Physiological adaptation to water salinity in the C3 and C4 halophytes species *Salicornia europaea* and *Salsola soda*

Calone R., Orsini F., Barbanti L.
roberta.calone3@unibo.it
Department of Agricultural and Food Sciences and Technologies, Alma Mater Studiorum, University of Bologna, Viale Fanin 44, 40127,Bologna, Italy

Salinization of agricultural land is a devastating phenomenon which is seriously threatening food safety and ecosystem security. Understanding how plants survive and thrive in response to salinity is therefore critical to potentiate tolerance traits in crop species. Owing to their high interspecific biodiversity, halophytes have been regarded as a primary tool for this purpose. The present study addressed the physiological response to salinity of two halophyte species common in the Mediterranean area: the C3 *Salicornia europaea* (SE) and the C4 *Salsola soda (SS)*. The two species were exposed to five NaCl concentrations (0, 90, 180, 360 and 540 mM) for 30 days in a greenhouse pot experiment. Carbon assimilation and stomatal conductance decreased with salinity in both species, with a sharper decrease in SE (-77% and -49% respectively) than in SS (-41% and -33% respectively). The consequent reduction in leaf transpiration (-67% and -13% respectively in SE and SS) resulted in a water use efficiency (WUE) increase in SE, which reached the highest value at 180 mM NaCl (+213%), but not in SS, which showed a 17%. mean WUE decrease. Despite the reduced photosynthetic activity, both species showed a fresh and dry weight increase with salinity, with the highest increment at 90 mM for SS (+67% and + 33% respectively) and at 180 mM for SE (+ 330% and +121% respectively). RWC, as well, increased with salinity (+4% and +0.5% respectively in SE and SS), with the highest increment in both species when exposed to 90 mM. Leaf water potential decreased proportionally with NaCl increase, with a greater extent in SE (-155%) than in SS (-20%). The considerable Na concentration increase (+118 and +88% in SE and SS respectively) suggests an involvement of this cation in the plants'osmotic adjustments and reflected in a general decrease of the other main ions (Ca, K, P, and Mg). Lastly, an increased ^{13}C discrimination ($\delta^{13}C$) was observed in both species with salinity up to 180 mM NaCl, with a higher increment in the C4 SS than in the C3 SE.

From these results it could be argued that water relations, rather than photosynthesis, play a major rule in support the growth of these species under salinity and, since plant sensitivity to salt may be indicated by the magnitude with which $\delta^{13}C$ changes over increasing salinity, it could be inferred, against the expectation, that the C3 SE reacted better to salinity than the C4 SS.

Keywords: halophytes, salt stress, photosynthetic pathway, water relations, carbon isotopes.