

PHYSIOLOGICAL TRAITS FOR IDENTIFICATION OF POTENTIAL DROUGHT TOLERANT ACCESSIONS FROM WILD *HEVEA* GERMPLASM

D.B. Nair, M.A. Mercy, K. Annamalainathan, R. Krishnakumar and James Jacob

Rubber Research Institute of India, Kottayam- 686009, Kerala, India

Received: 7 January 2011 Accepted: 8 May 2011

Nair, D.B., Mercy, M.A., Annamalainathan, K., Krishnakumar, R. and Jacob, J. (2011). Physiological traits for identification of potential drought tolerant accessions from wild *Hevea* germplasm. *Natural Rubber Research*, 24(1): 69-75.

In vitro experiments were carried out to identify the most intrinsic tolerance traits for abiotic stresses like drought, temperature, light *etc.* using two contrasting *Hevea* clones. Combination of stresses was found more deleterious than single stress causing an increased membrane injury, leaf chlorophyll bleaching and reduction of PS II photochemical activity. Attempts were made to identify a few vital drought tolerance traits using poly ethylene glycol (PEG) with known drought tolerant (RRIM 600) and drought susceptible (RRII 105) clones. Leaf samples of clone RRII 105 upon incubation with PEG (60%) and light together ($350 \mu\text{mol m}^{-2} \text{s}^{-1}$) exhibited more membrane injury in the drought susceptible clone RRII 105 (60.5%) than in the known drought tolerant clone RRIM 600 (44.2%). Experiments with *in vitro* drought and light stress decreased the chlorophyll content of leaves and enhanced chlorophyll bleaching more in clone RRII 105. Similarly the dark adapted Fv/Fm ratio in exposed leaf samples of clone RRII 105 was found more inhibited than clone RRIM 600.

The drought tolerance traits thus identified in laboratory were validated in young plants grown in nurseries. In young plants under acute drought stress, the reduction in chlorophyll content (24%) and mid-day water potential (25%) were more in clone RRII 105 than in clone RRIM 600 (8% and 15%, respectively). In similar stress condition, the PS II quantum yield declined by 41% in clone RRII 105 and 17% in clone RRIM 600. Under extreme drought, the greenish nature of leaves diminished and turned yellowish due to photo-bleaching causing reduction in total functional leaf area of plant leading to drying and senescence of leaves. Intrinsic drought tolerance traits thus identified were employed to screen large number of *Hevea* germplasm collection.

Leaf traits such as leaf yellowing and senescence that normally occur in summer under acute drought and high light stress in field were empirically scored in 3772 wild germplasm accessions. Accessions that were exhibiting less senescence and yellowing were ranked top as the most drought tolerant ones. From the large pool of wild germplasm 165 accessions were identified as intrinsic drought tolerant ones and 121 as most susceptible ones. The leaf samples of selected accessions were exposed to *in vitro* drought assay using PEG with light and an inverse relationship was observed between percent leaf yellowing under summer drought in the field and leaf PS II activity measured under *in-vitro* drought and high light stress. Thus, leaf yellowing is an easy proxy measure of PSII activity during drought and high light stress.

Keywords: Drought tolerance, Germplasm, Leaf yellowing, PS II activity.