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OVER-EXPRESSION OF MnSOD AND RELATED DROUGHT TOLERANT TRAITS IN MnSOD TRANSGENIC *HEVEA BRASILIENSIS*

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Two transgenic plants (L1 and L2) of *Hevea brasiliensis* (clone RRII 105) integrated with the manganese superoxide dismutase (MnSOD) gene were developed from two independent *Agrobacterium* mediated genetic transformation events. Six month old bud grafted plants of clone RRII 105 (control), non-transgenic somatic plants (control) and transgenic plants (L1 & L2), growing in polybags were subjected to water stress and their drought tolerance traits were evaluated through molecular, physiological and biochemical tools. MnSOD transcript abundance, leaf water potential, PS II activity, photosynthetic oxygen evolution and respiratory oxygen uptake rates, H_2O_2 content and superoxide dismutase and peroxidase enzyme activities were studied. Northern analysis indicated a higher MnSOD transcript level in the stressed transgenic plants. The maximum potential photochemical efficiency of PS II was not altered under drought stress. On the contrary, the effective quantum yield of PS II and mid-day leaf water potential were reduced in all the plants, however, the extent of reduction was small in L1 plants. Similarly, the drought mediated reduction in photosynthetic oxygen evolution rate was smaller in the SOD transgenic L1 plants than in the other plants. The SOD activity was 35 and 31 per cent higher under normal and drought conditions, respectively in the transgenic plant L1 than the bud grafted plants of clone RRII 105. Though there was an increase in SOD activity and H_2O_2 content in L1 plants, corresponding changes were not observed in the case of peroxidase activity. The results indicated that the transgenic plant L1 is superior to all other plants in terms of drought tolerance. Development of transgenic plants for abiotic stress tolerance, integrated with genes like MnSOD is a significant step in extending rubber cultivation to marginally suitable areas in the present scenario of changing climate.

Key words: Drought tolerance, Genetic transformation, *Hevea brasiliensis,* Mn superoxide dismutase, Transgenic plant.

INTRODUCTION

In plants, adverse environmental conditions lead to the formation of highly reactive oxygen species due to the imbalance between the production of reactive oxygen species (ROS) and the quenching capacity of the antioxidants. Environmental stresses such as drought (Price *et al.*, 1989), desiccation (Senaratna *et al.*, 1985a,b), extreme temperatures (Kendall and McKersie, 1989; McKersie *et al.*, 1993), high light intensity

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