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DROUGHT-INDUCED CHANGES IN PHOTOSYNTHESIS AND CHLOROPLAST PROTEINS IN YOUNG PLANTS OF *HEVEA BRASILIENSIS*

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One-year-old plants of *Hevea brasiliensis* belonging to four clones, viz. RRII 105, RRII 430, RRIM 600 and PB 260, grown in big-sized polybags, were subjected to water deficit stress by withholding irrigation for 18 days during two consecutive summer seasons (March, 2008 and March, 2009). A consistently over-expressing 23 kDa stress protein in the chloroplast was observed in plants stressed by drought and high light intensity. The amino acid sequence of the stress protein was already elucidated and found to be a small chloroplast heat shock protein (sHSP). The magnitude of the expression level of this stress protein was relatively high in drought-tolerant clones indicating the probable role of this protein in abiotic stress tolerance. The stress tolerance traits in these rubber clones were analyzed by measuring various photosynthetic parameters. There was a significant reduction in photosynthetic oxygen evolution rate in the leaves of drought imposed plants. On the contrary, dark respiration of leaf was increased during early drought period. Further, the maximum potential (Fv/Fm) and effective quantum yield of PS II (ΦPS II) and electron transport rate were drastically inhibited in drought-imposed plants. However, the clones RRII 430 and RRIM 600 recorded relatively small inhibition in ΦPS II and photosynthetic rate as compared to other clones which can be attributed to their inherent drought-tolerant characters. The clones RRII 105 and PB 260 were shown to be drought susceptible as determined from their photosynthetic parameters and expression level of sHSP.

Keywords: Drought, Effective quantum yield of PS II, High solar light, HSP, Photosynthesis

INTRODUCTION

Hevea brasiliensis is the most important commercial source of natural rubber (NR). Owing to the increasing global demand for NR and its limited scope for expansion in the traditional belts, attempts are being made to extend the cultivation to marginally suitable areas in most rubber growing countries with varied climatic constraints like moisture stress and high and low temperature. In India, cultivation of rubber is being extended to North East India. Drought, combined with high solar light intensity, has been reported as a major environmental constraint for establishing rubber cultivation in areas such as the North Konkan region of India (Jacob *et al.*, 1999; Alam *et al.*, 2005). Most of the field-grown plants tolerate environmental stresses through many metabolic adaptations at cellular level. In general, most of the damaging effects of irradiation and moisture stress to green leaves occur at the chloroplast membrane and enzyme levels (Oquiset *et al.*,

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