Hormonal interplay between plant growth promoting bacteria and plants grown under saline stress.

Vanegas-Guerrero Javier1, Bacilio Macario1, Sanchez-Nieves Jimena1, Holguin Gina1
1 CIBNOR Environmental Microbiology Mar Bermejo No. 195 23090 La Paz Baja California Sur Mexico
2 Universidad Nacional de Colombia, Bogota, Colombia

Reforestation of mangroves and the productivity of commercial crops is severely limited by soil salinization. Some works have shown that bacterial inoculation can mitigate the deleterious effects of saline stress in plants. However, the role of plant growth regulators in this response is not clear. The objective of this work was to determine if the synthesis of plant growth regulators by plant growth promoting bacteria, PGPB, is induced by root exudates and if inoculation of plants with PGPB changes the composition of plant growth regulators exuded by plants grown under saline stress. Chili plants (Capsicum annum) and mangrove seedlings (Avicennia germinans) were grown under hydroponic conditions at different concentrations of NaCl and inoculated separately with Enterobacter hormaecheii, isolated from the roots of A. germinans, Azospirillum brasilense, or with A. brasilense CdhPR1ACC transformed with the ACC deaminase gene. Root exudates were collected, and indoleacetic acid, IAA, indolebutyric acid, IBA, abscisic acid, ABA, and gibberellins AG3 and AG4 analyzed by HPLC. Addition of root exudates to bacterial cultures induced their synthesis of IAA and AG4 irrespective of the concentration of NaCl employed. No IAA was detected in root exudates of non-inoculated chili plants in contrast to inoculated plants where 0.84-0.5 lg/L of IAA, and 0.36-1.38 lg/L of AG4 were found. Similarly, no plant growth regulators were found in root exudates of non-inoculated plantlets of A. germinans, in contrast to inoculated plants, which registered both IAA (0.52 lg/L) and AG3 and AG4. Interestingly, non-inoculated chili plants grown under saline stress exuded significantly more ABA (0.97 lg/L) than inoculated plants. Results show that when the plant and the bacteria interact they create a cocktail of plant growth regulators that results from interaction with the plant, which is different from that of the bacteria alone. These modifications may play an important role in the mitigation of plant saline stress.

Valorisation of legume nodulating bacteria diversity for degraded arid and saline Algerian land restoration

Merabet Chaibene2, Bekki Abdelkader2, Bouthir Faiza2, Galiana Antoine2, Beurard Pierre2, Willems Anne2, De Laudie Philippe2
1 Institut de Recherche pour le Développement Ressources Vivantes Campus de Bailleulquet TA 10 J 34398 Montpellier cedex 5 France
2 Laboratoire de biotechnologie des interactions plantes-microorganismes, Univ. Oran Es-Senia, Algérie
3 UMR Symbioses Tropicales et Méditerranéennes, IRD-CIRAD-SupAgro-Univ. Montpellier II, Campus de Bailleulquet TA A-82U. 34398 Montpellier Cedex 5, France.
4 Laboratorium voor Microbiologie, Faculteit Wetenschappen, Universiteit Gent, Belgium.

In Algeria soils available for agriculture are limited by salinity and drought. In this country there is a need for plant production improvement to face the increasing demand for human food and fodder. The global strategy for saline and degraded areas restoration includes the use of plant species developing nitrogen-fixing symbioses well adapted to these constraints, especially legumes. In this study plant and soil samples originating from arid and saline regions were collected all around the country. 72 bacterial nodule isolates were obtained and characterised phenotypically and genotypically. Their salinity tolerance was tested on YEM medium and 23 of them tolerate 800mM NaCl. The growth kinetics of the most tolerant strains was determined in M9 medium added with either 600mM or 800mM NaCl. All strains tested for nodulation and nitrogen fixation with their host plant in standard lobe conditions. After 16S rDNA sequencing, isolates were affiliated to Sinorhizobium, Rhizobium, Agrobacterium, Phyllobacterium and Bradyrhizobium. Some of them, forming a separate group possibly representing a new species in Rhizobium were further characterised by Multi Locus Sequence Analysis (MLSA) of five housekeeping genes and by auxanographic tests.

Three S. medicans and two S. meliloti strains were selected for their efficiency and tolerance to NaCl in vitro and further tested as inoculants for the growth of Medicago, ciliata and M. polymorpha, the two dominant forage legume in and saline regions of Algeria. The effectivity of strains was estimated by measuring ARA and plant aerial dry weights with statistical treatments of data. Tests were performed both in a greenhouse and in open field located in a semi-arid region, South-Western part of Algeria.