

SoilSynbiotics (ID 169)

Development of Synbiotics for enhancing the soil microbiome

Coordinator

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Project partners

Country	Organization
Ireland	Maynooth University
Portugal	Instituto de Tecnologia Química e Biológica António Xavier

Summary

Maintaining soil health is central to the sustainability of agriculture and a key factor in productivity. At present, however, soil resources are seriously threatened by various anthropogenic influences, including climate change. As a result of climate change, agriculture and the ecosystem are becoming more insecure and complex, and their sustainability is decreasing. Plant-associated microorganisms stimulate plant growth and increase their resistance to various abiotic and biotic loads. For human, the modulation and enhancing of the microbiome is a highly important research topic including a lot of science driven innovations, but also a lot of dubious marketing driven products.

The soil microbiome is a highly complex community that develops and changes dynamically. In addition, diverse functions such as the production of bioactive metabolites, the regulation of plant health and protection against pathogens are associated with the soil microbiome. These functions depend largely on the **quantity and quality of the microbiota**, which among other things be determined by the composition of the soil. In order to enable the best possible colonization with microorganisms and thus achieve benefits for the plants and soil in general, **living bacteria (probiotics)** are necessary. So-called **prebiotics** (in human often oligosaccharides) serve as the food source for these bacteria. These are not only a source of food, but can also be used as selection agents. In order to ultimately increase the probability of the microorganisms surviving in the soil, **probiotic bacteria and substances with a prebiotic effect are combined and declared as synbiotics**. Converting what is known about the human diet to soil microbiome enhancers is the overall topic of the project. However, so far no real pre- and probiotics or **synbiotics for enhancing the soil microbiome** are available. The project SoilSynbiotics will tackle this need by combining following research aspects for a sustainable management of soil quality:

- Analysis of the soil microbiome and identifying the beneficial and non-beneficial microbes in various soil samples (soil metagenome, soil metaproteome)
- Identifying “prebiotics” to boost the beneficial microbes and reduce the non-beneficial ones
- Production and formulation of prebiotics to enable the usage in agriculture
- Identifying of “probiotic” microorganisms
- Cultivation and formulation of probiotics to enable the usage in agriculture

The **Fraunhofer IAP** from Germany as coordinator can engage mainly in production and formulation of “prebiotics” as well as in cultivation and formulation of microorganisms. The activity of the formulated species will be tested as well. For this, we will join forces of the two departments: “Polysaccharide Chemistry & Microencapsulation” and “Biofunctionalized Materials & (Glyco)Biotechnology”. The **Maynooth University** from Ireland has profound knowledge in Omics-technologies and will contribute by establishing innovative metagenome and metaproteome analysis of soil samples, which is the foundation of the development of the soil synbiotics. The **ITQB – NOVA** from Portugal has large expertise in soil microbiology and will develop and nanoformulate probiotics as well as identify prebiotics for an enhancing synergy. Additionally, laboratory tests in soil as well as in the greenhouse of the developed components will be carried out. The transnational team depicts the complete value chain needed for the success of the project. Additionally, all partners have a



network of industry partners for the economic exploitation of the results, so innovative science as well as commercialization will be fostered within the project **SoilSynbiotics**.

