

Press Release

GABI-PRECISE - Precision engineering of genes in barley initiated

Cologne, Germany, April 8th 2008

The GABI-PRECISE consortium announces cooperation for the development of precision engineering of genes. The goal of the cooperation is to introduce gene targeting technology to barley, which is the major model crop plant. This cooperation is supported by a grant of the German Federal Ministry of Education, Research and Technology ([BMBF](#)). The collaborative aspect of this 2 mill € project is emphasized by the cooperation of high-excellence partners, namely the Albert-Ludwigs-University of Freiburg (AG Reski), IPK Gatersleben (AG Schubert), the Johann-Wolfgang-Goethe University of Frankfurt (AG Kahl), the Max-Planck-Institute for Breeding Research (AG Reiss), the TH Karlsruhe (AG Puchta) and Phytowelt GreenTechnologies. The three-year project will be coordinated by Dr. Bernd Reiss of the Max-Planck-Institute for Breeding Research, Cologne.

This project is in line with the objectives of the [GABI](#) (an acronym for Genome Analysis of the Plant Biological System) initiative. GABI's thrust is to strengthen the German plant genome research on an international level by creating national networks and establishing competence centres. Therefore structural and functional information of important plant genomes will be collected. Innovative platform technologies and patents as well as technology transfer between research institutes and private enterprise companies will be resulted.

The scope of Agriculture is more and more diversified/valued up by the production of high-value plant-based products used in food, chemical or pharmaceutical industry or the generation of energy. This change necessitates a transition from traditional to knowledge-based bio-economy. Modern plant biotechnology, in particular methods for transferring and utilizing specific traits, will play a key role in this process. However, present transformation methods lack precision, a bottleneck that limits their use and contributes to high production costs.

“Targeted gene replacement, also called Gene targeting, would remove this bottleneck and solve the problem of imprecise transformation methods, but is currently not available for crop plants“ explains Dr. Bernd Reiss, coordinator of the consortium. *„Our consortium will apply recent progress in the field to introduce this technology to barley“.*

Gene targeting has become an indispensable tool for functional genomics in yeast and mouse, but it is still not enabled in crop plants. Moreover it is also of high impact for plant breeding as it may help to soften/solve the GMO problematic. Undesired toxic or allergenic endogenous genes can be removed without transferring foreign DNA, an approach named “self-cloning”. In addition, self-cloning by gene targeting may be applied to activate interesting endogenous genes, e.g. for biotic and abiotic resistance or valuable metabolites like antioxidants.

Rational approaches to improve gene targeting are still lacking, although they are needed for sustainable success. Therefore, a substantial part of the project will be devoted to understand the underlying biological processes by using model plants like *Physcomitrella patens* and *Arabidopsis thaliana* for gene targeting and gene modification. Additional candidate genes will be analyzed in respect to their capacity to improve gene targeting and modification. Other important outcomes of GABI-PRECISE will be the development of novel cytogenetic methods for recombination analysis, the demonstration of the value of modern genomic tools like Oligo-Arraying or SuperSAGE for gene expression profiling and the establishment of haploid transformation techniques for gene targeting in barley.

“For us as a R & D service provider in plant biotechnology and breeding GABI-PRECISE is a very significant project.“ explains Dr. Andreas Müller, CSO of Phytowelt GreenTechnologies GmbH. *„The project will enable*

*methods to understand, use and stimulate gene targeting in barley. Based on this research, the project will lead - as a long-term goal - to knowledge-based approaches for improved gene targeting which will be applicable to any crop plant. These methods will perfectly complement our portfolio of platform technologies to utilize and create plant biodiversity **phytoplus®**, and will support our mission to bridge industrial and green biotechnology.”*

The enabling of gene targeting in (crop) plants is perfectly in line with recent trends in our modern industrial society. Sustainability becomes more and more an important corner-pillar of production. Optimized sustainable plant resources, produced by green biotechnology and methods like efficient targeted gene replacement plays a significant role to support the (chemical) industry. This is indicated by other initiatives like CliB2021 ([CliB2021](#)), a winner of the German research ministry competition “BioIndustry 2021”. These initiatives aim at a sustainable development of lead products, intermediates and core technologies in the various fields of chemistry. Here, gene targeting will add a valuable tool to achieve sustainable production of high-value (plant-based) products.



The GABI-PRECISE consortium

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