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QUANTITATIVE EXPRESSION ANALYSIS OF STRESS RESPONSIVE GENES UNDER COLD STRESS IN *HEVEA BRASILIENSIS*

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Tolerance to extreme climatic conditions being experienced in non-traditional rubber growing regions in India involves genes/regulatory factors associated with this trait in *Hevea brasiliensis*. Identification of such genes/factors is necessary for evolving suitable clones for such regions. For this purpose, gene expression analysis was carried out on leaf samples of *Hevea* clones with varying tolerance levels *viz*. RRII 105 and RRIM 600 (relatively cold susceptible and tolerant respectively) exposed to low temperature stress. Among the 21 *Hevea* specific genes analyzed, expression of LEA 5 protein, ETR1, NAC transcription factor, annexin, ABC transporter protein, WRKY transcription factor, GPX, ACO2, HbDRT50 and peroxidase responded to low temperature stress. Among these genes, LEA 5 protein, peroxidase, ETR1, ETR2 and NAC transcription factor were found associated with tolerance. Genes such as NAC transcription factor, LEA 5 protein and peroxidase showed high magnitude level of expression under cold conditions indicating its stronger association with cold tolerance. This need to be further validated with more such tolerant clones to identify the best candidate genes/regulatory factors associated with cold tolerance.

Keywords: Cold stress, Gene expression, *Hevea brasiliensis*, qPCR analysis

INTRODUCTION

To meet the ever increasing demand for natural rubber (NR) both domestically and globally, cultivation of *Hevea brasiliensis*, in India is being extended to marginal areas like north-eastern regions where the temperature during winter is too low for its survival and optimum productivity. As *H. brasiliensis* is originated from the tropical regions of Amazonian forest where the mean temperature ranges between 25 and 28 °C (Strahler, 1969), it is very sensitive to low temperature conditions. While the required optimal growth temperature for successful cultivation of NR lies between 20 and 34 °C (Webster and Baulkwill, 1989), the mean temperature in North East India is less than 20 °C for five months with minimum temperature going as low as 2°C occasionally in winter nights (Meenattoor *et al*., 1989). In

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