Developments in Plantation Crops Research, 1998, 139-141.

AVAILABILITY OF PHOTOSYNTHATES AND OCCURRENCE OF TAPPING PANEL DRYNESS SYNDROME IN *HEVEA BRASILIENSIS*

MOLLY THOMAS, S. SREELATHA, SHEELA P. SIMON, N. USHA NAIR, K.U. THOMAS, JAMES JACOB and M.R. SETHURAJ

Rubber Research Institute of India
Kottayam - 686 009
Kerala

Healthy trees of the *Hevea* clone RRII 105 were continuously monitored at biweekly intervals for sucrose, inorganic phosphorus (Pi) and thiols contents in their latex and weekly for the occurrence of tapping panel dryness (TPD) with the objective of relating any changes in these parameters with the onset of TPD. Six trees out of fifty showed symptoms of TPD during the 20 months period of the present investigation. The concentrations of sucrose and Pi in the latex were higher in the affected trees than in the normal trees 15 to 45 days before the onset of TPD. Before this period there was no significant difference in sucrose and Pi content. No clear pattern was observed for thiols. The occurrence of high concentrations of sucrose suggests that the supply of photosynthates for rubber synthesis was not the primary cause for TPD. The simultaneous occurrence of high concentrations of sucrose and Pi in the latex indicates a possible inhibition in the metabolic conversion of sucrose into rubber due to poor energy status of the laticiferous tissues of the trees that are being affected by TPD.

INTRODUCTION

Tapping panel dryness (TPD) syndrome which limits production in *Hevea* plantations, is a complex phenomenon. Usually high yielding clones are more prone to this disorder than medium and low yielding ones (Sivakumaran *et al.*, 1988). In plantations, the number of trees affected by TPD increases with tapping frequency (Chua, 1965, 1967). Over-stimulation also leads to increased incidence of TPD (Paranjothy *et al.*, 1975). Despite many years of research, the causes of this syndrome are not clear and studies are difficult on account of the random occurrence of the disorder. In view of these facts an experiment was designed in which healthy trees of the *Hevea* clone RRII 105 were continuously monitored at biweekly intervals for changes in the biochemical composition of latex (sucrose, Pi and thiols) and weekly for the occurrence of TPD. The objective of the present study was to relate such changes, if any, in the biochemical composition of latex with the onset of TPD.

MATERIALS AND METHODS

The experiment was conducted in an estate 15 km away from the Rubber Research Institute of India. Fifty healthy trees of the clone RRII 105 were selected at random from 300 trees, which were planted in 1985 and opened for tapping in 1992. The experiment was started in October 1994 and data up to May 1996 are presented. The concentrations of sucrose, Pi and thiols in the latex were recorded at biweekly intervals upto January 1996 and thereafter these parameters were recorded monthly.

The trees were checked for the occurrence of TPD at weekly intervals. Latex samples collected between 5 to 30 min of flow were used

for estimations. Duplicate samples were analyzed individually for all the trees. A known amount of latex was extracted with 2.5 per cent trichloroacetic acid and aliquots were used for estimations of sucrose (Scott and Melvin, 1953), Pi (Taussky and Shorr, 1953) and thiols (Boyne and Ellman; 1972). Changes in the biochemical composition leading to TPD symptoms were compared in healthy and TPD affected plants.

RESULTS AND DISCUSSION

Trees which became TPD affected showed significantly higher concentrations of sucrose and Pi in their latex 15 to 45 days prior to showing symptoms of partial dryness (Fig. 1.1-1.2). Until this period, these biochemical parameters did not show any difference between healthy and affected trees. After the onset of TPD also latex sucrose and Pi contents were higher in TPD affected than in normal trees. The concentration of thiols in latex did not show any statistically significant change (Fig.1.3).

Sucrose is the basic substrate for cispolyisoprene production in latex. By increasing tapping frequency or by stimulation more sucrose is removed from the laticifers. If sucrose becomes deficient due to over-exploitation, latex production will be inhibited. Results of the present investigation indicate that the trees which were being affected with TPD did not experience any biotic stress due to deficient supply of photosynthates (sucrose) and therefore, supply of substrate. Inorganic phosphate plays an important role in the energetics of any actively metabolizing cell such as laticiferous cell, through it's role in the phosphorylation of ADP to ATP. For the conversion of sucrose into rubber the requirement of ATP is high. The simultaneous occurrence of high concentrations of sucrose and Pi in latex indicates a possible inhibition in the metabolic conversion of sucrose into rubber due to impaired energy status in the laticiferous tissues of the trees that are being affected by TPD. Therefore, the present study indicates that rather than the substrate (sucrose) availability, the in-

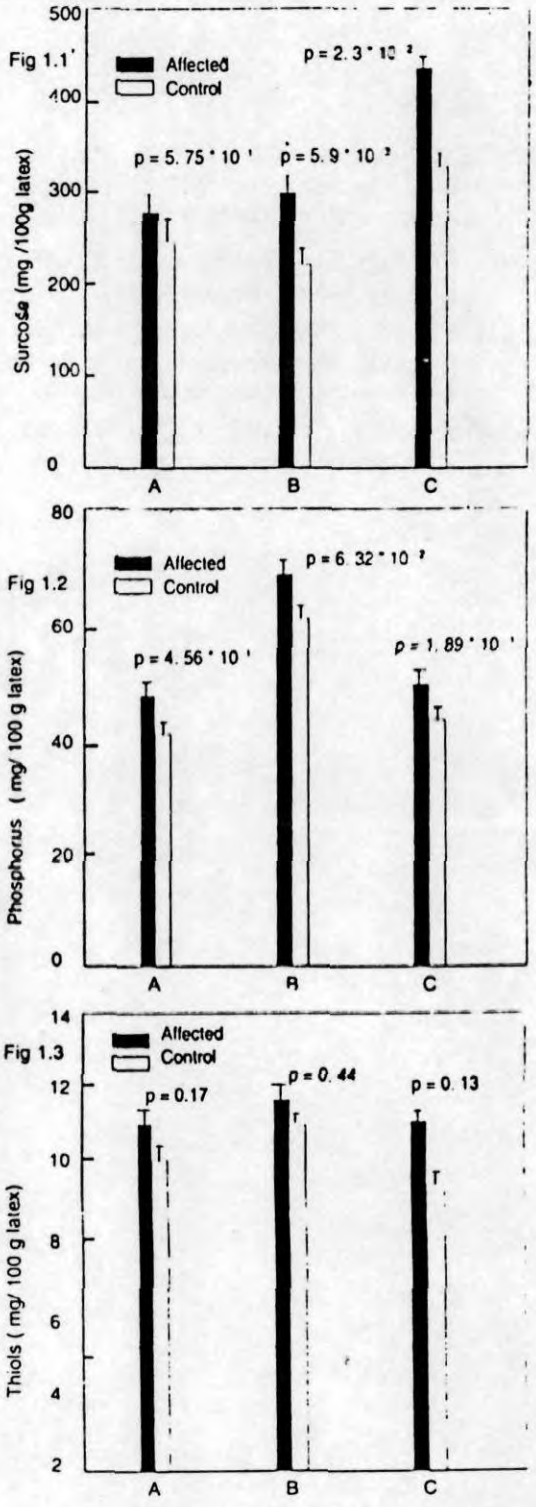

Fig. 1.1. Sucrose content: 1.2. Phosphorus content and 1.3. Thiol content in the latex of TPD affected and control plants. A: 45 to 90 days before the onset of TPD; B: 15 to 45 days before the onset of TPD; C: 15 to 45 days after the onset of TPD (Each bar is a mean of 6 trees. Probability of independent test is shown)

ability to convert sucrose in to rubber causes TPD.

REFERENCES

BOYNE, A.F. and ELLMAN, G.L. 1972. A methodology for analysis of tissue sulfhydryl components. *Analytical Biochemistry*, **46** : 639 - 653.

CHUA, S.E. 1965. Physiological aspects of exploitation. *Planters' Bulletin*, **80** : 139 - 143.

CHUA, S.E. 1967. Physiological changes in *Hevea* trees under intensive tapping. *Journal of Rubber Research Institute of Malaya*, **20** : 100-105.

PARANJOTHY, K., GOMEZ, J.B. and YEANG, H.Y. 1975. Physiological aspects of brown bast development. *Proceedings of International Rubber Conference*, 1975, Kuala Lumpur, Malaysia. pp. 181-202.

SCOTT, T.A. and MELVIN, E.H. 1953. Determination of dextran using antrone. *Analytical Chemistry*, **25** : 1956.

SIVAKUMARAN, S., HARIDAS, G. and ABRAHAM, P.D. 1988. Problem of tree dryness with high yielding precocious clones and methods to exploit such clones. *Proceedings of IRRDB Symposium*, Paris, France. pp. 253-267.

TAUSSKY, H.H. and SHORR. E. 1953. A micro calorimetric method for the determination of inorganic phosphorus. *Journal of Biological Chemistry*, **202** : 675 - 685.