Geophysical Research Abstracts
Vol. 20, EGU2018-1182, 2018
EGU General Assembly 2018

Selection of soil bacteria adapted to deteriorated soils and establishing a strain collection

Rita Kovacs (1), József Kutasi (1), Éva Kárpáti (2), Ildikó Pupán (1), Rózsa Máté (1), Csilla Imre (1), and Nikoletta Pék (2)

(1) Biofil Ltd., -, Hungary (rituu.kovacs@gmail.com), (2) Saniplant Ltd. - Hungary

40% of the EU area is agricultural land, managed in line with Common Agricultural Policy provisions that require lands to be maintained in good agricultural and environmental condition. Increasing need for environment-friendly and sustainable crop production worldwide promotes the development of alternatives to synthetic agrochemicals. The use of plant growth promoting rhizobacteria (PGPR) as soil inoculants denotes such an option to chemicals. Plant growth promotion by rhizobacteria is a complex phenomenon, including nitrogen supply by biological nitrogen fixation, biocontrol effect in the rhizosphere, nutrient solubilization in the root zone, and the phytostimulation by production and release of plant growth regulating phytohormone. In terms of habitat, greatly heterogenous European soil types are different in particle size, water regime, humus content, bedrock, pH and salt concentration. The most important stress conditions for soil microorganisms are pH, salt concentration and temperature.
The project aimed at the isolation of bacterial strains from deteriorated soils and the establishment of a strain collection having plant growth promoting, soil ameliorating and biocontrol properties.
10 different soil types were selected from various regions of Hungary. Low-fertility, deteriorated soil types (dystric and eutric arenosol, alisol, sodic solonchak, solonetz, dystric gleysol, dystric fluvisol) were sampled for the isolation of soil bacteria. Over 1300 strains were isolated that are adapted to extreme abiotic conditions and – as part of the native microflora -are able to enhance soil microbial activity when reinoculated in deteriorated soils. Stress-selective isolation and classical microbiological methods were used to select abiotic stress tolerant, plant growth promoting, biocontrolling and soil aggregation promoting bacterial strains. The isolated strains were classified according to rate of stress tolerance and biological activity. Strains were identified by 16S rDNA sequence analysis and BLAST database. A strain collection was composed of strains that are adapted to the regional climatic conditions at extreme soil pH levels and high salt concentrations based on the Soil Bacterial Screening System (Kutasi et al., 2015WO 2015/118516).
According to the classification system the most suitable 26 strains were selected, which are capable for soil inoculation in acidic, saline and cold conditions. The majority of the isolated nitrogen fixing strains belong to the genus Azospirillum. The best solubilizer strains are from Pseudomonas and Arthrobacter genera. Pseudomonas, Azospirillum and Agreia sp. were selected for siderophore producing. The most effective phytohormone producing strains belonged to the Azospirillum and a Kocuria genus. The stress tolerant strains were assigned to target soil types categorized according to soil pH. (acidic, alkaline and neutral). The salt- and alkaline pH-tolerant Azospirillum, Kocuria, Pseudomonas and Arthrobacter strains bacteria were assigned to the group of alkaline soil types. Azospirillum, Bacillus and Pseudomonas, Agreia and Paenibacillus strains showing tolerance of low pH associated with acidic soil types. We classified the stress sensitive but biologically active strains as neutral ones. This category has overlaps with the other categories.
The project entitled „Combined use of soil inoculation and biochar for the amelioration of deteriorated soils” (HU09-0029-A1-2013) was financially supported by the Norvegian Financial Mechanism 2009-2014, Green Industry Innovation Programme.