

Salt tolerant, nitrogen fixing and phosphate solubilizing bacterial strains as Biofertilizer for saline soil

Biotech Consortium India Limited (BCIL) is seeking companies interested in licensing the bacterial strains and formulation of biofertilizer for effective application to saline soil. The biofertilizer strains has been developed by the scientists at the M.S. Swaminathan Research Foundation (MSSRF), Chennai, India. These strains are with phosphate solubilizing and nitrogen fixing properties for effective application in saline soil environment.

About BCIL:

BCIL was incorporated as public limited company in 1990 under the Indian Companies Act 1956. It is promoted by the Department of Biotechnology, Government of India and is financed by several all India financial institutions, venture capital funds and the corporate sector. BCIL has been actively involved in technology transfer, project consultancy, fund syndication, information dissemination, and manpower training & placement related to biotechnology over the last two decades. BCIL has transferred more than 15 technologies in the last 5 years using its expertise in facilitating licensing agreements that allow healthy and productive cooperation between the inventor and the licensee.

Technology Background

Soil salinity is a key problem severely affecting the agricultural productivity mainly of the coastal areas and semi arid regions. High salt concentration is known to cause stress and damage to the plant starting from the germination phase through developmental stages and harvesting time. Salt prevents limits or disturbs the normal metabolism, water quality and nutrient uptake of plants and soil biota. There has been a constant effort to improve the soil fertility and productivity of saline soil through application of biofertilizers. Towards this effort many halotolerant microbial species has been isolated and

identified which includes *Azotobacter*, *Azospirillum*, *Phosphobacter* and Blue Green algae from marine



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aquatic sediments.

Research at M.S. Swaminathan Research Foundation (MSSRF) has been constantly focusing on exploring the microbial diversity of the saline coastal regions and isolating efficient saline tolerant plant growth promoters that are well suited for the saline soils of the coastal agriculture zones. A number of saline tolerant nitrogen fixing, phosphate solubilising and plant growth promoting *Azospirillum* and Phospho bacterial strains were isolated and identified from the coastal agriecosystems of Tamil Nadu. These saline tolerant strains have potential applications for sustainable agriculture in the regions where the soil electrical conductivity is higher than the normal.

Technology Description

The present technology pertains to a biofertilizer formulations with individual strains of salt tolerant Phosphobacteria (PS-4, PS-5, PS-9, PS-10); *Azospirillum* (MSA- 48, MSA-60, MSA- 274, MSA 289); Rhizobium (GR-55, GR-57 & GR-59) has been developed and tested through field trials. The halotolerant bacterial strains are effective phosphate solubilizers and nitrogen fixers. The bacterial strains are tolerant to salinity levels of upto 2.0M. Carrier based formulation with vermicompost as the carrier has been developed and is being used in a small scale.

The liquid based biofertilizer formulation has been tested through field applications for different crops such as rice, groundnut, sorghum, maize, green gram. The field trials showed increased crop productivity between 15% to 20% at salinity level of upto 4 dSm⁻¹.



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Technology highlights

- ***Biofertilizer with salt tolerant bacterial strains of Phosphobacteria and Azospirillum for agricultural application in saline soil***
- ***The biofertilizer strains shows effective phosphate solubilization and nitrogen fixation in saline soil.***
- ***The biofertilizer formulation is carrier based***
- ***The biofertilizer application increases the crop productivity up to 15%-20% in saline soil.***
- ***The biofertilizer is suitable for semiarid and coastal area farming.***
- ***The biofertilizer formulation has a shelf life of upto 6 months.***
- ***The biofertilizer formulation is of low cost.***
- ***Standardized production process.***

Scale of product development

- The liquid based biofertilizer formulation for all the individual bacterial strains has been standardized by an Agribiotech company
- The field testing of the product has been carried out through participatory approach in farmer's field.
- The present production level of the biofertilizer formulation with Phosphobacteria and Azospirillum is 5000 Kg/ annum.



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Publications

- Paul, Diby, N. Dineshkumar and Sudha Nair. 2006. Proteomics of a Plant Growth Promoting Rhizobacteria, *Pseudomonas Fluorescens* MSP-393 subjected to Salt Shock. *World Journal of Microbiology and Biotechnology*. 22 (4): 369-374.
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- V R Prabavathy, R. Rengalakshmi and Sudha Nair (2007). Ecoenterprises for sustainable lively hood – decentralized production of biofertilizers *Azospirillum* and Phosphobacteria.