Differential Morpho-Physiological & Chlorophyll Fluorescence Responses to Salt Stress in Two Alfalfa Cultivars.

Giuliano Barbieri[1], Fernando Luna[1,2], Monica Cornacchione[3], Rodrigo Parola[1,2], Marianela Rodriguez[1,2]

The rapid changes in land use induce new scenarios in alfalfa production. Salinization has long been known as a common environmental problem worldwide which directly affects the yield of this crop and the productivity of the livestock system. The aim of this work was to evaluate the morpho-physiological behavior and chlorophyll fluorescence (ChlF) of two alfalfa cultivars under salinity conditions. Monarca INTA is used by most farmers in Argentina due to its potential high total dry matter and low price in the market, while Kumen PV INTA was designed to combine high biomass production and tolerance to salt stress. Both cultivars were grown for twenty days in control hydroponic conditions. Next, plants were subjected to 200 mM NaCl or were maintained on a NaCl-free medium. Morpho-physiological parameters were evaluated at different days' time (0; 1; 7; 14). Monarca presented negative significant differences with respect to control in stem length and number of leaves after one week of treatment, in contrast, Kumen exhibited these differences with respect to control at 14 days of treatment. Furthermore, Kumen showed an early transient decrease (1-day post salinity treatment) of specific parameters associated with ChlF (F_m, F_v/F_m, F_v/F_0), while Monarca showed decreases in the same parameters after one week of salt stress until the end of experiment (14-days post salinity treatment). Moreover, L-band and K-band were higher in Monarca than Kumen. These results could indicate damage at the level of the oxygen evolution complex (OEC) and photosystem II (PSII). In this regard, Monarca under salt stress showed a significant decrease in performance index (PI), a parameter commonly related to plant growth and survival under stress conditions, while Kumen did not show significant differences with respect to control. On the other hand, Monarca showed a significant rise in DIo/CR, a parameter related to defense against photoinhibition and possible PSII damage. Altogether, these results demonstrated, for the first time, that both analyzed cultivars exhibited differential mechanisms related to electron transport in response to salt stress. Thus, we propose that the early and transient response of cultivar Kumen would confer a rapid adaptation to NaCl stress conditions.

1Consejo Nacional de Investigaciones Científicas y Técnicas (CONICET), Unidad de Estudios Agropecuarios (UDEA), Córdoba, Argentina; [2]Instituto Nacional de Tecnología Agropecuaria (INTA), Centro de Investigaciones Agropecuarias (CIAP), Instituto de Fisiología y Recursos Genéticos (IFRGV), Córdoba, Argentina; [3]Instituto Nacional de Tecnología Agropecuaria (INTA), Estación Experimental Santiago del Estero, Argentina.