Ph.D. projects in progress

1.

Mentor: Gergely Maróti

Doctoral School: University of Szeged, Faculty of Science and Informatics, Doctoral School of Biology

Ph.D. Student: Vaishali Rani

Title of the research topic: Applicability of algae in water with high nitrate content

Description of the research topic: The current project aims to study whether algae can successfully uptake excess nitrate present in their surroundings. In this study, the effects of various nitrate concentrations on two freshwater green algae namely *Chlamydomonas reinhardtii* and *Chlorella sorokinina* will be observed. To see the effects, algae will be grown in TAP media with increasing concentrations of nitrate followed by monitoring of morphological, physiological and biochemical changes. Furthermore, a detailed study will be done at the transcriptional level to observe whether there are certain genes which are playing an important role in nitrate uptake and assimilation pathway. Nitrate uptake efficiency of the algae will also be checked in wastewater.

2.

Mentor: Gergely Maróti

Doctoral School: University of Szeged, Faculty of Science and Informatics, Doctoral School of Biology

Ph.D. student: Prateek Shetty

Title of the research topic: Molecular study of algal-bacterial interactions

Description of the research topic: In this project, we explore the influence of growth promoting and inhibiting bacterial strains on algal gene expression. Over 60 different bacterial strains were isolated from diverse ecosystems including wastewater effluent, soil, plant tissues and seawater. These bacterial species will be individually co-cultivated with 2 different species of algae, *Chlamydomonas reinhardtii* MACC-124 and *Chlorella* MACC-360. Growthrate of co-cultures and axenic control will be monitored using a Fluroscence based cell counter. Bacterial strains promoting and inhibiting algal growth will be identified. Algal transcriptome under co-cultivation and in axenic condition will be generated using a polyA selection method at different timepoints. These time series transcritome experiments will be the first study to identify genes and pathways that are involved when an algal host interacts with its bacterial partners.

3.

Mentor: Gergely Maróti

Doctoral School: University of Szeged, Faculty of Science and Informatics, Doctoral School of Biology

Ph.D. student: Margaret Mukami Gitau

Title of the research topic: Comparative analysis of the plant biostimulant effect of green algae

Description of the research topic: During the project, a comparative analysis of the biostimulant effect of eukaryotic green algae strains on plants will be done. We intend to treat agriculturally significant model crops with selected algae strains. The experiments will include both plate and greenhouse-based tests. The biostimulant effect of algae on the model plants will be tested under optimal/ normal and abiotic stress conditions. The physiological and biochemical responses of plants will be monitored, in particular those that influence economically important parameters such as yield and quality. The impact of algae on the microbial community in the plants' rhizosphere will also be assessed using the soil metagenomics approach.

4.

Mentor: Maróti Gergely

Doctoral School: University of Szeged, Faculty of Science and Informatics, Doctoral School of Biology

Ph.D. student: Hupp Bettina

Title of the research topic: Optimization of microalgal hydrogen production

Description of the research topic: *Chlamydomonas reinhardtii* cc124 and *Chlorella* sp. MACC 360 algae strains will be investigated and compared for their growth and hydrogen production. Multiple growth conditions and various media will be tested as potential inducers of the hydrogen production. Beside growth and physiological experiments specific attention will be paid to the possible roles of partner bacteria in the induction of hydrogen production. Cutting-edge microscopy studies will be applied to investigate the green algae strains either under axenic conditions and when co-cultured with bacteria.

5.

Mentor: Gergely Maróti

Doctoral School: University of Szeged, Faculty of Science and Informatics, Doctoral School of Biology

Ph.D. student: Anna Hoffmann (Mucsiné)

Title of the research topic: Comparative investigation of the antimicrobial and biostimulant effects of various green algae

Description of the research topic: Various green microalgae (including eukaryotic green microalgae and cyanobacteria) will be investigated and compared for their capabilities to produce various antimicrobial agents and plant biostimulant materials. Multiple growth conditions will be tested as potential inducers of the production of the target molecules. Beside growth and physiological experiments a specific attention will be paid to the possible roles of partner bacteria in the induction of biostimulants and/or antimicrobials. Genome level analyses (high-throughput transcriptomics) and cutting-edge microscopy studies will be applied to get insights into the molecular background of the algal-bacterial interactions.