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COMPARATIVE ANATOMY OF VIRGIN AND RENEWED BARK IN *HEVEA*

D. PREMAKUMARI, A.O.N. PANIKKAR and P.J. GEORGE
Rubber Research Institute of India, Kottayam 686 009, Kerala

ABSTRACT

The economic period of Hevea tree is 20-23 years form the commencement of tapping, by which time both virgin and renewed bark are exploited. Considering the importance of bark structure on yield and yield variations on virgin and renewed bark, a comparative study was carried out. Laticifer traits and phloic characters were observed.

The trend of clonal differences in bark thickness and number of latex vessel rows in virgin bark was maintained in renewed bark also. Virgin bark and renewed bark differed significantly the proportion of unexploited laticifer rows and the height/width ratio. Importance of the structural aspects is discussed.

INTRODUCTION

Interclonal variation in yield is governed directly or indirectly by a large number of factors and their interactions, of which the major structural traits are bark thickness, number of latex vessel rows and density, diameter and orientation of laticifers which are clonal characteristics (Gomes *et al.* 1972; Narayanan and Ho, 1973; Narayanan *et al.* 1974; Premkumari *et al.* 1985, 1988). Economic exploitation period of the *Hevea* tree is about 23 years from the commencement of tapping during which period both virgin bark and renewed bark are exploited. A comparative study of virgin bark and renewed bark was conducted for a set of structural traits.

MATERIALS AND METHODS

The study was conducted in seven clones of *Hevea brasiliensis Muel.* Arg. (Willd. ex Adr. Juss.) - RRII 101, RRII 102, RRII 105, RRII 106, RRII 109, RRII 111 and Tjir 1 - planted in a large scale trial in 1966 at the Central Experimental Station of the Rubber Research Institute of India at Chethackal. The trees were opened for tapping at the age of seven years and 1/2 Sd/2 (100%) system of tapping was followed.

Samples of virgin bark were collected from five trees per clone, at random position, at a height of 150 cm from the bud union when the trees were 11 years old. Renewed bark after five years regeneration was also collected from the same trees. The bark samples were fixed in formalin acetic alcohol. Before fixation, bark thickness was measured. Radial and tangential longitudinal sections of the bark at 120 and 80µm thickness respectively were cut with a base sledge microtome. The sections were stained with Sudan III and data collected on the following traits:

1) Total number of latex vessel rows
2) Thickness of soft bast
3) Number of latex vessel rows in the first millimeter from the wood
4) Diameter of latex vessels
5) Density of latex vessels (no. of laticifers per 0.25 mm circumference of the tree)
6) Intensity of anastomosis (no. of connections per 0.25 mm height of the vessel at the portions of anastomosis).
7) Ray height
8) Ray width
9) Diameter of ray cells

From the data, proportion of soft bast as percentage of total thickness, proportion of uncut vessels (i.e. in the first millimeter) as percentage of total number of latex vessel rows and the height/width ratio of phloic rays were computed. Pooled

data was used for comparing the virgin bark and renewed bark by 't' test. Association of virgin bark thickness with renewed bark with that trait in renewed bark were examined by correlation study.

RESULTS AND DISCUSSION

Thickness of virgin and thickness of renewed bark showed fairly good correlation (r=0.63, P<0.01). For the number of latex vessel rows, association between virgin bark and renewed bark was less significant (r=0.44, P< 0.05). Comparative data of virgin bark and renewed bark with respect to laticifer characters are given in Table I. Laticifer diameter and intensity of anastamosis in the virgin bark and renewed bark were comparable. Proportion of soft bast was numerically high in the virgin bark though statistically not significant. The two growth phases of bark varied significantly for the density of latex vessels (P< 0.05) and the renewed bark recorded lower density. The proportion of uncut latex vessel rows was significantly high in the renewed bark (<0.05). For density of latex vessels, clonal differences in renewed bark maintained the general trend in virgin bark.

Laticifer area and orientation of laticifers are very important factors affecting the yield of *Hevea* (Premakumari *et al.* 1988). High negative association between ray width and latex vessel density has also been reported (Premkumari *et al.* 1984). Hence, significantly reduced vessle density associated with an increased ray width in the renewed bark is growth oriented and in agreement with earlier findings.

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Table I. Comparison of virgin bark and renewed bark for the laticifer traits

Source	Diameter µm	Density Nos./ 0.25mm	Anastamoses Nos. 0.25 mm	Proportion of soft bast %	Proportion of uncut vessels %
Virgin bark	17.21 ± 2.47	7.80 ± 0.71	6.47 ± 1.12	36.63 ± 9.98	28.93 ± 10.41
Renewed bark	17.07 ± 1.63	7.38 ± 0.55	6.66 ± 1.01	33.17 ± 10.52	43.71 ± 18.72
Computed 't' value	0.2269	2.2432*	0.6046	1.1446	3.3099*

* P < 0.05

Table II. Comparison of virgin bark and renewed bark for the phloic ray characters.

Source	Diameter of ray cells µm	Height of phloic rays µm	Width of phloic rays µm	Height/width ratio
Virgin bark	15.07 ± 2.60	372.30 ± 54.42	50.65 ± 5.59	7.40 ± 1.50
Renewed bark	16.50 ± 3.05	301 ± 38.12	56.54 ± 6.67	5.43 ± 0.91
Computed 't' values	1.7115	5.1113*	3.2465**	5.3861**

* P < 0.05
**P < 0.01

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