Institute: Institute of Environmental Sciences

Topic: Microgreens (Plant Microbial Interaction)

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Background information:
Microgreens are edible seedlings usually harvested 7–20 days after germination when they have two fully developed cotyledon leaves [1, 2]. Various herbs, vegetables, and even flowers are grown as microgreens. The project will contribute to developing of sustainable forms of microgreens superfood, including herbs and vegetables such as coriander, basil, radish and beet. We hypothesize that microgreens interact effectively with the media/soil-inoculated or soil natural microbiome, thus generating microgreens that have reduced dependencies on external inputs while maintaining or increasing quality, safety and shelf-life of microgreens under non-stress as well as abiotic (drought) stress conditions.

The main question to be addressed in the project:
This project will generate a basic knowledge which will help to understand how to obtain a resilient microgreens cropping system to recover from abiotic stresses in changing climate. It will show the power and functional traits provided by the microbiome-based solutions including arbuscular mycorrhizal fungi (AMF) and beneficial bacteria (BB), as well as improved microgreens – microbes interactions

Information on the methods/description of work:
characterization and preparation of arbuscular mycorrhizal fungi (AMF) for inoculation of microgreens (DNA isolation, sequencing, culturing); 2)characterization and preparation of beneficial bacterial (BB) strains for inoculation of microgreens (BIOLOG system, zymography methods); 3) influence of arbuscular mycorrhizal fungi on microgreens-microbiome interactions of herbs and vegetables under optimal and abiotic stress (drought) conditions (Handy PEA, Nitrogen index); 4) colonization of microgreens by beneficial bacterial strains including description of this phenomenon; 5) microbiome composition of microgreens during storage in order to determine its shelf-life after inoculation with microbial-based solutions (NGS, Biolog EcoPlates); 6) plant resistant pathways and oxidative stress measurements of microgreens inoculated with MBS; 7) Visualization of microgreens colonization by beneficial bacteria and arbuscular mycorrhizal fungi; 8) Determination of nutritional value and quality of microgreens inoculated with MBS (spectrophotometic/HPLC-MS/MS methods).

Additional information (e.g Special requirements from the student) **:**
ability to cooperate within the group, commitment/passion in research; knowledge in microbiology with special emphasis on mycology

Place/name of potential foreign collaborator:
Prof. Erika Kothe and Dr Katrin Krause (Jena University)

References (max.3**):**
[1] Xiao et al. 2012. Assessment of Vitamin and Carotenoid Concentrations of Emerging Food Products: Edible Microgreens. Journal of Agricultural and Food Chemistry 60(31):7644-51. DOI: 10.1021/jf300459b
[2] Ebert AW. 2022. Review. Sprouts and Microgreens—Novel Food Sources for Healthy Diets. Plants 2022, 11, 571. DOI: org/10.3390/plants11040571
[3] Zhiqing Li et al.2022. Microgreens: Exciting new food for 21st Century Eco. Env. & Cons. 26 (November Suppl. Issue) : 2020; pp. (S248-S251) DOI:10.1016/j.scienta.2022.111673