

Na⁺ TRAFFICKING AT DIFFERENT TISSUE LEVELS REVEALS POSSIBLE SALINITY TOLERANCE MECHANISMS IN Bw400 RICE VARIETY

B.I. Dasanayaka¹ and H.A.C.K. Ariyaratna^{1,2*}

¹Postgraduate Institute of Science, University of Peradeniya, Sri Lanka

²Department of Botany, Faculty of Science, University of Peradeniya, Sri Lanka

*chandimaa@sci.pdn.ac.lk

Rice is particularly vulnerable to salinity during the seedling stage, making it essential to broaden the genetic diversity for salinity tolerance. Although Bw400 is a moderately salt-tolerant rice variety, the mechanisms underlying this tolerance remain unknown. To identify the salinity tolerance mechanisms of Bw400, an experiment was conducted using a randomized complete block design involving Bw400, FL478 (salt-tolerant), and Bg352 (salt-sensitive) rice varieties. Two hydroponic systems containing Yoshida nutrient medium were used for 14 days, with one system treated with NaCl at 12 dS/m to impose salinity stress, while the other served as the control. After 12 days of salinization, the Na⁺ content, fresh and dry weights of roots, shoots, and leaves, root length, and shoot height were measured. The relative response of each parameter was calculated by comparing it with the corresponding control. Data were analysed using GLM and Dunnett's multiple comparison in MINITAB. Leaf width, length, and chlorophyll content were measured three times per day under stress. The rate of reduction in chlorophyll content varied in the order of Bg352 > Bw400 > FL478. The whole-plant Na⁺ concentration was highest in Bg352 (2,147 mmol/kg), followed by Bw400 (1,871 mmol/kg) and FL478 (1,384 mmol/kg). Relative water content ($p = 0.565$) and root length ($p = 0.171$) were not significantly different. Na⁺ accumulation (out of the total accumulation) in the roots of Bg352, Bw400, and FL478 was 23.7%, 33.6%, and 13.5%, respectively, while in the shoots, it was 45.6%, 27%, and 42%. The youngest leaf accumulated the highest amount of Na⁺ (368.5 mmol/kg) in Bw400 compared to 169.5 mmol/kg in Bg352 and 124.3 mmol/kg in FL478. Although the leaves and roots of Bw400 accumulate more Na⁺ than both Bg352 and FL478, the plant still tolerates salinity. Further studies are needed to uncover the biological mechanisms and associated genes responsible for this tolerance.

Financial support provided by UNESCO/OWSD is gratefully acknowledged

Keywords: Bw400, Physiological mechanisms, Salinity tolerance, Sri Lanka