



Research Project

Managing arbuscular mycorrhizal fungi (AMF) for sustainable agriculture: Molecular tools for strain-specific tracing and quantification of AMF applied as bio-fertilizers

Third-party funded project

Project title Managing arbuscular mycorrhizal fungi (AMF) for sustainable agriculture: Molecular tools for strain-specific tracing and quantification of AMF applied as bio-fertilizers

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Organisation / Research unit

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Status Completed

In fulfillment of our tasks in phase II of the SA bio-fertilizer network, we assessed the native AMF communities at the nine experimental field sites in India by spore morpho-typing and developed laboratory scale test systems for selecting AMF strains with outstanding symbiotic performance. Our major achievement, however, was the development of molecular tools to identify AMF at the strain level. These tools are first of their kind for AMF, and have an immense potential to address both fundamental and applied questions in AMF ecology. The further development and application of these tools will be our focus during phase III. Specifically, we envisage the following tasks:

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Task 1: With our newly developed molecular tools, AMF strains can now be specifically traced, and thus, the consistent identity of strains over successive propagation cycles can be ascertained. We want to further develop and adapt these tools in order to manage AMF for sustainable crop production in marginal areas of India. First, we will work out procedures to deploy them on samples from field experiments that may contain a large background of native AMF in addition to the strains applied. Second, we want to drastically reduce the expenses for the molecular analyses, so that a high sample throughput at reasonable costs can be attained. To achieve this goal, we will take full advantage of advanced techniques for molecular marker assays such as multiplex PCR, TaqMan procedures etc. This will be of importance also to meet industrial demands.

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Task 2: At the present time, our molecular tools can only distinguish different strains of *Glomus intraradices*. Although this is currently by far the most widespread and most commonly applied AMF species, the next generation of biofertilizers on the market will contain combinations of AMF species that might have synergistic effects, such as the “synthetic LL2-consortium inoculant” developed by our Indian partners. It is therefore essential to upgrade our molecular tools so that they will be applicable also for other commonly applied AMF species, e.g. *G. etunicatum* and *G. mosseae*.

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Task 3: A key point in the assessment of the utility and success of biofertilizers based on AMF is a quantitative analysis of the strains in question. We plan to further develop ourã molecular tools, which are now providing qualitative information, in order to allow quantitative analyses of root colonization by

specific AMF strains, using real-time PCR, TaqMan based quantitative microsatellite analysis (QuMA) and other emerging technologies.

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The further development of molecular techniques for qualitative and quantitative tracing of AMF strains will be central to a successful completion of phase III but will have far-reaching consequences beyond the present goal of the SA-network project, i.e. the delivery of an exclusive and novel "bio-fertilizer package". There is a huge, virtually untapped potential for discovering AMF strains with highly superior symbiotic efficacies that could be selected with appropriate functionality tests. Our techniques will make it possible to specifically track such strains, both in glasshouse tests and in the field.

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Swiss Government (Research Cooperations)

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ID	Kreditinhaber	Kooperationspartner	Institution	Laufzeit - von	Laufzeit - bis
169602	Boller, Thomas; Wiemken, Andres M.	Mäder, Paul, Dr., Forschungsleiter	Forschungsinstitut für Biologischen Landbau, Frick	01.09.2008	31.03.2011
169610	Boller, Thomas; Wiemken, Andres M.	Sharma, Anil, Prof. Dr.	Department of Biological Sciences, G.B. Pant University of Agriculture and Technology, Pantnagar	01.09.2008	31.03.2011
169612	Boller, Thomas; Wiemken, Andres M.	Adholeya, Alok, Dr., Research Director	TERI, Darbari Seth Block, Habitat Place, Lodhi Road, New Delhi	01.09.2008	31.03.2011
169617	Boller, Thomas; Wiemken, Andres M.	Sahai, Vikram, Dr., Research Director	Indian Institute of Technology Delhi, Hauz Khas, New Delhi	01.09.2008	31.03.2011