

## CHANGES IN THE BIOCHEMISTRY OF LEAVES OF TAPPED AND UNTAPPED TREES OF *HEVEA BRASILIENSIS* DURING REFOLIATION, MATURATION AND WINTERING

Natesan Geetha and James Jacob

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Changes in the physiology of leaves were monitored for their entire life time in tapped and untapped trees of *Hevea brasiliensis*. At periodic intervals the biochemical components of the leaves, namely, chlorophyll, soluble proteins, free amino acids (FAA), starch, soluble sugars and malondialdehyde (MDA) and the extent of membrane leakage were measured. Total chlorophyll, soluble protein, starch and sugar progressively increased as the leaves matured, but their levels decreased during senescence and wintering. FAA and MDA contents in the leaf increased during the maturation and remained constant before their concentrations increased drastically during wintering. The total chlorophyll/soluble protein ratio decreased sharply and FAA/soluble protein and MDA/total chlorophyll ratios were found to increase abruptly during wintering. Accumulation of MDA indicates severe peroxidative damage of the membrane systems leading to increased membrane leakage during wintering. Results show that tapping led to higher concentrations of starch and soluble sugars in the leaves possibly due to the increased photosynthesis as a result of increased sink activity (exudation of latex). There was more accumulation of MDA and increased membrane damage suggesting increased stress in the leaves of the tapped trees when compared to the untapped trees.

Key words: Ageing, *Hevea brasiliensis*, Malondialdehyde, Membrane damage, Oxidative stress, Senescence, Tapping, Wintering.

### INTRODUCTION

Wintering of deciduous trees is one of the spectacular phenomena in nature and has been a theme of active research by plant biologists for a long time (Biswal and Biswal, (1999). In temperate regions wintering occurs during the fall end of autumn, also known as fall season referring to the leaf fall. From a physiological perspective, wintering is an accelerated process of ageing and senescence triggered by internal factors that are yet to be fully elucidated. The most obvious aspect of wintering is the sudden change in the colour of the leaves from green to a variety of shades depending on the species and the eventual defoliation.

*Hevea brasiliensis* is a deciduous tree species of tropical origin. Mature trees of this species shed all their leaves between late December and early January, but young plants (1 to 3 year old) are not deciduous in nature. Once the tree enters into the winter-

ing phase in early December, it takes hardly 2 to 3 weeks for the complete change in the leaf colour from green to yellow and for their total defoliation. Within a period of another 2 to 4 weeks the tree gets refoliated with lush green leaves. While some clones of *Hevea* winter partially, certain others winter completely and the clones may be either early or late wintering types (George *et al.*, 1967; Meenattoor *et al.*, 1989; Soman *et al.*, 1995). The exact timing of wintering in *H. brasiliensis* is an important factor that determines the incidence of powdery mildew, a serious leaf disease affecting the young foliage of this crop (Vinod *et al.*, 1996; Edathil *et al.*, 2000). Besides the above observations, there have been few scientific and systematic studies on wintering in this important species. It is not known why the deciduous trait begins to express only after the plants are about four to five years old. The biochemical changes in the leaf during wintering have not been