

# „The use of bacteria to the solubilization of phosphorus raw materials”

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the summary of a doctoral thesis

The doctoral dissertation takes the issue of the use of microbiological methods for the dissolution of phosphorus materials, including low quality, such as bones, fish bones, ash from burning sludge from biological wastewater treatment for production of the new phosphate biofertilizer.

As part of the present study microorganisms solubilizing phosphates and phosphorus materials also of low quality were selected. The solubilization process conditions were determined and the microbiological solubilization of phosphorous raw materials on a laboratory scale was performed. Next, the solubilization mechanism was characterized. For the regular growth of microorganisms, a bioreactor system was designed (both in aerobic and anaerobic conditions).

The next step of my research was to increase the scale of the solubilization tests. There was also prepared a biofertilizer in a granular form with bones and ash from burning sludge from biological wastewater treatment.

Liquid and granular biofertilizers in *in vivo* tests (hydroponic, scales) were evaluated to make the assessment of the phytotoxicity and utility of the formulations.

The efficiency of the liquid fertilizer from bones was tested in field trials using spring wheat. The effectiveness of the biofertilizer was compared to the efficiency of conventional phosphate fertilizers. The positive effect of the prepared formulation on wheat yield was shown. Additionally, liquid and granular biofertilizers were forwarded to the University of Warmia and Mazury in Olsztyn for field trials.

Based on the conducted research, initial technological assumptions for the production of phosphate biofertilizer and preliminary economical analysis of the proces were developed.