

## **Physiological studies of tolerance to saline stress in *Lotus glaber* and their correlation with the establishment and efficiency of the symbiotic association with *Mesorhizobium loti*.**

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Soil salinity represents the main cause of abiotic stress in cultivable plants around the world. At least 34.000.000 Has. are subjected to excess of water and mineral salts in Argentina, These factors determine extreme ecological conditions causing a drastic reduction in their productivity. Salt stress has two components: osmotic stress, caused by a relative increase of solute concentration and the consequent decreased in water availability in the soil, and ionic stress, caused by the modification of the  $K^+/Na^+$  relationship and by concentrations of  $Na^+$  and  $Cl^-$  that are harmful for plant tissues. Plants strategies to overcome these conditions are directed to the activation of multiple metabolic pathways in order to: facilitate the acquisition and retention of water, protection of cell functionality, modifications of growth patterns and maintenance of general homeostasis. These biochemical and physiological modifications include changes in mechanisms such as: (a) phytohormones balance, (b) osmoprotectans synthesis, (c) specialized proteins synthesis for active species of oxygen (AOS) scavenging, (d) toxic ions mobilization and compartmentation.

The rapid increase in world population makes it necessary to find alternative ways to improve agricultural productivity and make the available resources be used more efficiently. One of the strategies consists on obtaining plants tolerant to different stresses in order to introduce them in unfavourable lands. The Argentinean region called Pampa Deprimida del Salado concentrates near 70% of the Argentinean livestock activity, and their productivity is intimately linked to its edaphic characteristics: nutritionally poor soils with high concentrations of minerals salts, high pH, and high fluctuations of the useful water determined by seasonal cycles of drought and flood. In this way, the search for tolerant plant populations, as well as the understanding of the physiological basis of salinity tolerance in Pampa Deprimida ecosystem species, can be considered as a high-priority topic to be studied. Preliminary observations in the IIB-INTECh indicate the existence of high salinity tolerant genotypes in different populations of *Lotus glaber* (Vignolio *et al.*, 1994). The soil conditions in the Pampa Deprimida are a natural obstacle for the efficient installation of pastures based in traditional leguminous as alfalfa or clover. In this sense, the possibility of obtaining improved populations of *Lotus glaber* represents an important productive alternative for those ecosystems and makes this species an excellent experimental model. In relation to its symbiotic associations, previous work in the IIB-INTECh indicates that for a

significant nodulation in an established population of *Lotus glaber* it is necessary to use several *Mesorhizobium loti* strains (Fulchieri *et al.*, 2001). Studies to verify if the physiological conditions of the tolerant plant affect the infection process, colonization and effective biological N fixation have not been addressed yet, nor has the question if the fixation efficiency is due to a minimum number of nodulating strains in the soil.

Our hypothesis suggests that salinity tolerance in *Lotus glaber* would depend, at least in part, on the plant capacity to associate with different native *Mesorhizobium loti* strains. The physiological conditions of the plant in this moment would be decisive for the effective bacterial colonization and later biological N fixation. To corroborate this hypothesis we propose the following general objectives: (a) to elucidate physiological and biochemical salinity tolerance mechanisms in *Lotus glaber* populations and their nodulation through association with *Mesorhizobium loti*; (b) to identify efficient symbiotic associations among tolerant populations of *Lotus glaber* and *Mesorhizobium loti* strains that could facilitate their successful installation under adverse edaphic conditions.

## References

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