MICROBIAL TOOL FOR IMPROVING SALT RESISTANCE IN PLANTS

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The presence of high amounts of salts in soils induces severe stress in plants entailing growth reduction, thus the increase of the area affected by soil salinity represents an enormous worldwide problem for agriculture. Salt exposure may induce oxidative and osmotic imbalance in plant cells, which severity is depending on salt concentration. To counteract this stress, plants can rely on several morphological and physiological responses leading to tolerance, e.g. stomatal closure, production of non-enzymatic antioxidants, enhanced antioxidant enzymatic activities and synthesis of osmolytes. Such adaptations strongly depend on the genotype and the intensity of stress.

Plant Growth Promoting Bacteria (PGPB) is a group of microorganisms (usually rhizobacteria),having the ability of enhancing plant growth either directly or indirectly. The latter occurs when PGPB decrease the deleterious effect of pathogens; the direct ones occurs when the PGPB directly enhance plant growth facilitating the uptake of nutrients or providing the plants with different useful compounds. Under stressful conditions the microbial contribution to the plants can be fundamental, since they can either a source of hormones (auxin, cytokinins) important for the plant growth, or of osmolytes (i.e. proline, polyamines) that can help to counteract the osmotic stress. Further bacterial contribution to the stressed plants can be the decrease of stress ethylene synthesis by means of their enzymatic activity.

The aim of the PhD project is to determine the effectiveness of PGPB in the improvement of salt tolerance in sensitive genotypes in order to provide an environmentally friendly tool to recover saline soils. The project will be divided in three phases. In the first year different PGPB strains will be screened for their tolerance to saline conditions of growth. Selected salt tolerant strains will be inoculated on seeds of different crops in order to determine the best association between bacteria and cultivars under high salinity conditions. Finally, field trials will be planned based on the results obtained in laboratory in order to test the plant/bacteria performances in field conditions. The results will be helpful to understand the adaptative mechanisms to salinity of plants associated with bacteria.