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LATEX DIAGNOSIS FOR ASSESSMENT OF CLONAL PERFORMANCE IN *HEVEA*

The concept of physiological diagnosis (latex diagnosis) of *Hevea* (Eschbach *et al.*, 1983) is based on the hypothesis that some specific biochemical and biophysical parameters in latex which exhibit a high degree of correlation with production could be used for predicting the state of the latex producing system at a given time. The assumption is that an analysis of certain constituents in latex could provide information on the productivity of clones under any particular exploitation system.

Latex production at tapping depends on the factors like duration of latex flow and regeneration of latex between two tappings. These yield limiting factors are controlled by genetic constitution of the plant and the environment, and the exploitation systems undertaken. Limiting factors of clonal origin can be anatomical and physiological characters of latex vessels, the latter being more (Jacob *et al.*, 1989). Productivity can be manipulated to some extent by changes in exploitation systems. Certain biochemical parameters in latex namely, dry rubber content (DRC), sucrose, thiols and inorganic phosphorus (Pi) which influences latex flow and regeneration process help in the assessment of the physiological status of the laticifers in the drainage area of the tree.

Since rubber constitutes over 90 per cent of the total solids of latex, DRC can reflect the biosynthetic capacity of the trees. A high sucrose content in latex may indicate an active metabolism and high productivity (Tupy and Primot, 1976) or a low metabolic utilization and low productivity. The Pi in latex reflects the energy metabolism and has a direct correlation with rubber yield in clones (Subronto, 1978; Eshbach *et al.*, 1984). Thiols in latex trap toxic forms of oxygen protecting the cell compartmentation of latex (d'Auzac *et al.*, 1982).

A study was taken up with nine clones belonging to high (RRII 105, PB 235,PB 215, PB 217), medium (GT 1) and low (Ch 4, Pil B 84, Tjir 16, Ch 29) yielding groups grown in the germplasm garden of the Central Experimental Station of the Rubber Research Institute of India at Chethackal. The trees were in the sixth year of tapping under the 1/2S d/2 system. Six trees in each of the clones were selected for the study from a randomized block design planting. Approximately 1 g of latex extracted with 2.5 per cent trichloroacetic acid and made up to 10 ml was used for estimation of sucrose (Scott and Melvin, 1953), Pi (Taussky and Shorr, 1953) and thiols (Boyne and Ellman, 1972). Biochemical analyses were done in duplicate using samples collected from individual trees and the mean values are presented in Table 1.

Average yield (volume of latex) of the

Table 1. **Physiological parameters of latex from clones under 1/2S d/2 6d/7 system in the sixth year**

Clones	Sugar (mM)	Pi (mM)	Thiols RSH (mM)	DRC (%)	Volume (ml/tree/tap)
Pil B 84	2.59	6.39	0.49	33.50	69.60
Ch 29	2.74	12.93	0.46	30.29	88.16
Ch 4	2.13	13.60	0.46	33.00	111.30
Tjir 16	2.04	9.88	0.65	30.67	122.16
PB 235	1.29	16.69	0.35	44.35	192.00
PB 215	5.89	13.42	0.63	44.60	292.00
PB 217	6.76	16.48	0.71	39.00	292.00
RRII 105	4.73	17.28	0.41	41.81	314.30
GT 1	3.87	11.90	0.68	40.12	209.20
CD (0.05)	0.70	3.07	0.16	7.59	99.50

nine clones show that there is significant difference between the high yielders (with the exception of clone PB 235) and the low yielders. It is possible to explain the production mechanisms of the clones studied on the basis of the latex diagnosis parameters as the measurements were done under comparable conditions. The low yielders in this study showed almost similar metabolism indicated by a low DRC, low sugar content and a low Pi content in two cases. The yield and plugging characteristics of the low yielders in general are indicative of a lower capacity for intercellular and tissue exchanges (Jacob *et al.*, 1989). A high thiol content which forms an effective system for membrane protection and a lower rate of metabolism indicated by a low Pi may be one of the reasons for the low susceptibility of the low yielders to bark dryness (Eschbach *et al.*, 1984).

On the other hand, the high yielding clones, PB 235 and RRII 105, with low sugar and thiol contents coupled with a high Pi, have an active metabolism in the latex vessels. The low values of sugars and thiols are indicative of its rapid utilization. In RRII 105 and PB 235, sugar and thiols become the limiting factors for latex yield under d/2 system of tapping. Since these clones have long duration of flow, more biochemical energy is being utilized for membrane translocations. These clones are more sensitive to incidence of tapping panel dryness (TPD) because of their active metabolism and easy flow, which make considerable demand on cellular and subcellular membranes, producing toxic forms of oxygen, leading to bark dryness.

PB 217 has a less active metabolism when compared to RRII 105 and PB 235 as shown by a high sugar and thiol content and low DRC. These are factors which favour this clone's positive response to stimulation. Response to stimulation is linked to availability of sugar and level of thiols. A higher thiol and sugar content, when compared to RRII 105, suggests the suitability of this clone for higher intensity of exploitation. The higher thiol content which protects the lutoid membranes from peroxidation may be contributing to lower incidence of TPD in this clone.

A higher thiol and sugar content in clone PB 215 are factors that suit this clone to intensive exploitation systems with a possible lower TPD incidence. The high yielding attributes of this clone may be of use to plant breeders.

GT 1 which shows a lower level of Pi, higher level of thiols and a lower DRC than the high yielders has an intermediary metabolism and shows characteristics which suggest that stimulation may favour optimum yield in this clone.

The physiological parameters discussed help to explain the production mechanism of the *Hevea* clones studied. A functioning mechanism can be foreseen based on these values to evaluate planting materials and suggest exploitation systems best suited for these clones.

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