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Recycling of plant nutrients from biogas digestate through the cultivation of microalgae and their use as plant biostimulants or fertilizers

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Abstract:

University of Ljubljana is partner in project Water2Return, which purpose is to recover plants nutrients and energy from the slaughterhouse industry wastewater. One part of this process will utilize microalgae for the wastewater treatment and for production of algal biomass to be used as fertilizers and/or biostimulants in agriculture.

Preliminarily, a biogas digestate was used for microalgae-bacterial biomass production. Microalgae biomass was tested on biostimulant and fertilizer properties after several different pre-treatments (thermal, drying, microbial fermentation, combination of thermal and microbial fermentation and enzymatic pre-treatment) and the efficiency of these methods and characterization of obtained products was observed measuring different chemical parameters. The treated microalgae biomass was used in germination *in-vitro* tests using garden cress and barley. Microalgae stimulated growth only at the very low biomass concentrations (less than 1%), thermal pretreatment having the most stimulative effect on barley root growth. Additional tests are currently running as pot experiment in greenhouse, where corn and barley seeds were drenched by liquid suspension of microalgae, using four different concentrations (0.1%, 1%, 5% and 20% v/v) of untreated, thermally pre-treated and fermented microalgae biomass. Until mid of July, the soil physio-chemical and microbiological parameters as also the plant growth parameters will be watched regularly. At an existing demo plant at University of Ljubljana, algal ponds in a greenhouse will be also connected with hydroponics system or fields for crop and vegetable cultivation (i.e. tomatoes, maize, and barley).