

## COLD RESPONSES OF *HEVEA BRASILIENSIS* CLONES UNDER CONTROLLED ENVIRONMENTAL CONDITIONS

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Low temperature during winter season is the major constraint for the extension of rubber cultivation in sub-tropical environments that are prevailing in north-eastern India. Cold stress strongly affects the growth and productivity of rubber plants. In the present study, four *Hevea brasiliensis* clones viz., RR1105, RRIC 100, SCATC 88/13 and Haiken 1 were exposed to cold stress under controlled environmental conditions. Morphological symptoms such as yellowing and drying of leaves were more prominent in RRIC 100 followed by RR1105 and less prominent in SCATC 88/13 and Haiken 1. Photobleaching of the photosynthetic pigments, chlorophyll and carotenoids were comparatively lesser in Haiken 1 and SCATC 88/13. Maximum photochemical efficiency of PS II (Fv/Fm) and effective quantum yield of PS II ( $\Phi$  PS II) were stable in SCATC 88/13 followed by Haiken 1 under low temperature conditions. The rate of lipid peroxidation was severe in RR1105 and RRIC 100, indicating that these two clones succumbed to cold mediated oxidative stress. Two stress proteins were found in the chloroplast protein profile of Haiken 1 and SCATC 88/13 that may probably be involved in conferring cold tolerance to these two clones.

**Keywords:** Chlorophyll fluorescence, Cold stress, Lipid peroxidation, PS II, Stress proteins

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### INTRODUCTION

*Hevea brasiliensis*, the most important commercial source of natural rubber (NR) grows in a warm humid climate (21–35 °C) with a fairly distributed annual rainfall of not less than 200 cm (Rubber Grower's Companion, 2012). Temperature extremes are the major factors limiting the productivity and geographical distribution of this crop. Shortage of available land ensuing from competition with other crops and increasing national and international demand for NR led rubber cultivation to be

extended to marginal and subtropical environments that are prominently located in north-eastern regions of India, highlands and coastal areas of Vietnam, southern China and Southern plateau of Brazil. Low temperature, typhoon and prolonged dry periods are frequently encountered in these areas (Priyadarshan and Goncalves, 2003). Among these factors, low temperatures (between 0 to 10 °C) strongly affect the development and latex production of rubber trees in South Central China and northeastern states of India (Priyadarshan