410 ÉVE AZ OKTATÁS ÉS A TUDOMÁNY SZOLGÁLATÁBAN, 100 ÉVE SZEGED ÉS A RÉGIÓ FEJLŐDÉSÉÉRT.

21st WELLMANN INTERNATIONAL SCIENTIFIC CONFERENCE

BOOK OF ABSTRACTS

18th April 2024

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PLENARY SESSION

RELATION BETWEEN AGROBIODIVERSITY, WATER AVAILABILITY AND MICROCLIMATE CHARACTERISTICS IN THE OASES OF KEBILI, TUNISIA

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Oases are unique desert locations where plants and trees thrive due to water availability and have been traditionally classified in Tunisia based on their agro-biodiversity levels. Initially, "traditional" oases have three-layeres of date palms, fruit trees, and annual crops, while "modern" oases since their establishment consisted of only date palms. Nevertheless, our results showed that this classification has shifted over time, with "traditional" oases chang-ing towards monoculture due to water constraints, while "modern" are diversifying into poly-culture setups when water is available. Moreover, discussions and interviews with oasis far-mers have revealed noticeable variations in date fruit yield and quality traits between these oasis types. To explore these distinctions, two weather stations were established in El Bargho-uthia oasis, located in the Kebili region of southern Tunisia—one in a one-layer plot and the other in a three-layered plot—to assess their microclimate characteristics. Over three years, records on temperature, humidity, wind speed, and gust were collected at 10-minute intervals from each station. Comparative analysis of the records disclosed that three-layered plot exhi-bited lower temperatures, higher relative humidity levels, and lower wind speed and gusts compared to the one-layered plot. These variations highlight unique microclimate conditions attributed to the dense vegetation in the three-layered plot. Our findings emphasize the sig-nificance of conserving and overseeing agro-biodiversity levels within oases. This can poten-tially foster more favourable microclimates for palm date pollination, health, and fruit quality, enhance the adaptive ability of these unique ecosystems to confront climate change threats and confirms the growers' insights.

TECHNOLOGICAL CHALLENGES AND PARADIGM SHIFTS IN WASTEWATER TREATMENT AND SLUDGE UTILIZATION

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Because of water shortage of last decades, the protection of drinking water resources, and the development of efficient wastewater purification technologies has been come into the limelight. The fluctuation in quantity (e.g., diurnal and spatial variations) and the diversity of components present new technical, technological, and economic challenges for both research and development (R&D) and operators, respectively. The continuously increasing expectations of society and future tightening of environmental standards and legislation necessitate detailed investigations into the effects of contaminants of emerging concern (CECs), such as endocrine-disrupting substances (EDSs), pesticide and pharmaceutical residues, and microplastics, on human health and the environment. Some of these pollutants cannot be removed with conventionally used wastewater treatment technologies. Therefore, there is a need for the development of novel and more efficient processes (such as membrane filtration, advanced oxidation processes, biotechnological methods, and their combinations) that can be scaled-up and implemented into municipal wastewater treatment plants (WWTPs) and industry-scale wastewater purification technologies. It can be noticed that water suitable for drinking quality is one of the most commonly used raw materials and processing aids in the food industry (for dilution, heating, cooling, disinfection, cleaning, etc.). Therefore, the increased efficiency of water and wastewater treatment can help to achieve improved food safety, as well. The availability of fresh and safe water, both in quantity and quality, is one of the key elements for maintaining economic development. Regenerated (reutilized) wastewater can be an alternative water resource that ensures water availability while reducing pressure on water bodies. These technological solutions help to meet the principles of the circular economy (CE). Wastewater, including municipal and industrial wastewater, is rich in valuable organic and inorganic compounds for recovery. During the mechanical treatment and separation stages of secondary and tertiary wastewater purification processes, a significant amount of pollutants are concentrated into the sludge. Global wastewater sludge production is estimated to be around 45 million dry matter tonnes annually. In recent years, problems in the supply of materials and energy have led to a renewed emphasis on the recovery of sludge components (e.g., nitrogen, phosphorus) or the use of the whole material streams through biological processes (e.g., biogas production by anaerobic digestion or composting). Several technologies are known to achieve better water recovery (e.g., closing the water loop in industry-scale manufacturing processes) or to produce energy from wastewater and sludge (e.g., controlled anaerobic digestion). These efforts and technological developments will also contribute to the achievement of the Sustainable Development Goals (SDGs) of the United Nations. The effectiveness of technologies for wastewater and sludge treatment and utilization can only be assessed on the basis of complex criteria, which may include technological and economic indicators as well. Improving the efficiency of wastewater and sludge treatment and utilization processes and developing monitoring methods to optimize these processes are of great importance due to the high operational costs of wastewater treatment. There are specific expectations for industry-scaled monitoring methods applied to wastewater and sludge treatment, mainly regarding robustness, minimum chemical need, reduced measurement time per sample, and, suitability for non-destructive, on-line, in-line, and real-time analysis in real wastewater and sludge matrices. In addition to conventional non-destructive analytical methods used in analytical practice (e.g., AFS, FTIR), novel monitoring methods based on electrical

measurements, such as dielectric measurements, are highly relevant not only for science but also for practical use. The research is financed by National Research, Development and Innovation Office FK 146344 project and supported by the Bolyai János Research Scholarship of the Hungarian Academy of Sciences (BO/00161/21/4).