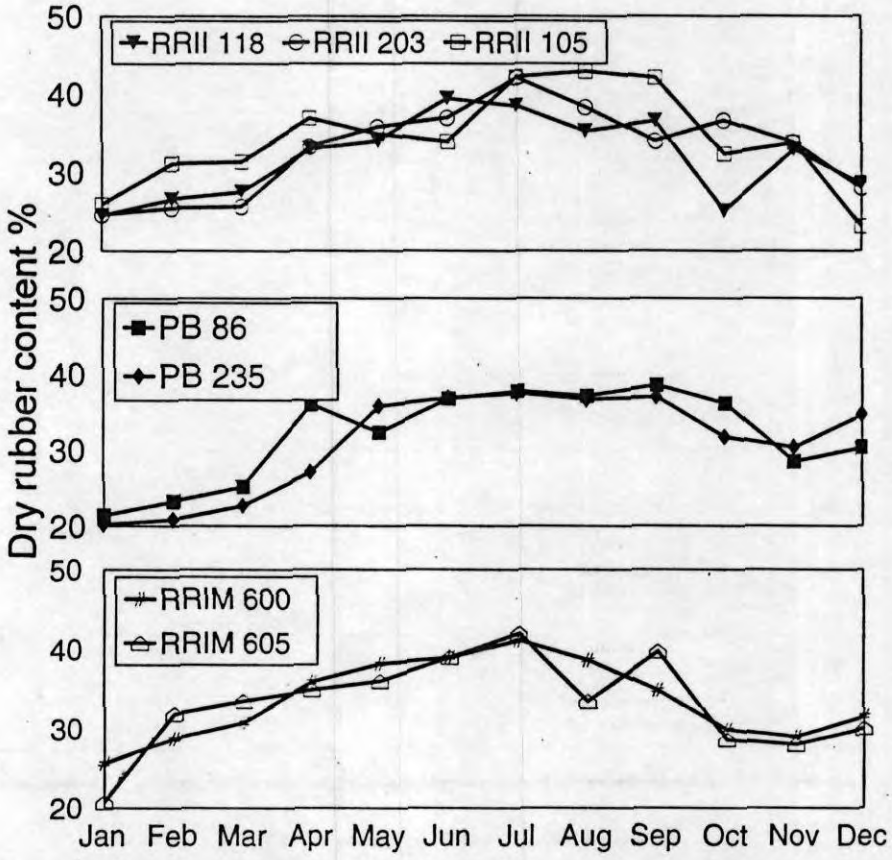

Fig. 4. Monthly dry rubber content of seven *Hevea* clones over the first three years of tapping

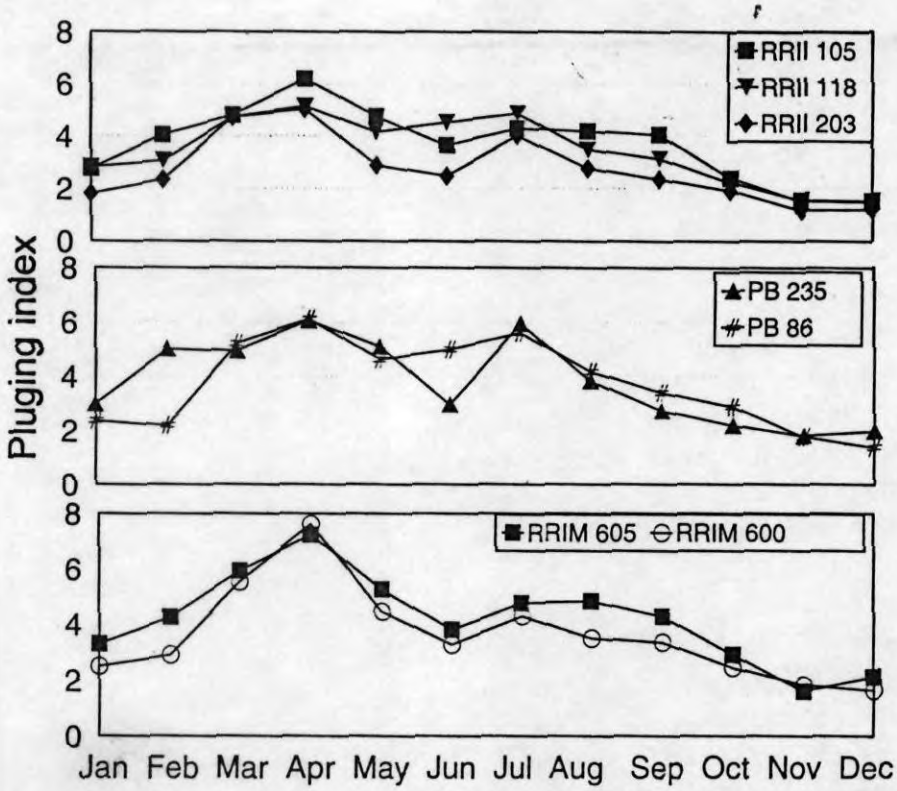

Fig. 5. Monhly plugging index of seven *Hevea* clones over the first three years of tapping

dry rubber content and soil moisture (Table 2). Significant positive correlation of girth increment with yield and yield components may be due to the age of the plants (Paardekooper, 1989). Significant negative correlation between PI with DRC and RY and positive correlation between SM and other yield parameters are the important factors of functional relationship between these attributes (Devakumar *et al.*, 1988; Chandrashekhar, 1994).

ACKNOWLEDGEMENTS

The authors express their gratitude to Dr. N.M. Mathew, Director, Rubber Research Institute of India, Kottayam for all the facilities provided and encouragement in carrying out the work. Thanks are also due to Shri. T. Gohain, Dr. G.C. Mondal and Shri. P. Rabha Regional Research Station, Guwahati for their help in the preparation of the manuscript.

REFERENCES

Chandrashekhar, T.R., 1994. Correlation and path analysis of yield and its components, some factors of water relations and soil moisture in Hevea brasiliensis. *Indian Journal of Natural Rubber Research* 7: 89-94.

Chandrashekhar, T.R., Jana, M.K., Joseph Tho-

Table 2. Interrelationship between yield components and soil moisture

Character	GI	RY	DRC	PI	SM
Girth Increment (GI)		0.4721*	0.6207**	-0.2497	0.4609*
Rubber Yield (RY)			0.3181	-0.6738**	0.1301
Dry Rubber Content (DRC)				-0.2391	0.4462*
Plugging Index (PI)					0.0457

*, ** significant at five and one per cent level, respectively

mas, Vijaykumar, K.R. and Sethuraj, M.R. 1990. Seasonal changes in physiological characteristics and yield in newly opened trees of *Hevea brasiliensis* in North Konkan. *Indian Journal of Natural Rubber Research* **3**:88-97.

Devakumar, A.S., Gururaja Rao, G., Rajagopal, R., Sanjeeva Rao, P., George, M.J., Vijayakumar, K.R. and Sethuraj, M.R. 1988. Studies on soil-plant-atmosphere system in *Hevea*. II. Seasonal effects on water relations and yield. *Indian Journal of Natural Rubber Research* **1**: 45-60.

Gururaja Rao, G., Devakumar, A.S., Rajagopal, R. Annamma, Y., Vijaykumar, K.R. and Sethuraj, M.R. 1988. Clonal variation in leaf epicuticular waxes and reflectance: Possible role in drought tolerance in *Hevea*. *Indian Journal of Natural Rubber Research* **1**: 84-87.

Hu Yaohua and Xie Haisheng. 1985. A study on growth of new plant body and the law of growth and decline of stored matter in the plant body during the sprouting of the first leaf storey of *Hevea*. *Chinese Journal of Tropical Crop* **6**: 29-38.

Jiang, A. 1988. Climatic and natural production of rubber (*Hevea brasiliensis*) in Xishuangbanna, Southern part of Yunnun Province, China. *International Journal of Biometeorology* **32**: 280 - 282.

Milford, G.F. J., Paardekooper, E.C. and Ho Chai Yee. 1969. Latex vessel plugging, its importance to yield and clonal behaviour. *Journal of Rubber Research Institute of Malaysia* **21**:274.

Paardekooper, E.C. 1989. Exploitation of the rubber tree. pp.350-414. In: *Rubber*. Eds. C.C. Webster and W.J. Baulkwill. Longman Scientific and Technical, England.

Sethuraj, M.R. and Raghavendra, A.S. 1984. The pattern of latex flow from rubber tree *Hevea brasiliensis* in relation to water stress. *Journal of Cell Biochemistry* **8B**(suppl.): 236

Sethuraj M. R., Potty, S. N., Vijayakumar, K. R., Krishnakumar, A. K., Sanjeeva Rao, P., Thapliyal, A. P., Mohankrishna, T., Gururaja Rao, G., George, M. J., Soman, T. A., Chaudhuri, D. and Rajeswari, M. 1989. Growth performance of *Hevea* in the non-traditional regions of India. pp.212-227. In: *Proceedings of Rubber Planters Conference*, Rubber Research Institute of Malaysia, Kuala Lampur Malaysia.

Vinod, K.K., Rajeswari, M.J., Priyadarshan, P.M., Jacob Pothen, Chaudhuri D., Krishnakumar, A.K., Sethuraj, M.R., Potty, S.N. 1998. Early performance of some clones of *Hevea brasiliensis* Muell. Arg. in Tripura. *Indian Journal of Natural Rubber Research* **9**:123-129.

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