

ANALYSIS OF DROUGHT RESPONSIVE GENE EXPRESSION IN *HEVEA BRASILIENSIS*

Molly Thomas, M.B. Mohammed Sathik, Lisha P. Luke, Linu Kuruvilla, K.V. Sumesh,
P.R. Satheesh, K. Annamalainathan, R. Krishnakumar and James Jacob

Rubber Research Institute of India, Kottayam- 686 009, Kerala, India

Thomas, M., Sathik, M.B.M., Luke, L.P., Kuruvilla, L., Sumesh, K.V., Satheesh, P.R., Annamalainathan, K., Krishnakumar, R. and Jacob, J. (2011). Analysis of drought responsive gene expression in *Hevea brasiliensis*. *Natural Rubber Research*, 24(2): 247-252.

Cultivation of *Hevea brasiliensis* is being extended to drought-prone marginal areas and therefore, identification of suitable clones that can survive under adverse climatic conditions is highly essential for enhancing the production of natural rubber in India. Identification of genes/factors contributing to stress tolerance will help in understanding the molecular basis of drought tolerance. Relevance of seven drought responsive genes (identified earlier) was studied in drought sensitive/tolerant clones. Studies on net CO₂ assimilation rate (A) and stomatal conductance (g_s) indicated that clones such as RRIM 600 and RRII 430 were relatively more tolerant to drought than RRII 105 and RRII 414. The gene expression studied by quantitative PCR method demonstrated strong association of genes such as CRT/DRE binding factor and ABC transporter protein with drought tolerance, as evidenced by their up-regulation and down-regulation, respectively only in the drought-tolerant clones (RRIM 600 and RRII 430) when exposed to drought stress. Expression analysis of these genes in more *Hevea* clones would further strengthen the significance of their association with drought tolerance potential.

Keywords: Drought stress, Gene expression, *Hevea brasiliensis*, Stress responsive genes, qPCR analysis

INTRODUCTION

Cultivation of *Hevea brasiliensis*, the most important source of natural rubber, is being extended to marginal areas of western and central India where soil and atmospheric drought and high temperature are the major environmental factors limiting its growth and yield (Jacob *et al.*, 1999). Identification of clones that can survive under extreme climatic conditions giving sustainable yield is essential to maximize productivity in rubber plantations in such stressful regions in India.

Tolerant clones develop several adaptive mechanisms to manage or escape

the adverse impacts of environmental extremes. One of the major molecular responses that plants exhibit when exposed to drought stress is altered expression of genes related to different metabolic pathways associated with stress perception, signal transduction and regulation and synthesis of a number of compounds (Ramanjulu and Bartels, 2002; Sreenivasulu *et al.*, 2007). Understanding the mechanisms involved in •???????• response to abiotic stresses such as drought, cold, *etc.* is required for selecting plants with better tolerance to environmental stresses.