

Effect of salinity on Na⁺ and K⁺ compartmentation in salt tolerant and sensitive wheat genotypes

Vazan S.¹, Rajabi F.¹, Askari H.², Nakhoda B.³, Torabi S.⁴

¹Department of Agronomy, Karaj Branch, Islamic Azad University, Karaj, Iran

²Biotechnology Department, New Technologies and Energy Engineering Faculty, Shahid Beheshti University, G.C., Tehran, Iran

³Systems Biology Department, Agricultural Biotechnology Research Institute of Iran, Seed and Plant Improvement Campus

⁴Department of Biotechnology, Science and Research Branch, Islamic Azad University, Tehran, Iran

ABSTRACT

In order to investigate Na⁺ compartmentation in different wheat tissues under salinity stress, 20 different wheat genotypes including salt tolerant, semi-tolerant and sensitive ones were studied in the greenhouse condition. A factorial experiment was carried out based on completely randomized design (CRD) in three replicates in normal and salinity conditions with 12 dS m⁻¹ electrical conductivity (EC). Soil was salinized with calculated amount of NaCl salt to develop level of salinity (12 dSm⁻¹) while control has the same EC as that of original soil. 20 pure wheat genotypes were selected from 100 genotypes during the same experimental method and condition. Higher K⁺/Na⁺ ratio and more dry weight were two criteria for selecting of tolerant genotypes. Na⁺ and K⁺ content was measured in the root, internodes, flag leaf and its sheath blade to assess the mechanism of salt exclusion. The results showed that Na⁺ accumulated in the root and leaf sheath of tolerant genotypes and this mechanism prevented to transfer Na⁺ to leaf blade. Whereas, K⁺ could be transferred to leaf blade more than Na⁺. These results were vice versa in sensitive genotypes. Leaf sheath was detected as a storage tissue that prevented to transfer of Na⁺ to leaf blade and this mechanism involved in improving of salt tolerance. Moreover, significant negative correlation between Na⁺ and K⁺ content was announced in most tissues due to transfer of K⁺ to above ground tissues and excluded Na⁺ in tolerant genotypes.

Keywords: Ions, K⁺/Na⁺ ratio, NaCl, wheat tissue