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SCREENING OF *HEVEA BRASILIENSIS* GERMPLASM FOR WOOD QUALITY USING CINNAMYL ALCOHOL DEHYDROGENASE (CAD) ACTIVITY AND LIGNIFICATION PATTERN

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Lignins are phenolic polymers of the plant cell wall associated with mechanical strength, sap conduction, defense mechanisms and imperviousness to biodegradation. Cinnamyl alcohol dehydrogenase (CAD) is the key enzyme involved in the synthesis of lignin monomers. A study was conducted in stems of 18 wild germplasm accessions and five Wickham clones of *Hevea brasiliensis* to localize and correlate CAD activity and lignification at various stages of xylogenesis. CAD activity was maximum during the early stages of stem development and minimum during the mature stage of xylogenesis whereas the pattern of lignification showed a reverse trend. The quantity of lignin also increased in association with the progress of secondary thickening. The lignin percentage in the wild accessions ranged from 21.0 - 27.4 per cent and it was 20.0 – 23.0 per cent in the Wickham clones. Nine wild accessions showed significantly higher percentage of lignin over the Wickham clones. The localization of CAD activity and quantification of lignin in the juvenile growth phase can be used as early selection parameters for wood quality in *Hevea brasiliensis*.

Keywords: CAD activity, *Hevea brasiliensis*, Lignification, Wild germplasm, Wood quality.

INTRODUCTION

Lignins, the phenolic polymers of the plant cell wall, form the second most abundant group of biopolymers after cellulose (Roth *et al.*, 1997; Boudet, 2000). Functionally, lignin is associated with mechanical support, sap conduction, defense mechanisms, strengthening of plant tissue and its imperviousness to biodegradation (Piquemal *et al.*, 1998; Gierlinger *et al.*, 2004).

Lignification is a tightly regulated and dynamic process subject to modulations during normal development and response to different environmental stresses. Recent enzymatic and genetic engineering studies on lignins revealed a specific route to the synthesis of lignin precursors in the cytoplasm, which is translocated to the cell wall for polymerization (Boudet, 2000; Gierlinger *et al.*, 2004). Regulation of transport or polymerization affects the quantity of lignin produced.

The lignin biosynthesis involves the shikimate, phenyl propanoid and lignin specific pathways (Higuchi, 1990). The cinnamyl alcohol dehydrogenase (CAD) is an $NADPH^+$ specific oxidoreductase enzyme catalyzing the reversible conversion of cinnamyl aldehydes to the corresponding alcohols in the lignin specific pathway. As

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