Success Story
COMET

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acib innovations from nature

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Austrian Centre of Industrial Biotechnology
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Agriculture with microorganisms – Bodyguards for precious seeds

Naturally occurring, plant-associated bacteria represent an environmental friendly alternative for crop protection to alleviate the contamination of soil with pesticides. Bacteria associated with bioressources in extreme habitats are formulated and integrated to commercial seed productions. These bacteria prevent infestations caused by fungal pathogens, promote plant growth, and increase plant resistance to pathogens.

Biological control with microorganisms

We protect plants and their seeds from blight, pest and other pathogens with an alternative to chemicals. Bacteria from extreme habitats were selected to biologically protect maize, oilseed rape, sorghum and sugar beet. Formulated bacteria were combined with the seed pill and planted. The growth promoting properties of microorganisms are engaged: while the seed germinates, the microorganisms are simultaneously developing and supplying the plant with nutrients, promoting growth, warding off pests, reducing the stress on the crop and increasing their resilience.

The aim was to find bacteria-seed combinations and formulations to get plants, which need less or no fertilizer and pesticides. Each plant and soil harbours specific microorganisms, the so called microbiome. The microbial diversity is reduced in agricultural used fields and more than 95% of the organisms are unculturable. To find suitable bacteria we analysed bioressources from extreme habitats. Mosses and lichens and their microorganisms grow under extreme conditions. Mosses tolerate acidic pH values and nutrient deficiencies and lichens accept UV-light and drought. Bacteria were isolated, identified and characterized.

Get the target with bait plants

Bait plants were used to select the bacteria from the extreme environments. We took advantage of specific plant-microbe interactions to select compatible bacteria for the new host plant. Root characteristics and the root exudates attract bacteria, which can be characterized and formulated (Fig. 1). At the end, we developed a commercial seed pill, which harbour biological control and stress protecting agents. In the soil the seeds germinate and activate the microorganisms, which grow along the developing root and protect the plant host.

bmwfw Federal Ministry of Science, Research and Economy
bmvit Austrian Ministry for Transport, Innovation and Technology

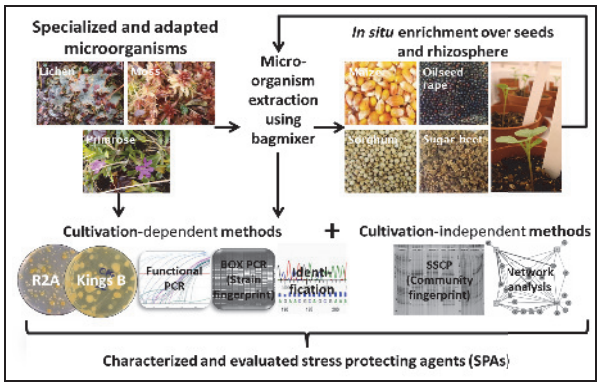

Fig. 1: Bioressources and bait plants (Zachow et al. Agronomy 2013)

Impact and effects

The seed with the bacterial consortia were produced by companies and the farmers get the well-equipped seeds. They plant the biologically protected seeds and reduce the amount or totally replace the use of fertilizer and pesticides.

A big hurdle was solved by the development of formulations enabling longevity and stability of the applied bacteria. The bacteria survive the commercial seed pill production by the formulation and stay active. For the farmers no additional management or investment is necessary.

The revolutionary development concerns two processes: 1) catching of uncultivable and to the host matching bacteria (Fig. 2A), which was solved together with the Graz University of Technology and 2) the formulation (Fig. 2B) of vital bacterial consortia in high cell numbers, which was solved with the project partners and the Graz University of Technology.

Fig. 2: The (A) microorganisms from the bio-ressources are (B) formulated and transferred to the seeds (©Zachow)

The project enables a new type of biological control in an industrial scale, which reduce chemical burden of our soils and plants and provides healthy food for healthy people.

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Project partners

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Bio-ferm	Austria
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