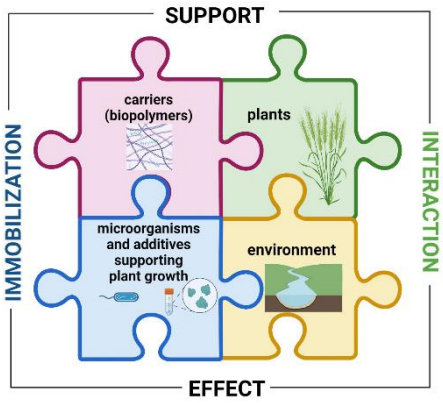
VEFAF - Versatile and Environmentally Friendly Alginate-based Fiber

Project title: Designing a versatile and environmentally friendly alginate-based fiber platform and evaluating the impact on the soil environment

Units: Wroclaw University of Science and Technology, Wroclaw University of Environmental and Life Sciences

Motivation for raising the topic: The rapidly growing world population is forcing the need for continuous agricultural intensification. There is an urgent necessity for innovative solutions to increase crop production while protecting plants from biotic stresses. The use of biopolymer matrices, which are carriers of nutrients, active components or plant growth-promoting microorganisms, seems to meet the needs of modern agriculture. When introducing a new product into the soil environment, ensuring full biodegradability, non-toxicity to the surrounding, and soil condition monitoring is crucial.



The main objective of the project is: to develop innovative alginate-based polymer matrices (having a fiber structure) for promoting plant growth (immobilization of microorganisms and active components that support plant growth) and to verify their usefulness in tests on plants and through long-term analysis of their impact on the soil environment..

Research description: Matrices will be prepared as electrospun fibers and seed coatings based on natural polymers, containing microorganisms beneficial for plant growth and the active compounds they produce (growth stimulants, fungicidal compounds, fertilizer compounds). The prepared formulations will be evaluated for physicochemical properties and tested *in vivo* on plants, including in the presence of a plant pathogen. The project plans to monitor the soil environment during long-term tests, in particular (1) the degradability analysis of the polymer matrix, (2) the survival analysis of microorganisms introduced into the environment, (3) the analysis of the soil microbiome changes. Recognizing the matrix structure-environmental effect relationship will enable us to propose the most advantageous solution for precisely delivering components to plants. To the best of the authors' knowledge, this type of research has not been conducted before.

Expected results: we will develop novel matrices in the form of fibers (mats and seed coatings) that:
(1) will carry microorganisms and the compounds they synthesize,
(2) will exhibit beneficial effects on plant growth,
(3) will protect the plant from the effects of biotic stress,
(4) will be fully biodegradable,
(5) will have a beneficial effect on the soil environment.