Plant NORD Meeting 2021

Response to salt stress of some annually spontaneous populations of medicago (*Medicago ciliaris*, *Medicago intertexta* and *Medicago scutellata)*

Sonia Mbarki[1,2*] , Siwar Minyaoui[1], Marian Brestic [3], Chedly Abdelly[2], Aziza Zoghlami Khélil[4]

[1] Laboratory of unconventional used water, National research Institute of rural engineering, Water and Forests(INRGREF). BP 10, 2080, Ariana.
[2] Laboratory of Plant Extremophiles, Biotechnology Center at the Technopark of Borj-Cedria Tunisia. BP 901, Hammam lif 2050, Tunisia.
[3]Department of P lant Physiology, Slovak University of Agriculture, Nitra,Tr. A. Hlinku 2, 949 01 Nitra, Slovak Republic.
[4] L'Institut National Agronomic Research of Tunis (INRAT). Hédi Karray -2049 Ariana, Carthage University of Tunisisia . *: mbarkisonia14@gmail.com

Introduction

Salinization is one of the most serious land degradation processes and a major abiotic stress limiting growth and productivity of plants in many areas of the world due to increasing use of poor quality of water for irrigation and soil salinization. Soil salinity is responsible for the reduction in the yield of the main crops and the deterioration of the plant cover and consequently the insufficiency of the food resources.

Plant adaptation or tolerance to salinity stress involves complex physiological traits, metabolic pathways. The identification of plant tolerance mechanisms to salinity are therefore of obvious interest for varietal improvement (1).

A comprehensive understanding on how plants respond to salinity stress at different levels and an integrated approach of combining physiological tools with biochemical techniques are imperative for the development of salt-tolerant varieties of plants in salt affected area.

Material and methods

Seeds of seven populations of medicago ciliaris and two others populations of Medicago ciliaris and *Medicago intertexta* were cultivated in clay soil and exposed to salt stress at 100 mM NaCl. After plant emergence (20 days).

The plants are subjected to salt stress that will last (about 35 days) until the final collection of plant material.

The salt is added by gradient of a solution of NaCl (The salt is applied to the 9 populations: seven of M.ciliaris, M.scutellata and M.intertexta each represented by 5 seeds per pot of which 4 pots are watered with a solution of ascending concentration of the salt for 10 days (until 100 mM NaCl is expected) and 4 pots as a control (with distilled water: 0 mM NaCl).

Fresh weight (FW) and Dry weight was obtained after oven drying the samples at 60°C until a constant weight wasreached.

Photosynthesis parameters (Spad chlorophyll, CO2 Assimilation and chlorophyll pigments.

Discussion

The purpose The tolerance to salt of Medicago ciliaris (Pop 355), *M.scutellata* and *M.intertexta*) appears to be related to an ability to avoid the accumulation of toxic levels of Na +, sustained growth of the roots in the presence of salt, improved ability to osmotic adjustment and / or to maintain adequate levels, especially in the limb of the leaf (2,3).

The decrease in the growth of the M. ciliaris vegetative growth of most populations except 355 can be explained by the fact that NaCl acts by an increase of the osmotic pressure of the medium, which prevents the absorption of the water and mineral salts through the root system, alteration of photosynthesis, and activity of enzymes (4).

Conclusion

In this study salt stress has an effect on the length of the epicotyl and the weight of the aerial part. It is clearly that salt reduction of growth in the various populations of Medicago ciliaris is due to the difference of geographical origins.

The genotype most sensitive to salt stress is 773, whereas *M.ciliaris* (population *355*), *M.scutellata* and *M.intertexta* showed sustained biomass production in the presence of salt compared to other M.cliaris populations.

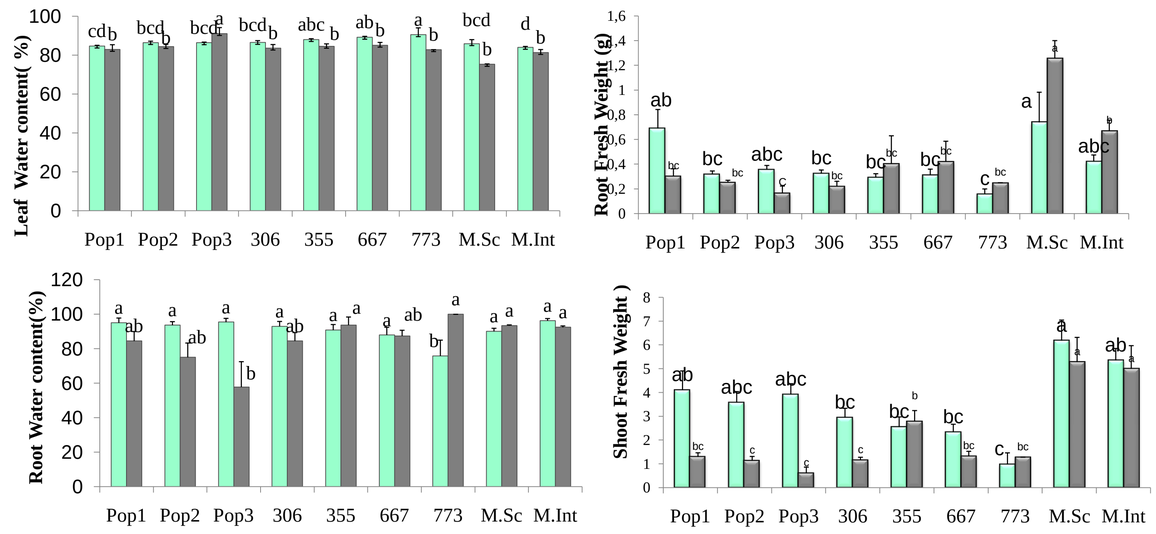
The sustained growth of the shoots and roots systems under salt stress would be a factor of tolerance to salt stress.

Clay soil whoud be good conditioner for ameliorating productivity of populations of 355 of *M.ciliaris, M.scutellata* and *M.intertexta* under salt irrigation and this can be explained by geographic origin of these populations with clay soil texture.

Results

Salt induced a reduction on the various parameters of growth but this decrease remains correlated with the population as they have different geographical origins. Salt has no effect on the hydration of the aerial organs but has a significant effect on those of the roots. The length of the epicotyls and the production of fresh biomass of shoots are affected significantly by salt except (*355* and *M. scutellata*) and to a less degree *M.intertexta*. While the elongation of roots even the fresh biomass production are not affected by irrigation with salt water (100 mM NaCl).

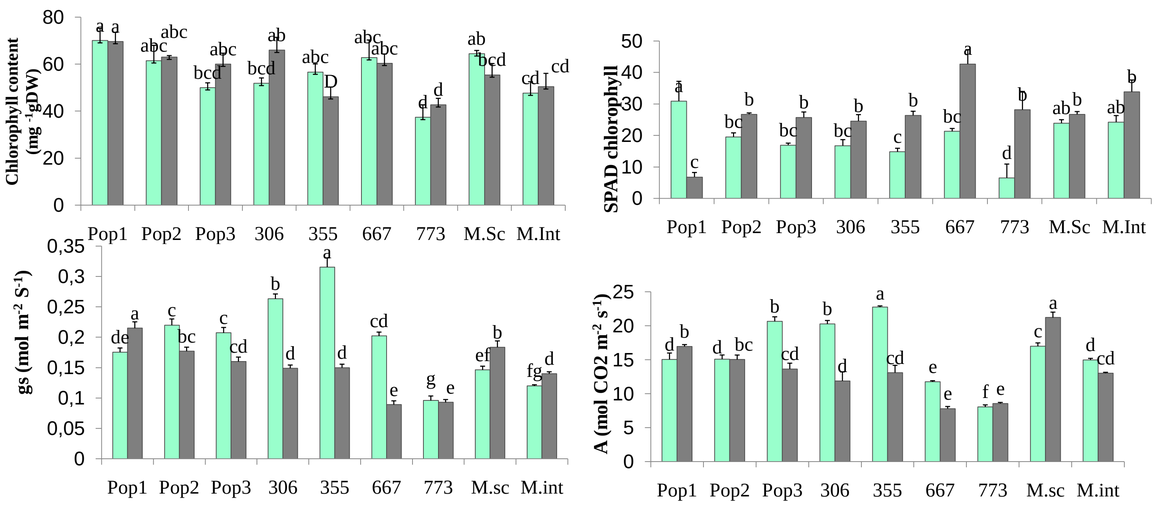
Salt effect on plant gowth of seven populations of Medicago ciliaris

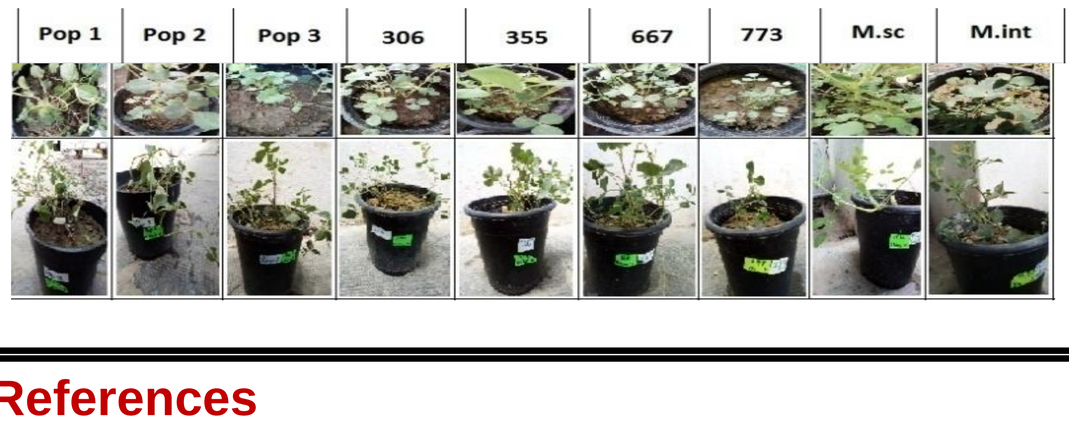


*Salt effect on p*hotosynthesis parameters *of seven populations of Medicago ciliaris*

Results showed a non-significant effect of salt and significant effect of population for total chlorophyll but significant effect of salt and population on SPAD chlorophyll therefore salt caused a drop for all population on the this parameter. We measured SPAD chlorophyll because it is correlated to extractible chlorophyll and depends on plant species and type of stress.

Stomatal conductance decreased in all populations except *Pop1*, *M.scutellata* and *M.intertexta*. Similarly, salt affects the net assimilation of CO_2 and their values decrease in all populations except *Pop1*, *Pop2*, *667* and *773*.





References

1- Zhani, K., Elouer, M. A., Aloui, H., & Hannachi, C. Selection of a salt tolerant Tunisian cultivar of chili pepper (Capsicum frutescens). *EurAsian Journal of BioSciences*, *6*. . (2012)

2- Mezni, M., Albouchi, A., Bizid, E., & Hamza, M. Minerals uptake, organic osmotica contents and water balance in alfalfa under salt stress. *Journal of Phytology*. (2010).

3. Samadi, S., Habibi, G., & Vaziri, A. Effects of exogenous salicylic acid on antioxidative responses, phenolic metabolism and photochemical activity of strawberry under salt stress. *Plant Physiology*, *9*(2), 2685-2694. (2019).

4.Isayenkov, S., & Maathuis, F. J. M. Plant Salinity Stress; Many Unanswered Questions Remain. *Frontiers in Plant Science*. (2019).

Acknowledgement

Acknowledgement This research was conducted in laboratory of animal and plant forage production at INRAT
We also thank Dr MOHAMED Annabi (INRAT) for technical assistance.