THE BEHAVIOR OF SOME ROMANIAN ALFALFA GENOTYPES TO SALT AND HYDRIC STRESS

Petcu Elena, Maria Schitea, Domnica Badea

National Agricultural Research and Development Institute, Fundulea, N. Titulescu str., No. 1., Romania.
E-mail: petcue@ricic.ro

Key words: biomass, leaves transpiration, proline content, alfalfa, salinity, drought

SUMMARY

Abiotic stress conditions cause extensive losses to agricultural production worldwide (Bray et al., 2000). Drought and salinity stress can significantly effect plant yield in arid and semi-arid regions and not only. Climatic changes will conducted at sever drought conditions and to aridization of some important regions in Romania. One of the most important drought and salinity strategies for alfalfa (Medicago sativa) breeding which could reduce the influence of those limiting factors is to increase the cultivar tolerance. The present paper reports the reactions of some Romanian alfalfa genotypes to salt and hydric stress. The aim was to elucidate some physiological and metabolic aspects of those stresses in order to establish screening criteria to facilitate the development of genotypes with enhanced tolerance to field stress conditions.

Seeds of nine alfalfa genotypes were sown in Mitchellich plots filled with a soil-sand mixture. The plant were grown in vegetation house under optimal condition up to before flowering, when for hydric stress variant the watering was reduced for 10 days, salt stress was impose on plants by adding 300 mM NaCl/l and under combined stress the plants were treated with 300 mM NaCl/l one week before to reducing watering.

The alfalfa yield for all studied genotypes was significantly reduced under hydric and salt stress and stresses combination caused a reduction on fresh biomass, too. Salt stress significantly decreased biomass more 37 % while hydric stress more 73%. The effect of salt and water stress on yields are additive but not equal. Alfalfa respond to drought by decrease of leaves transpiration and between biomass accumulation and leaves transpiration under hydric and salt stress there are a linear relationships \((r = 0.76*; r = 0.82*)\). Under optimal condition the proline content was very small (1.7-5.4 mg Proline/g. f.w) but was obviously the high proline content under salt stress (156-441 µM proline/g. f.w), hydric stress (45-68 µM proline/g. f.w) and stress combination (120-330 µM proline/g. f.w).

The negative effect of salinity and stress combined on alfalfa growth could be attributed to an osmotic effect. Osmotic stress inhibits water uptake from the soil and requires the plant to use energy and carbohydrate in synthesizing organic solutes to ajust its internal osmotic potential. Yield loss results from closing stomata (as result the transpiration decrease) and from energy and carbohydrate use in osmoregulation. The leaves transpiration and biomass accumulation were correlated that indicated to be used as screening tools for drought and saline tolerance of alfalfa genotypes.