

**„Plant productivity and food safety:  
Soil science, Microbiology, Agricultural Genetics and Food quality”  
15-17.09.2021 r.**

The aim of conference is to enable the exchange of knowledge, views and scientific experience in terms of the sustainable soil use and the maintenance of a microbiome favorable to plant development as a key factors for preserve tolerance of plants against adverse environmental conditions and to maintain their high productivity. The six thematic panels will broadly discuss new research trends in plant microbiome and the effect of abiotic factors on their growth and development, in obtaining plants safe for health with increased nutritional value, the use of biocontrol and biofortification factors in plant crops and the need to monitoring changes in the soil environment in order to achive sustainable management of this natural resource. The conference will be an opportunity to present global and national activities in the field in improving the latest food production technologies, analyzing the properties of the food products and the safety of their production, storage and use. The conference will include workshops about the use of GIS techniques in environmental and ecological research enabling independent spatial analysis using QGIS program.

We very much look forward to your participation.

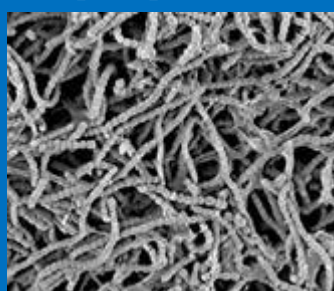
Best regards,

Katarzyna Hrynkiewicz

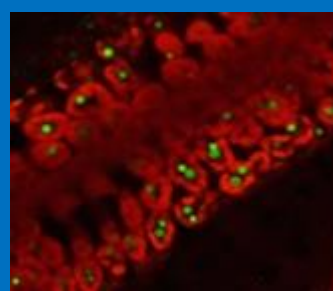
**Session I: Plant-microbial interactions**



**Session II: Alternative and sustainable technologies for plant protection**



**Session III: Plant lipids engineering for sustainable future**



**Session IV: Advances in analysis and technology of food**



**Session V: Different approaches to enhance food security and food safety**



**Session VI: Urban soils – Towards to sustainable use and management**



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First day (15th of September 2021)

**Session I: Plant-microbial interactions**

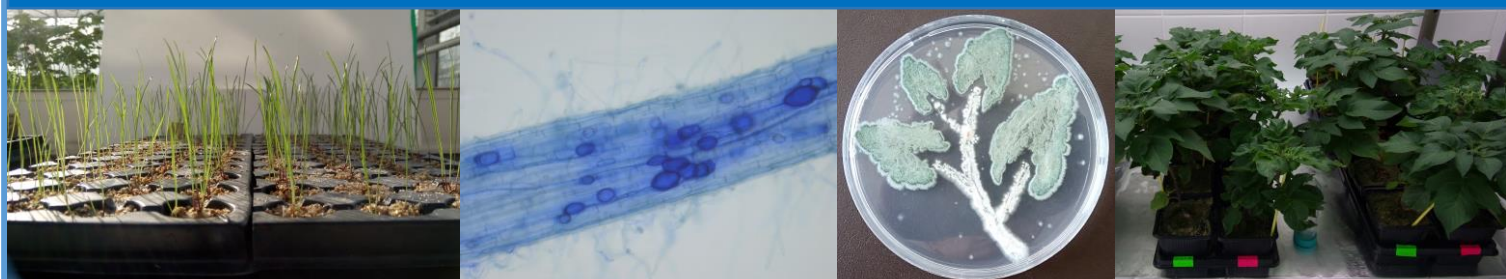
Session Chair: Prof. Katarzyna Hrynkiewicz

Microorganisms can interact with plants through the rhizosphere, phyllosphere and endosphere which may positively or negatively affect plant growth and development. These microbes form non-symbiotic associations as free living soil microbes or as saprophytes, while some form symbiotic plant association's such as the mutualistic interactions of mycorrhizae, nitrogen fixing bacteria and the hidden colonizers i.e. the endophytes, or the parasitic interactions of the plant pathogens. The type and structure of the plant-microbial community depends on several abiotic and biotic factors e.g. plant genotype, development stage, composition of exudates, climate, soil composition, nutrient availability, microbial species and function.

Research on understanding the basis of plant-microbe interaction has gained interest today as it paves for a more sustainable and environment friendly future in agriculture. The positive effects of Plant growth promoting microorganisms (PGPMs) may be (i) direct - providing nutrients synthesized by microorganisms or released by them to the environment and thus making them available to the plant and / or (ii) indirect - reducing or eliminating the harmful effects of phytopathogens. Application of this available resource as bio-formulations will increase the productivity of plants and contribute to reduce the progressive degradation of agricultural land by the application of fertilizers. The protection of plants with the use of bioinoculants against the adverse effects of biotic and abiotic stresses is consistent with the assumptions of sustainable agriculture.

Research subjects includes:

- impact of environmental factors on plants microbial diversity,
- microbiome of plant rhizosphere, endosphere and phyllosphere,
- selection of beneficial microorganisms for increasing plant productivity,
- techniques in preparation of bioinoculants for commercial application,
- role of PGPMs in biotic and abiotic stress mitigation of crops,
- evaluation of compatibility between PGPMs and plant genotypes.



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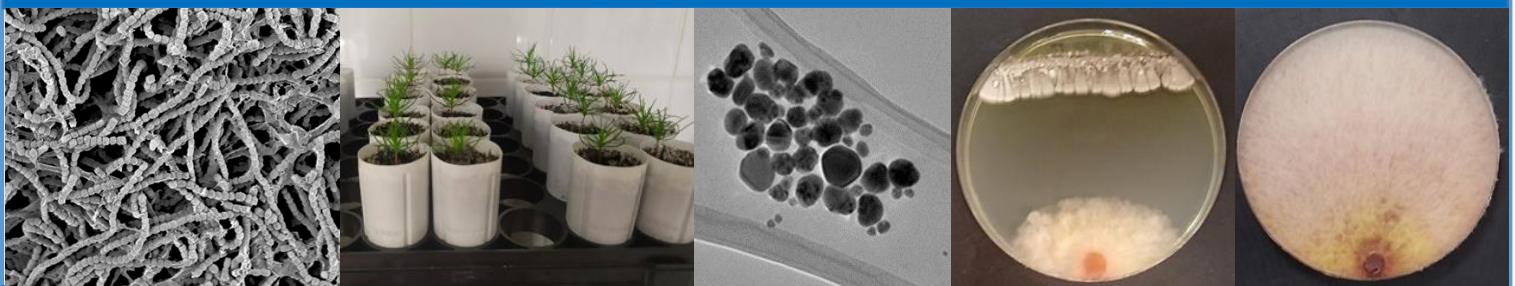
**Session II: Alternative and sustainable technologies for plant protection**

Session Chair: PhD Patrycja Golińska, Assoc. Prof. at NCU

Agricultural production provides fundamental products for nutrition, and industry (food, feed, fiber and fuels). Apart from abiotic factors, pests and pathogens highly influence yield reduction. Plant diseases caused by different microorganisms (i.e. bacteria, fungi, insects, viruses) are responsible for agricultural crop and economic losses worldwide. These pathogens attack crops in the field, and during storage, transportation and commercialization phases. Traditional plant protection strategies are often insufficient. Consequently, huge financial resources are spent annually on pesticides to control plant pests and pathogens and secure quality and yield in plant production. However, an excessive and inappropriate application of chemical-based pesticides has negative effects on animals, humans, and other non-target organisms as well as the environment. The biological control is an eco-friendly and economically viable method that involves the use of living organisms for the management of plant pathogens and pest populations, has been considered among the most promising applications for sustainable agriculture. Novel eco-friendly strategies or technologies (e.g. nanotechnologies) for the management of plant diseases are developed. Nanotechnology can be an alternative to the current practices and provide new tools that allow to minimize production inputs and maximize agricultural production outputs. Both of these strategies meet the increasing need for global sustainability.

Research subjects includes:

- biocontrol of plant pathogens for sustainable plant production,
- microbial diversity and disease suppression,
- botanicals/ plant-based eco-friendly products as alternatives for plant disease control,
- integrated management of plant diseases,
- nanotechnology, including bionanotechnology for management of plant diseases,
- plant tissue culture as a tool for the sustainable production of disease-free plants.



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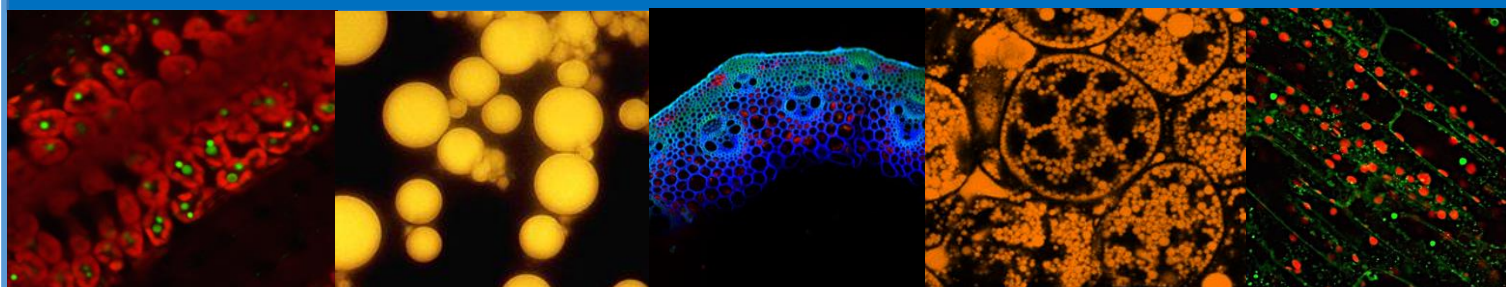
**Session III: Plant lipids engineering for sustainable future**

Session Chair: PhD Agnieszka Zienkiewicz, Assoc. Prof. at NCU

The current global trend oriented towards production and use of sustainable lipid-based products is the result of many diverse factors acting directly on economies in both, developing as well as developed countries. Of these, the most important are: 1) rapidly growing human population, 2) strong reduction of arable land resulting from recent negative climatic changes, 3) gradual exhaustion of global fossil fuels and unstable petroleum prices. The major advantage of plants is the natural ability for CO<sub>2</sub> assimilation and its conversion to lipids of high-energy content, mainly in the form of triacylglycerol (TAG). Thus, they gained a strong attention as a potential source of energy-rich lipids. These lipids in turn are the sustainable feedstock for food and biofuels production. However, the dilemma of choice between using plants for energy or food production requires development of novel strategies oriented towards boosting the lipid production in plants. One of the most powerful tools to achieve this goal is modern genetic engineering which allows for efficient regulation and modification of pathways governing lipid synthesis and accumulation in diverse plant tissues.

Research subjects includes:

- molecular aspects of lipid synthesis and accumulation in plants,
- genetic control of lipid homeostasis in plant cells,
- biotechnology of plant lipid metabolism,
- employment of synthetic biology for increasing plant energy density,
- use of plant biomass as a lipidic feedstock.



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Second day (16th of September 2021)

**Session IV: Advances in analysis and technology of food**

Session Chair: Prof. Aleksandra Szydłowska-Czeraniak

Advances in analysis and technology of food is focused on new analytical challenges and the innovation of food production. Conference will give an opportunity for presentation of the international and domestic activities on the improvement of the best technologies, knowledge development on food products analysis and characteristics. The session III subject is in the main stream of efforts for the sustainable growth and the best usage of natural resources.

Research subjects includes:

- characteristic of antioxidants in food products,
- studies of antioxidants activity mechanism and nutrition properties,
- implementation of components with antioxidant properties to functional food production,
- production and technology aspects of food with high antioxidant capacity,
- legislation issues of adding natural extracts to food products,
- marketing of food products with components of high antioxidant capacity.



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Second day (16th of September 2021)

**Session V: Different approaches to enhance food security and food safety**

Session Chair: PhD Grażyna B. Dąbrowska, Assoc. Prof. at NCU

In the face of a growing world population food security and food safety are one of the most important global challenges nowadays. These complex socio-economical issues are defined as the availability of sufficient quantities of safe and nutritious food for everybody, produces in sustainable way. Food security and safety are inextricably linked with the quality of food products, they include all aspects of plant- and animal-based food production, storage, and utilisation. Changing climate, growing world population, and environmental stress factors are only few existing and future threads for food security and food safety. Fighting against food insecurity should be multidimensional and diversified approaches to the problems will be present during this session.

Research subjects includes:

- current and future challenges to achieving food security and food safety,
- molecular mechanisms underneath crop yields and animal productivity,
- biofortification of crop plants as a tool for fighting against microelements deficiency,
- genetically modified organisms in the context of food security,
- food safety in the context of storage in polymer packages.



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Second day (16th of September 2021)

**Session VI: Urban soils – Towards to sustainable use and management**

Session Chair: PhD Piotr Hulisz, Assoc. Prof. at NCU; PhD, Przemysław Charzyński, Assoc. Prof. at NCU

Nowadays, 55% of the world’s population lives in urban areas, a proportion that is expected to increase further. During the development of cities, fertile soils, predominantly used for agricultural purposes and providing a wide range of ecosystem services such as food and biomass production, dilution, filtration and sequestration of pollutants, nutrient resources, storing genetic materials, and use for recreation, information and knowledge archives are being transformed into SUITMAs (soils of residential, traffic, industrial and commercial areas). The designation of new places for settlements usually leads to the soil degradation and a loss of valuable soil resources. That is why monitoring of changes in urban soil cover, reasonable spatial planning and protection of the soil environment are important aspects of an effective urban management, especially in relation to the potential and possibilities of producing food in cities.

Research subjects includes:

- ecosystem services provided by SUITMAs,
- urban agriculture challenges,
- soil hazards in the city,
- urban soils management strategies.



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Workshops (17th of September 2021)

Trainer: MSc Sylwia Pindral

**Workshop 1:** Introduction to GIS techniques with QGIS (9:00 – 12:00)

This workshop will allow to fully understand the basics of Geographic Information Systems (GIS) and Remote Sensing, learn how to use the open-source program QGIS and how to get and download freely available sources of geodata. All participants will gain experience in vector and raster data preparation, layout development, and finally, maps creation.

**Workshop 2:** Basics of Satellite Image Analysis in QGIS (13:00 – 16:00)

This workshop is designed to guide through and learn participants with the practical knowledge of land use and land cover mapping, which is one of the core skills for any Geographic Information Systems and Remote Sensing analysis. Land use and land cover maps can be an input data for other environmental spatial analyses. After the workshop, you can gain a background of land use mapping and detection of land use/land cover changes. The course is ideal for professionals such as geographers, soil scientists, geologists, and GIS technicians, and all other experts who need to use land use maps in their field and would like to learn the fundamentals of Remote Sensing. The course program includes the use a classification algorithms and map algebra tools for advanced spatial analysis.

**Workshop 3:** Mapping the Species Distribution and Diversity (17:00 – 20:00)

This workshop is dedicated to biologists (ecologists) who are interested in the practical use of QGIS in biodiversity and species distribution. The aim of the workshop is to use advanced techniques and QGIS plugins to analyze and visualize the vector data for environmental monitoring purposes. It is aimed at those who want to learn how to integrate GIS tools into their species distribution and biodiversity modelling projects. The workshop assumes that you have a basic knowledge of GIS. The course program includes: an introduction to the concept and practical application of species distribution and biodiversity modelling using QGIS software, including selection of environmental variables, processing data, creating spatial visualisations, and validating the biodiversity within selected area.

