



Rhizobacteria for reduced fertiliser inputs in wheat (RHIBAC)

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RHIBAC introduction

High inputs of agricultural fertilisers, particularly containing nitrogen and phosphorus compounds, have increased crop yields dramatically over the past fifty years. However, it has been clear for a number of years that intensive arable cultivation of this kind is no longer sustainable. Firstly, the nitrogen compounds in fertilisers contribute to a number of environmental problems. Run-off from agricultural land causes pollution of rivers and lakes, and nitrate levels must be carefully monitored to ensure the quality of drinking water. Nitrogen oxides which are emitted during the application of nitrogen fertilisers are implicated in poor air quality at ground level and also nitrous oxide is a highly potent greenhouse gas. Furthermore, the production of chemical fertiliser depends on natural gas or oil as a primary feedstock, and supplies of these commodities will become increasingly more expensive in the coming decades.

The European Union is aiming through its Framework 6 programme to support research projects which pave the way for reductions in inputs of chemical fertiliser. One approach, to be investigated in RHIBAC, is to introduce plant growth promoting rhizobacteria (PGPR) to the root systems of crops. Unlike symbiotic Rhizobia which invade the plant tissues of legumes, these rhizobacteria have a more associative interaction with the plant. The best known example is *Azospirillum brasilense*, which has been isolated from various plants, including wheat. Like Rhizobia, *Azospirillum* and other PGPR fix nitrogen from the air, but the plant growth promotion effect is thought to be due mainly to other factors, including excretion of plant hormones which increase the efficiency of crop root systems, and increased mobilisation of soil nutrients.

For over 30 years, researchers have been investigating the application of PGPR such as *Azospirillum* in inocula to promote the growth of key arable crops such as wheat and maize. Results of greenhouse and field trials have been variable, and much remains to understand concerning the plant-microbe interactions.

The RHIBAC project aims to develop PGPR inocula for plant growth promotion of wheat. It aims for a better understanding of PGPR-plant interactions through studies of the molecular biology of PGPR, and how their interaction with plants is related to the crop variety. The project builds on previous research, particularly working with new PGPR strains previously isolated by research projects in the EU (FP5 project MicroNfix), Brazil, Chile, and Turkey.

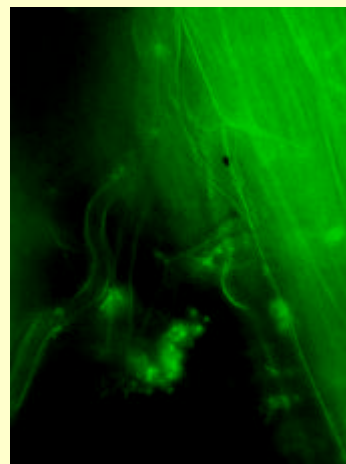


Image of PGPR labelled with green fluorescent protein, colonising plant roots

K.U.Leuven





RHIBAC workplan

RHIBAC includes the following activities to understand the plant-PGPR interaction and develop PGPR inocula for application in wheat cultivation:

- Study of molecular pathways in PGPR involved in plant growth promotion
- Examination the interaction of PGPR and specific crop genotypes
- Observation of root colonisation by PGPR
- Development of new inocula formulations, including encapsulation and seed coating
- Small-scale field trial to assess efficacy and effect on soil nutrients of PGPR inoculation
- Assessment of compatibility of PGPR with other common biological agents used in agriculture
- If effective PGPR inocula are developed, larger scale demonstration field trials



Field trials in Israel

AGRON

RHIBAC partners

The RHIBAC consortium is international with a strong contribution from two agricultural companies.

Institute of Plant Nutrition, University of Hohenheim, Germany

Austrian Research Centers, Austria

Ecole Nationale d'Ingénieurs des Techniques des Industries Agricoles et Alimentaires, France

AGRON, Agrochemicals Development and Marketing Ltd, Israel

Dalgety Arable Research, part of Masstock Arable (UK) Ltd, UK

Centre of Microbial and Plant Genetics, Catholic University of Leuven, Belgium

Universidad Austral de Chile, Chile

Embrapa Agrobiology, Brazil

Department of Genetics and Bioengineering, Yeditepe University, Turkey

The partners have links with agricultural companies, farming organisations and related research projects through the RHIBAC observer group.

If you are interested to find out more about RHIBAC, please consult the project website at www.rhibac.org or contact us below:

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