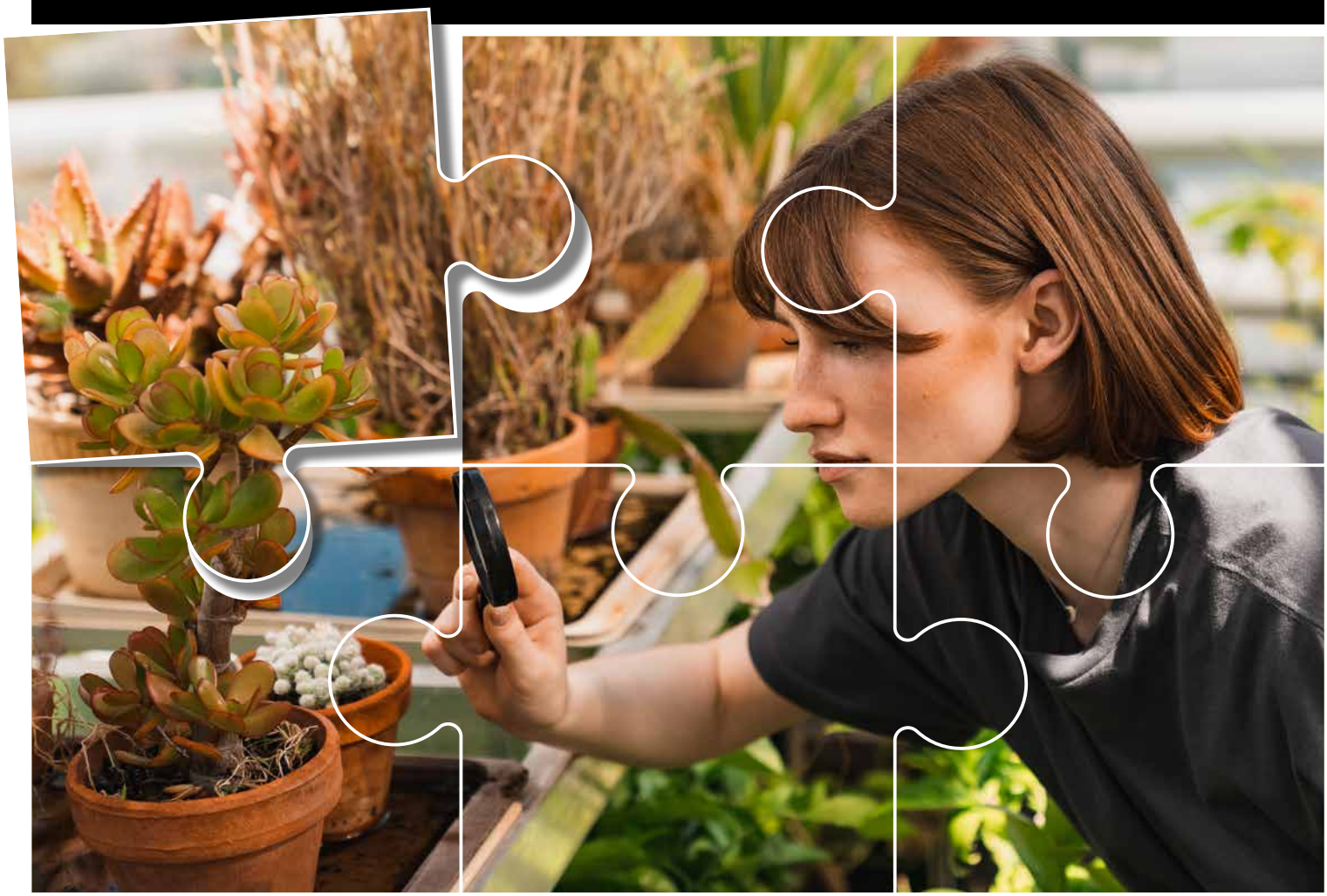
Euroleague FOR LIFE SCIENCES

WAGENINGEN UNIVERSITY & RESEARCH

SCIENTIFIC STUDENT CONFERENCE 2024

BOOK OF ABSTRACTS

22-23 November 2024 | Wageningen University & Research



THE PUZZLE OF LIFE SCIENCES - ADD YOUR PIECE

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SCIENTIFIC STUDENT CONFERENCE 2024

BOOK OF ABSTRACTS

THE PUZZLE OF LIFE SCIENCES - ADD YOUR PIECE

Editors:

Mirjam Troost

Maaike Uijttenboogaard

Wageningen University & Research, the Netherlands

22-23 November 2024

Colofon

Scientific Student Conference 2024
Euroleague for Life Sciences
The puzzle of Life Sciences – Add your piece
22 - 23 November 2024
Wageningen University & Research
Wageningen, The Netherlands

Editors:
Mirjam Troost, Maaike Uijttenboogaard

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ORGANIZATION AND ACKNOWLEDGEMENTS

The organizing committee gratefully acknowledges the support of the member universities and overseas partner universities in the network Euroleague for Life Sciences:

AGRO	L'Institut Agro, France
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WELCOME

by Rector Magnificus of Wageningen University

Dear Student,

It is my pleasure to welcome you to our campus in Wageningen. We are honoured to host the 2024 edition of the Euroleague for Life Sciences (ELLS) Scientific Student Conference (SSC). A truly unique event focused on the scientific work of the ELLS students and intended to help you prepare for the next steps in your career. The SSC is a conference during which you will be able to interact with students and lecturers from the different ELLS universities on the topics close to our hearts. Ranging from the smallest particles to the big societal transitions.

Please use this opportunity to expand your international network, to interact with students and staff from the other ELLS universities, but also to challenge each other by raising the difficult questions. Besides the oral and poster presentations we have different "Let's discuss" sessions, plenaries, and social events scheduled for you.

We hope that you will have a great conference and that you are willing to share your experiences with your fellow students to inspire them to participate in next year's Scientific Student Conference at the Swedish University of Agricultural Sciences (SLU, Sweden) or in one of the many other ELLS activities (Summer schools, Case Study Competition, Joint Programmes etc).

I would like to thank the Euroleague for Life Sciences Student Association (ELSA) for their continuous contributions to the ELLS network and to the content and execution of the SSC.

As you can see around campus, we are working hard on reducing our footprint and would like to ask you to contribute as well in any way you can.

Have a great conference and I hope to see you around the coming days,

Carolien Kroeze
Rector Magnificus Wageningen University
Chair of the ELLS network (2023-2025)

PROGRAMME

FRIDAY 22 NOVEMBER 2024				
08:30 - 09:00	Registration and coffee			Ground floor
09:00 - 09:15	Official opening ELLS SSC 2024			C1040
09:15 - 10:00	1st Keynote speaker - Prof. Dr. Gregor Halff			C1040
10:10 - 11:10	Campus tour	Meet at reception Orion	Oral session 1.1	B3020
			Oral session 1.2	B3030
			Oral session 1.3	B3034
11:20 - 12:20	Campus tour	Meet at reception Orion	Oral session 2.1	B3020
			Oral session 2.2	B3030
			Oral session 2.3	B3034
12:20 - 13:30	Lunch & SA/ST market			The Spot (Orion) / Ground floor
13:30 - 14:30	2nd Keynote speaker - Dr. Ir. Birgit Boogaard			C1005
14:40 - 15:40	Poster session 1	Ground floor	Oral session 3.1	B3020
			Oral session 3.2	B3030
			Oral session 3.3	B3034
15:40 - 16:05	Refreshment break			The Spot (Orion)
16:05 - 17:05	Poster session 2	Ground floor	Oral session 4.1	B3020
			Oral session 4.2	B3030
			Oral session 4.3	B3034
17:15 - 18:15	Poster session 3	Ground floor	Let's Discuss 1	B3030, B3034
18:30 - 20:00	Dinner			The Spot (Orion)
21:30 - 01:00	Student Party			KSV, Stadsbrink 373, 6707 AA Wageningen

SATURDAY 23 NOVEMBER 2024				
08:30 - 09:00	Registration and coffee			Ground floor
09:00 - 10:00	Poster session 4	Ground floor	Oral session 5.1	B3020
			Oral session 5.2	B3030
			Oral session 5.3	B3034
10:10 - 11:10	Poster session 5			Ground floor
11:20 - 12:20	Poster session 6	Ground floor	Oral session 6.1	B3030
			Oral session 6.2	B3034
12:20 - 13:15	Lunch			The Spot (Orion)
13:15 - 14:15	Case Study Competition	C1005	Let's Discuss 2	B3030, B3034
14:15 - 14:45	Refreshment break			The Spot (Orion)
14:45 - 16:00	Award ceremony & Closing of the conference			C1005

Venue of Conference
Orion, building number 103
Bronland 1
6708 WH Wageningen

Venue of Student Party
KSV
Stadsbrink 373
6707 AA Wageningen

Contact
Email: ells24@wur.nl
Website: www.wur.eu/ells2024

PRACTICAL INFORMATION

Venue

The conference venue is the Campus of Wageningen University & Research. All oral and poster sessions, as well as breaks, lunches and the conference dinner will take place in the Orion building on Campus.

Orion, building number 103
Bronland 1
6708 WH Wageningen

Coffee, lunch and dinner are included in the conference registration, but we would like to ask you to wear your badge clearly visible.

Student Party

The student party will take place at student association KSV, one of the major student associations in Wageningen. Show your conference badge to get access.

KSV Sint Franciscus Xaverius
Stadsbrink 373
6707 AA Wageningen

KEYNOTE SPEAKERS

Keynote Speaker 1: Prof. Dr. Gregor Halff

Gregor Halff is Dean of the Faculty of Social Sciences at Vrije Universiteit Amsterdam where he also holds a Chair in Corporate Communication. Previously he was member of the Executive Board at Copenhagen Business School and Deputy Dean at Singapore Management University. Prior to (re)joining academia Gregor was managing partner at Publicis, a global advertising conglomerate headquartered in Paris. His keynote will focus on the trilemma's of universities and on the choices leaders and students need to jointly make about their universities' profiles and partners.

Keynote Speaker 2: Dr. Ir. Birgit Boogaard

Birgit Boogaard is senior lecturer at the Knowledge, Technology and Innovation Group at Wageningen University (WUR), where she teaches courses on African Philosophy and Social Justice, Technology and Development. Her courses received multiple Excellent Education Awards at WUR, and in 2023 she was awarded national Teacher of the Year in the Netherlands. Her teaching style can be described as interdisciplinary, creative, dialogical, intercultural, transformative, critical, reflective, and enthusiastic. With her interdisciplinary background, Birgit aims for substantial integration of philosophy, social sciences, and natural sciences. In the keynote lecture "Crossing Epistemic Boundaries: Towards Knowledge Diversity in Education", Birgit will give an introduction on the need for knowledge diversity in education and research. She will illustrate this with examples of her courses, which includes a diversity of knowledge – by closely collaborating with African philosophers - as well as transformative educational methods that provide a brave learning space.

ABSTRACTS

ORAL SESSION 1.1

Friday 22 November 2024 at 10:10 – 11:10

B3020 Orion

Rapid viral detection in milk using near infrared spectroscopy combined with chemometrics and neural networks

Samy De Oliveira, Alexis de Rougemont, Laurence Dujourdy, Stephane Guyot, Elias Bou-Maroun

AGRO, France

Education level: PhD

Keywords: Viral detection, food safety, near infrared spectroscopy, chemometrics, neural networks

Viruses play a significant role among foodborne pathogens, their outbreaks contributing to substantial economic impacts with dozens thousand human cases of illness each year. Traditional methods for viral detection like polymerase chain reactions are often time-consuming and labour-intensive, thus a rapid and reliable detection in complex food matrices, such as milk, is crucial for ensuring food safety and quality.

This study investigated the efficacy of near-infrared spectroscopy (NIRS) coupled with advanced chemometric techniques for real-time detection in milk of the MS2 bacteriophage, closely resembling Noroviruses in structure (surrogate). The aim was to evaluate the ability of this non-destructive, fast and solvent-free analytical method to detect viruses at low concentrations.

The detection process involved NIRS measurement to generate the spectral fingerprints of the virus within the milk matrix. The experimental design was performed twice with a time interval of 9 months and included two series of tests on 11 serial dilutions of virus-spiked milk, each performed with 4 replicates. The Plaque- Forming Unit (PFU) method served as a reference for the virus detection. Chemometric analysis was conducted using two approaches: Partial Least Squares Regression (PLS) and a Single Layer Perceptron (SLP) neural network. For PLS, 4 latent variables were employed to model the spectral data, while the SLP model utilized 300 hidden units. The PLS regression achieved a good coefficient of determination (R^2) of 0.985 and the SLP model showed superior performance with an R^2 of 0.99, both demonstrating high predictive accuracy and good capability to handle complex nonlinear relationships in the spectral data. The quantification limit of the NIRS technique was determined to be 56 PFU/mL, when traditional methods often detect around 102-103 PFU/mL.

The findings highlighted NIRS's potential to offer significant advancements in real- time viral detection in complex liquid matrices.

Acknowledgements: We would like to thank Caera O'Neil for her help in generating the data and Emmanuel Denimal for his assistance in processing the data.

Early growth agronomic research on Kernza Intermediate Wheatgrass: effect of soil type and fertiliser amendments

Anna Tsibidis

CZU, Czech Republic

Education level: MSc

Keywords: Perennial grains, novel crop, soil analysis, fertiliser

Intermediate wheatgrass (IWG) is a novel perennial grain crop that can be used for forage and grain production. Existing studies have demonstrated its potential to provide valuable ecosystem services such as promoting soil health and nutrient cycling. As a perennial, it has a much deeper rooting system and provides year-round soil cover. The edible seed it produces can be used in baked products or beverages to augment or replace grains such as wheat, rye, or barley. However, research into agronomic practices has been limited especially in the European context. The experimental portion of this work outlines the series of pot experiments conducted to assess how management practices and soil affected early growth. Namely, how different NPK fertilisers and soils from different areas in Czechia affected young plant's above and below ground biomass. Soil type was found to affect biomass significantly, and lower drainage capacity of heavy, clay soils was correlated with less growth. Following a nutrient analysis, poor growth was also observed in soils with extremely high levels of phosphorus, indicating IWG does not grow well in excess concentration. NPK fertiliser was found to significantly increase early growth, an important consideration for increasing weed suppression in the field. Understanding early growth will be key for introducing the crop into farming operations, especially as IWG is suited for integration into low input, marginal parts of the field where other crops would not grow successfully.

Acknowledgements: Theresa Reinhardt Piskáčková, Ph.D.

Growing the Future: Exploring Vertical Farming from a Plant Science Perspective

Pauline Seeburger

SLU, Sweden

Education level: MSc

Keywords: Urban agriculture, smart farming, plant growth, AI, autonomous farming

By introducing high-density crop production in controlled environments, vertical farming (VF) offers a sustainable solution to problems with urban food security. Incorporating plant science is necessary to improve an already functioning VF system after technological improvements and breakthroughs like robotics. This is where the following pilot study steps in: examining the output of the hydroponic vertical farming system at SweGreen AB, Stockholm, where we planted basil (Ocimum basilicum), romaine lettuce (Lactuca sativa var. romana), and oakleaf lettuce (Lactuca sativa L.). One objective is to compare plant performance, post-transplant recovery support, and growth forecast across ebb and flow (EF) and the nutrient film technique (NFT) irrigation system. Further, image analysis and chlorophyll contents were used to see whether digital images can be used as a substitute for direct measurements of chlorophyll. Leaf temperature was monitored as a proxy for plant growth that is fuelled by photosynthesis. NFT was found to outperform EF for the lettuce species for plant performance and prediction accuracy. Image analysis algorithms for leaf color in RGB color channels were shown to need improvement, e.g. by machine learning, to make robust statements on the correlation to chlorophyll. For leaf temperature, it was found that in NFT, leaf temperature has less influence on plant growth, but additional studies are needed to fully understand the mechanisms behind it. With this study, I intend to contribute to the autonomy and sustainability of vertical farms to supply people with nutritious, fresh food in the future.

Acknowledgements: This project was a cooperation between the vertical farming company SweGreen, Stockholm, Sweden, and the Swedish University of Agricultural Sciences, Uppsala Sweden.

ORAL SESSION 1.2

Friday 22 November 2024 at 10:10 – 11:10

B3030 Orion

Future-proofing the Randstad's drinking water supply: Utility of the DAPP approach (Dynamic Adaptive Policy Pathways)

Yoost Raevel

WUR, The Netherlands

Education level: MSc

Keywords: Drinking water, adaptive water management, climate adaptation, adaptation pathways

The Randstad's drinking water sector is facing complex challenges, both on the short- and the long term. Climate change and population growth are projected to threaten the supply to the point where it cannot be guaranteed to its regulatory standards. These challenges require adaptation. However, the best approach to adaptation in this particular context is yet to be identified. Therefore, this thesis research assesses the utility of DAPP in addressing the challenges faced by the Randstad's drinking water sector. To this end, interviews and workshops were conducted with employees of the involved drinking water companies and provinces for two case studies in Rotterdam and Utrecht. Additionally, interviews were conducted with experts in the fields of climate change adaptation and water management. A total of 11 interviews and 2 workshops were organised. The current approaches to adaptation lack comprehensive planning and cooperation between the involved parties, hampering the adaptation process. The use of DAPP as a decision-support tool may help fill this gap. The main advantages of DAPP are that it allows decision-makers to plan long-term adaptation under uncertainty. It is also a useful tool for decision-makers to structure the adaptation dialogue and organise their adaptation process. Finally, the visual representation of pathways makes DAPP a very efficient internal and external communication tool. This feature should be developed to a greater extent to enable decision-makers to exploit its full potential. However, DAPP has a few limitations. Using DAPP may lead to narrowing down the adaptation problem too much, thereby ignoring important aspects such as the root causes of vulnerability to change, and other (inter)sectoral challenges related to water use in the Netherlands. Other decision-support tools should be explored to determine whether a better alternative exists in this context.

Acknowledgements: Maria del Pozo, Wout Sommerauer, Edward Sparkes, Saskia Werners, Rutger van der Brugge

Impact of polystyrene nanoparticles on development and mortality of zebrafish (Danio rerio) embryos – preliminary study

Tomasz Bartoszek, Bogumił Łosiewicz, Adam Bajorek

SGGW, Poland

Education level: BSc

Keywords: Confocal microscope, Ecotoxicology, Embryo toxicity, Polystyrene nanoparticles, Zebrafish

The aim of the study was to investigate the effects of polystyrene nanoparticles (PS- NPs) on the development of zebrafish (Danio rerio) embryos. The effect of three types of PS-NPs, differing in the presence of possible substituents on their surface that change the surface charge, was analyzed. The following nanoparticles were used: neutral (without any surface modification; GREEN fluorescence), coated with NH2 (ORANGE fluorescence) and coated with COOH (RED fluorescence). The experiment was carried out according to OECD Test no. 236 (Fish Embryo Toxicity Test) on zebrafish embryos two hours post fertilization (HPF) and lasted for 96 hours. Embryos were divided into 16 groups: a control group without xenobiotic and three types of PS-NPs - GREEN, ORANGE and RED. Each group with xenobiotic was tested at the following concentrations: 0.5; 1; 2.5; 5; 10 mg/dm3. The survival rate, hatching rate, and detection of localization of nano xenobiotics in the embryos using confocal microscopy were analyzed. On the last day of the experiment, the highest mortality rate (35%) was found in the group of embryos exposed to 5 mg/dm3 RED PS-NPs. Lower mortality rates were found for the other types of PS-NPs. First hatching larvae were observed at 72 HPE. The highest number was found in the RED PS-NPs groups (averaged 73.33%) and was higher compared to the other groups, where hatching rate was 15-18%. After 96 HPE, the average hatching rates were 80%, 88.14% and 92% for PS-NPs RED, ORANGE) and GREEN, respectively. Confocal microscopy analysis showed the presence of PS-NPs in developing embryos. PS-NPs were particularly frequently observed in the yolk sac, gastrointestinal tract and occasionally in the brain. The results indicate that the tested PS-NPS negatively affect developing zebrafish embryos, as they can cause mortality, premature hatching and can be deposited in organs of embryos.

Acknowledgements: We would like to express our deepest appreciation and gratitude to the thesis supervisor's professor Maciej Kamaszewski and MSc Adrian Szczepański who supervised our work on the research project.

Resilient use of natural resources

Effects of forest management on haemosporidian vectors infecting Parus major in the Wienerwald Biosphere Reserve

Isabell Kuhn, Marcela Suarez-Rubio, Swen Renner

UHOH, Germany

Education level: MSc

Keywords: Dipteran vectors, ecosystem parasitology, mixed forest, beech forest, great tit

Avian haemosporidians are bird blood parasites transmitted by insects such as dipterans of the families Culicidae, Ceratopogonidae and Simuliidae. These insects are called vectors and represent the connecting component in host-vector-parasite interactions. However, the role of vectors in dependence on their habitat has been little studied to date. As dipteran vectors mainly lay their eggs in water or damp material, such as leaf litter, forest type and forest management can affect the distribution and abundance of vector species, which in turn may influence the bird host's health status. This study aims to expand our knowledge of host-vector-parasite interactions by using Parus major as a model organism. Specifically, we investigated (i) whether forest type and forest management influence the abundance of dipteran vectors by comparing beech (Fagus sylvatica) to mixed forest stands and core to non- core zones, and (ii) whether the abundance of vectors influences the health status of Parus major nestlings. We set up vector traps near nest boxes at 40 sampling sites in the Wienerwald Biosphere Reserve, Austria from May to June 2024. The traps ran for about 24 hours and attracted vectors by the smell of sweat and yeast fermentation. The collected insects were assigned to different vector families. The health status of the bird nestlings was measured during intense nestling monitoring using scaled mass index and tarsal asymmetry. We expect that more microhabitats and rapidly decomposing leaf litter in the mixed forest will affect vector abundance and the transmission risk of haemosporidians. This study provides a deeper insight into avian- dipteran-haemosporidian interactions in relation to human land use and contributes to finding sustainable forest management strategies to conserve wildlife in European forests in the long term.

Note: This is a promissory abstract, as the study is not finished yet.

Acknowledgements: PD Dr. Marcela Suarez-Rubio (BOKU University), PD Dr. Joanna Fietz (University of Hohenheim), PD Dr. Swen Renner (Natural History Museum Vienna, BOKU University)

ORAL SESSION 1.3

Friday 22 November 2024 at 10:10 – 11:10

B3034 Orion

The influence of Farm Advisory Services on the use of Agroecological Practices among Farmers in Germany, with emphasis on Bavaria

Katharina Angerer

NMBU, Norway

Education level: MSc

Keywords: Farm advisory services, farm advisory system, agricultural advisory services, governance, agricultural advisers, agricultural consultation, agricultural policy, advice, sustainable agriculture, agroecology, agroecological practices, ecological practices, German agriculture

Many farming practices are negatively impacting the environment and threatening the future of the food systems. Agroecological practices are considered as a solution to overcome the challenges arising from this. Farm Advisory Services are the connection between research and practice and therefore can stimulate the adoption of certain practices. This research's main objective was to evaluate the influence of the Farm Advisory System (FAS) on farmers' uptake of agroecological practices in Germany. A focus was laid on the federal state of Bavaria. For the evaluation, a multi-method approach and a qualitative research strategy were applied. Based on information collected during an online survey with 72 advisors an analysis of the existing FAS in Germany was generated. An in-depth analysis of the Bavarian FAS was conducted according to the data collected during one-on-one interviews with 10 farmers, 15 advisors, and one expert. The findings represent the types of advisory services advising on agroecological practices, the major factors driving the adoption of such practices, as well as the sources from which knowledge is obtained. Public advisory services and Farmer-based Organisations including organic associations, are identified as the core consultation services. Interviewees reported that the utilization of agroecological practices was mainly driven by personal conviction, monetary incentives, and the aim to solve a problem. Specialized journals, seminars, and colleagues play a significant role in the knowledge acquisition process of farmers. With advisors being only of little importance for the information gain. Overall, the results show that farmers mainly adopt agroecological practices because of personal beliefs, monetary factors, or pressing issues, and advisors play only a minor role in the decision-making and knowledge-accumulation process. This paper discusses the factors influencing the use of agroecological practices in the study region as well as the conditions that can facilitate the wider uptake of these practices.

Acknowledgements: Alexander Wezel; Geir Lieblein

Impact of Participation in an Alternative Food Network on Consumer Perception of Agriculture – A case study in the Netherlands

Hannah Gläser, Dr. Thijs Bosker

BOKU, Austria

Education level: MSc

Keywords: Alternative Food Systems, organic Agriculture, ecosystem services, ecosystem disservices, public perception

Public calls for sustainable agriculture are increasing, but changing farming systems is complex and requires understanding among consumers. Alternative Food Networks (AFN) facilitate knowledge transfer through direct consumer-producer interactions. This study examined how AFN participation affects consumer perceptions of agriculture in the Netherlands, using the concept of ecosystem services and disservices. A survey comparing AFN consumers with organic supermarket consumers included statements about agriculture's positive and negative impacts and contextual questions to explain response patterns. Results show that AFN consumers have a more positive perception of agriculture than organic supermarket consumers. Both groups recognize the need for change in Dutch agriculture, but only AFN members stress that food should play a bigger role in the future. The study suggests that AFNs could facilitate agricultural knowledge exchange to the consumers, crucial for public debates in which consumers and farmers find common ground to facilitate the transition to a more sustainable agricultural system.

Acknowledgements: Thank you also to my bachelor thesis group, who has provided me with helpful feedback. Special thanks go to Joost Herrebout, Luke Dedecke and Lina Pitz for their help during the research. Furthermore, we would like to thank Sara Maestre Andrés and Laura Calvet Mir for providing feedback on the method section.

Sensor Based Machine Learning Approach for Non-Destructive Quality Evaluation and Shelf-Life Prediction of Agri-Food Products

Florian Kaltenecker, Julia Senge, Christian Krupitzer

UHOH, Germany

Education level: MSc

Keywords: Quality control, Spoilage detection, Fresh produce, Non-destructive testing, Food waste, Electronic Nose (E-Nose) technology, Principal Component Analysis (PCA), Linear Discriminant Analysis (LDA), Support Vector Machine (SVM), Machine learning, data fusion

Monitoring the ripeness and quality of fresh fruits and vegetables is necessary to ensure a safe and satisfactory product for consumers. Methods to monitor the ripeness and decay of fresh produce like near-infrared spectroscopy, penetrometer testing, and microbial tests exist, however, they are often costly or not practicable during harvest, transport, and storage. Additionally, some of them involve the destruction of the sample, e.g., puncture tests for firmness checks, which leads to additional, avoidable food waste. Electronic Nose (E-Nose) Technology has been established as a method to track the ripeness, spoilage, and quality of, for example, fruits and vegetables. The main advantage of E-Nose technology is its cheap, fast, and non-destructive identification of sample properties, allowing quality checks on a larger number of individuals without increasing food waste. In this research, a spoilage monitoring system for tomatoes combining E-Nose Technology with color analysis and weight-loss tracking was established. The E-Nose was constructed using commercially available semiconductor metal oxide gas sensors and an Arduino microcontroller. The system's performance was tested using tomatoes bought in a supermarket which were stored in different conditions, i.e. chilled vs. non-chilled and damaged vs. intact. Features were extracted from the collected sensor data by calculating the ratio of sensor resistance in the presence of the sample to the sensor resistance in fresh air. Subsequently, Principal Component Analysis (PCA) and Linear Discriminant Analysis (LDA) were used to reduce the dimension of the data thereby reducing the noise from the data. Finally, samples were classified using a Support Vector Machine (SVM) algorithm. The system was able to detect spoilage in the monitored samples before it was visibly detectable and could classify how many days a sample spent in the storage trial. The incorporation of additional data sources (color analysis, weight-loss monitoring) improved the predictive ability of the E-Nose.

Acknowledgements: I want to thank Peter Gschwind for his technical support and help in designing the gas sensor array, and to Herbert Götz for providing analytical devices. Thanks to the Hohenheim Mechanics Workshop for their practical inputs and for building the sensor chamber, and the Hohenheim Electronics Workshop for electronics support. Lastly, I thank Peter Lang for providing additional materials.

ORAL SESSION 2.1

Friday 22 November 2024 at 11:20 – 12:20

B3020 Orion

Stimulating plant immunity: an alternative in the fight against bacteria?

Mathilde CHASSERAY - - DESCHAMPS, Nino CHARRIER, Céline HEEL, Pierre RYSMAN, Sorélia VERGUET

AGRO, France

Education level: BSc

Keywords: Plant immune defence, pathogenic bacteria, plant protection, plant defence elicitors, sustainable agriculture

Being the world's leading vegetable crop, potatoes (Solanum tuberosum) play a major role in both human and animal nutrition as well as in industry. However, this crop is affected by Dickeya and Pectobacterium, pectinolytic bacteria which cause blackleg disease in vegetation and potato tuber soft rot in storage.

Like animals, plants have an immune defence system which that enables them to resist disease and environmental stress. They are able to recognize specifics molecules of pathogen named PAMPs (pathogen associated molecules patterns) or their effectors through specific receptors. Recognition triggers the activation of molecular cascades reaction and the induction of defence gene expression and so to defence mechanisms, i.e. neutralization of the aggressor and limitation of its spread. Concomitantly, information is transmitted to the whole plant and potentially to neighbouring organisms.

Progress in understanding these mechanisms had led to the development of molecules that stimulate this natural immune system. These plant defence stimulators (PDS) could be an alternative to antibiotics, prohibited in Europe and to pesticides. The issue raised by this evolution of agronomy and crops protection is whether PDS are efficient in protecting crops from pectinolytic bacteria.

The efficacy of two DPSs, a PAMPs of an oomycete and an algae extract were tested on two potato varieties and against two species of pectinolytic bacteria, Pectobcaterium atrosepticum and Pectobacterium wasabiae. After 48h treatment by PDS respectively, ten half potato tubers were be inoculated with P.atrosepticum or P.wasabia (108 CFU/ml). Five days later, the efficiency of PDS was evaluated by measuring the mass of rot. Our results showed that CCF but not algae extract reduced the development of soft rot depending on genotype and bacteria. They suggest that PDS could be an effective alternative to conventional plant protection products. However, field trials will be needed to confirm the agronomic relevance of SDPs.

Acknowledgements: We would like to thank F. VAL (PR) and G. LEROY(TFR) for the support and help they gave us throughout the entire project.

Changes of tocols in the frying medium during the preparation of French potatoes

Ing. Marie Veselá, prof. Ing. Lenka Kouřimská, Ph.D

CZU, Czech Republic

Education level: MSc

Keywords: Vitamin E, tocopherols, tocotrienols, oils, frying, French fries

Purple potatoes contain a higher content of phenolic compounds, and therefore the aim of this study was to compare how the frying medium degrades when frying purple potatoes compared to frying traditional yellow potatoes, and whether phenolic compounds have an inhibitory effect on lipid oxidation. The yellow potato variety Princess and the purple variety Fleur Bleue were selected for analysis. The prepared fries were fried in rapeseed oil 5 times with an interval of 1 day for both varieties under identical conditions of 170 °C in a deep fryer. The oil was left at room temperature until further frying. Freshly fried fries were evaluated by sensory profile. The stability of the oil was tested by the Schaal test. Changes in tocopherol and tocotrienols in the oil were determined by HPLC/FLD. The results showed that there were no statistically significant differences in sensory evaluation. The intensity of aftertaste increased with increasing frying for both types of fries. The purple potato fries were less well accepted compared to the traditional yellow fries we are used to. The induction period for oil yellow potatoes shortened after the 1st frying, whereas for the purple potatoes it did not start to shorten even after the 5th frying compared to the non-fried sample. The greatest overall relative loss of tocol occurred for α- tocopherol (51.8% loss for oil after frying of purple potatoes and 71.9% loss for oil after frying of yellow potatoes) and the least loss was for δ-tocotrienol after 5th frying. Unfried and fried oil contained the highest amount of γ-tocopherol followed by α-tocopherol for both potato varieties. It was found that the degradation of tocopherols and tocotrienols was slower when purple potatoes were repeatedly fried, and also the total loss of tocols was lower than when yellow potato fries were fried.

Acknowledgements: prof. Ing. Lenka Kouřimská, Ph.D.

Genetic evaluation of M4 population of Pigeon pea (Cajanus cajan(l.) Millsp.) through molecular markers

Shraddha Dhamore

CZU, Czech Republic

Education level: MSc

Keywords: Pigeon pea, genetic variability, ISSR markers, DNA fingerprinting, molecular markers

The cultivation of Pigeon pea in the Konkan region of Maharashtra faces challenges due to a lack of irrigation infrastructure during the prolonged rabi season. To address this issue, there is a dire need for Pigeon pea varieties having shorter maturity periods. This study focuses on assessing the genetic diversity and variability of Pigeon pea mutant lines derived from gamma irradiation, using ISSR markers. Fieldwork was conducted at the Agricultural Botany farm, College of Agriculture, Dapoli, and laboratory work at the Plant Biotechnology Centre, College of Agriculture, Dapoli. Twenty ISSR markers were employed to analyze a phenotypically diverse population of mutant lines from the M4 generation. The results revealed a considerable degree of polymorphism, with 84.56% of the markers exhibiting variation. In total, 142 alleles were identified, with an average of 7.1 alleles per marker. Furthermore, cluster analysis based on ISSR data categorized the mutant lines into two primary groups, providing insights into their genetic relationships into the genetic. This research underscores the effectiveness of ISSR markers in assessing genetic diversity within the Pigeon pea population and the significance of molecular-level 50 analysis in distinguishing mutants from the original variety. These findings offer valuable insights for the selection of favorable mutants and their integration into future breeding programs.

Acknowledgements: Dr. S.V. Sawardekar

ORAL SESSION 2.2

Friday 22 November 2024 at 11:20 – 12:20

B3030 Orion

Resolving the Neoavian radiation using synteny-based phylogenomic methods: insights into genome evolution of modern birds around the Cretaceous-Paleogene extinction event

Dennis Vlegels

WUR, The Netherlands

Education level: MSc

Keywords: Neoaves radiation, Synteny, Avian genome evolution, Phylogenomic methods, Cretaceous-Paleogene extinction event

The phylogeny of Neoaves, which includes 95% of all modern bird species, remains difficult to resolve due to rapid speciation around the Cretaceous-Paleogene mass extinction event ~66 million years ago. Traditional phylogenomic methods relying on molecular sequences face limitations due to sampling biases and insufficient resolution at early divergences. This study examines synteny—gene order conservation—as an alternative marker for phylogenetic reconstruction in Neoaves, offering insights into chromosomal evolution across modern birds.

To evaluate the performance of established synteny-based phylogenetic tools (MLGO, PhyChro, and Syn-MRL) and two constructed in this research ("Anchor Adjacency" and "Shared Anchor"), vertebrate genome evolution was simulated. The study also estimated the phylogenetic signal in gene orientation, and between synteny blocks identified by GENESPACE and MCScanX. Following benchmarking, I reconstructed the first large-scale avian phylogeny using synteny data, including 79 bird genomes, to further assess method performance and help resolve the Neoavian radiation.

Results showed no significant difference in phylogenetic signal between GENESPACE and MCScanX blocks for most methods, except PhyChro, which performed better with MCScanX blocks. Gene orientation was found to have low phylogenetic signal. While MLGO and Syn-MRL performed well in simulations, their practical application to avian phylogenetics highlighted sensitivities to data quality and annotation differences.

PhyChro demonstrated superior topological accuracy and robustness but failed to recover monophyly of all avian taxonomic orders, questioning the applicability of synteny-based phylogenetic tools to avian phylogenomics.

Acknowledgements: We would like to thank F. VAL (PR) and G. LEROY(TFR) for the support and help they gave us throughout the entire project.

The Role of LEADER as Support for Social Innovation in Forest-Related Case Studies in rural areas from Austria, Germany, Finland, and Spain

Yanisse Basauri Torres

BOKU, Austria

Education level: MSc

Keywords: Social Innovation (SI), Forestry, Rural Development, LEADER, EU Policy, Case Studies, Stakeholder Collaboration, Sustainability, CLLD, rural areas, forest policy

Social innovation (SI) is about new forms of interaction between environmental, economic, and social realms in order to solve shared problems and achieve common goals through strengthened collaboration and bottom-up initiatives. This approach has significant potential for the development of rural areas and can contribute to reverting abandonment, increasing competitiveness, and securing jobs and services. However, the knowledge of social innovation in rural areas, including the forestry sector is lacking. This thesis focuses on the EU policies that have the potential to support Social Innovation in rural areas, focusing on the LEADER (local development method) and CLLD (Community-Led Local Development) policy. The study investigates the role of the LEADER approach as a means of supporting social innovation in forest-related case studies from rural areas in Europe.

For this purpose, several case studies from four different countries across Europe were used. The cases are forestry related (nature conservation, environmental protection, biodiversity, etc.) from Austria, Germany, Finland, and Spain. The information is obtained by literature, all the cases representatives have been contacted through questionnaires and for some telephone interviews were done. The research seeks to answer the questions if the policy framework is relevant, as well as the interactions between the stakeholders and the similarities and limitations across all the cases.

The comparative analysis highlights key factors that enabled the development and implementation of these social innovations. The LEADER approach, as a community- led local development tool, provided critical support in overcoming barriers and enabling these social innovations to succeed, by fostering multi-stakeholder collaboration, mobilizing funding, and facilitating knowledge exchange. The study emphasizes the importance of organizational structures and scaling-up strategies in amplifying the impact of these social entrepreneurial efforts. It is hoped this study will help inform policy makers, decision makers and stakeholders about SI in rural areas.

Acknowledgements: Prof. Dr. Gerhard Weiss

The effect of vitamin D supplementation on enhanced efficiency of plant alkaloids in a 3D model

Pavel Kouřimský, Ivo Doskočil

CZU, Czech Republic

Education level: MSc

Keywords: Amaryllidaceae cell lines toxicity HT29

Alkaloids from plants of the Amaryllidaceae family have a great diversity in terms of biological activity. Because of their antitumor and cytotoxic properties, their cytotoxic effect and potentially synergistic effect with other beneficial substances for humans is being investigated. Such a compound could be vitamin D, which can influence the signalling pathways of cellular metabolism and can thereby also influence tumour cells. The aim of this work was to test the synergistic effect of vitamin D with alkaloids from the Amaryllidaceae family and to find out if their joint effect increases their effect on the growth of tumour cells.

Amaryllidaceae extracts were tested on the HT29 colorectal cancer cell line in a 3D model. The difference between alkaloids with and without added vitamin D was also tested. The experiment was carried out for 18 days, where for the first 12 days a photo of the 3D model was taken once every 2 days and then only once every 3 days. From the subsequent photographs, the volume of 3D cells in mm3 was calculated and their change was compared with the control sample as well as with vitamin D alone.

The obtained results show that the effect of alkaloids from plants from the Amaryllidaceae family was more effective on the growth of tumour cells than vitamin D alone. A significant difference between alkaloids and vitamin D occurred between 10th and 12th day. No significant difference was observed between the sample with vitamin D extract and the sample without vitamin D extract. The work brings original results about the effect of vitamin D on the growth of the HT29 cell line in a 3D model and about its interaction with extracts from plants from the Amaryllidaceae family. In the future, it would be good to focus on this issue in more detail.

Acknowledgements: I would like to thank to my supervisor Dr. Ivo Doskočil.

ORAL SESSION 2.3

Friday 22 November 2024 at 11:20 – 12:20

B3034 Orion

Exploring the impact of insecticides on *Amblyseius andersoni* (Chant): Understanding resistance and compatibility

Venkata Avinash Addanki, Guillaume Serra, Paola Tirello, Alberto Pozzebon

SGGW, Poland

Education level: PhD

Keywords: Deltamethrin, Amblyseius andersoni, Crop protection, Pest control, Pyrethroids

Insecticides, specifically pyrethroids, are widely used by farmers to control pests; however, they can also have a detrimental impact on beneficial organisms such as biocontrol agents. *Amblyseius andersoni* (Chant) (Acari: Phytoseiidae) is a key biocontrol agent of spider mites and thrips, two major pests responsible for significant damage in various crops. *A. andersoni* can be negatively affected by insecticides commonly used for pest control. Ensuring compatibility between biocontrol agents and insecticides poses a significant challenge in contemporary agriculture with fewer chemicals available on the markets. This study aimed to investigate the dose-response effect of a common pyrethroid insecticide, deltamethrin (IRAC group 3), on three *A. andersoni* strains. Additionally, we examined the impact of deltamethrin on the fecundity of *A. andersoni* strains. Moreover, side-effects of spinosad (IRAC group 5) and etofenprox (another pyrethroid, IRAC group 3) on fecundity and survival of *A. andersoni* were evaluated. Although the fecundity of the two field strains decreased with the increase in insecticide dosage, they displayed high resistance levels while a third strain resulted susceptible and served as a reference. One of the resistant strains survived the recommended field dose of etofenprox but was susceptible to spinosad. The second deltamethrin-resistant strain exhibited reduced susceptibility towards both spinosad and etofenprox. This study highlights the potential of incorporating resistant *A. andersoni* strains in integrated pest management programs.

Caring for fields: Evaluating fungicide resistance of cereal pathogens to enhance sustainable farming practices

Martina Čapková

CZU, Czech Republic

Education level: MSc

Keywords: Wheat, barley, cereal, diseases, protection, fungicides, fungicide resistance, monitoring, pathogen

Today, ensuring effective protection of cultivated cereal crops against fungal pathogens is paramount, given their significant impact on global yield and quality. The emergence of fungicide-resistant pathogen populations poses economic challenges, necessitating effective strategies to mitigate their establishment and spread.

This study conducted a susceptibility analysis of fungal pathogens to five fungicidal active ingredients: fluxapyroxad, azoxystrobin, fenpicoxamid, prothioconazole, and mefentrifluconazole. A total of 236 isolates of Monographella nivalis, Oculimacula yallundae, Zymoseptoria tritici, and Ramularia collo-cygni were tested across varying concentrations of these agents. Results demonstrated notable variability in efficacy among fungicides, suggesting a need for reevaluation of their application in crop protection.

The hypothesis regarding pathogen susceptibility variation to fungicides was confirmed, aiming to determine the susceptibility levels of selected fungal pathogen isolates to commonly used agents. Azoxystrobin exhibited the highest proportion of individuals with lower susceptibility (EC50 > 0.5 µg/ml), indicating widespread resistance among Monographella nivalis isolates (94.83%), while showing negligible resistance to prothioconazole and only 6.78% resistance to fenpicoxamide.

Oculimacula yallundae exhibited no resistance to prothioconazole or fluxapyroxad. Zymoseptoria tritici showed significant variability in resistance, with no resistance to fenpicoxamide but 85.51% resistance to azoxystrobin. Ramularia collo-cygni displayed the highest resistance to all fungicidal active ingredients tested.

Overall, this study provides critical insights for optimizing cereal crop protection strategies and minimizing fungal pathogen resistance risks. Continuous monitoring of resistant isolate occurrences in pathogen populations is essential, alongside research into new control methods adapted to evolving agricultural conditions. These findings underscore the importance of strategic fungicide use to sustain cereal crop health and productivity amid increasing pathogen resistance challenges.

Acknowledgements: Ing. Jana Mazáková, Ph.D., Mgr. Dominik Bleša, Mgr. Pavel Matušinský, Ph.D., Dr. Ing. Ludvík Tvarůžek, Eva Švarcová

Microbial factors underlying genotype-specific storability of sugar beet

Daniela Wöber, Karin Hansel-Hohl, Martina Dokal, Marion Seiter, Eva M. Molin

BOKU, Austria

Education level: PhD

Keywords: Beta vulgaris ssp. vulgaris L., storage capacity, pathogens, microbial patterns

Sugar beet is a major crop for sugar production in Austria, making the preservation of its yield and quality essential throughout the production chain. However, significant challenges arise due to food loss during long storage periods. Next to environmental factors, the genetic arrangement has been described to influence the storage capacity of sugar beet, as some genotypes exhibit greater resilience under uncontrolled storage conditions. In addition, microbial factors might play a key role as the plant microbiota significantly impacts plant establishment, growth, and health. Despite extensive studies on preharvest microbiota, the dynamics of postharvest microbial communities and their effect on crop quality remain largely unexplored. While microbial colonization can cause significant economic losses through rot development, the beet´s microbiome also contains natural antagonists that protect the root from harvest to processing. To uncover the dynamics underlying genotype-specific microbial patterns, we utilized 16S rRNA and ITS amplicon sequencing to analyze bacterial and fungal communities in four sugar beet varieties with different storability responses during a 12-week storage trial. Finally, our study identified temporal- related microbial differences as well as microbial markers indicating sugar beet storability. Specifically, the fungal class Saccharomycetes including species such as Candida santameriae, Pichia membranifaciens and Starmerella ballicaris as well as agonists and antagonists correlating with reduced storage capacity were determined. These biomarkers can potentially be used to identify good storable sugar beets and to improve the storability of agricultural products.

ORAL SESSION 3.1

Friday 22 November 2024 at 14:40 – 15:40

B3020 Orion

A PRELIMINARY INVESTIGATION ON DISPERSAL OF MITES BY FRUIT FLIES IN COMPOSTING ENVIRONMENTS

Muhammad Arslan Ibrahim, Katarzyna Michalska, Dariusz J. Gwiazdowicz, Grażyna Soika, Marcin Studnicki, Marek W. Kozłowski, Marcin Wit, Wojciech Wakuliński

SGGW, Poland

Education level: PhD

Keywords: Predatory mite, Dispersal, Carriers, Compost ecosystem, Diversity

Predatory mites can attach to drosophilid fruit flies for nutrition and dispersal between ephemeral habitats. The goal of our study was to examine which species of predatory mites are being carried by fruit flies and which species of fruit flies carry mites in the field in close proximity to composters that are generally, particularly attractive to flies. Insects were collected using netting and traps from 3 different locations of composters with varying decomposing materials: an organic orchard site, a chemically controlled orchard site, and a site consisted of chemically controlled fruits and vegetables. A markedly high number of Drosophila species (13) were collected from the organic compost pile, notably exceeding the number found at other locations. The percentage of flies carrying mites was 2.61% in organic waste pile and 1.045% in chemically controlled orchard waste and no mites on fruit flies were recorded in the composter where fruits and vegetables were mixed in waste. Drosophila melanogaster was a dominant species both in organic as well as chemically controlled sites. Strikingly, D. hydei was most frequent species carrying mites on its body. In total, there were 15 specimens of D. hydei, 5 specimens of D. melanogaster, and 2 speciemens of D. immigrans reported as carriers of mites. The mites that were found attached to fruit flies were predominantly from Macrocheles (88%) (Macrochelidae) followed by Lasioseius (12%) (Blattisociidae). In conclusion, composters from organic production appear to be a promising source for both fruit flies and mites, suggesting their potential for further investigation.

Antimicrobial peptide based multifunctional coatings for orthopedic implants reduce staphylococcus aureus adhesion and survival

Katharina Pütz, Guruprakash Subbiahdoss, Leonie de Boer, Bas Zaat, Erik Reimhult

BOKU, Austria

Education level: MSc

Keywords: Bacterial adhesion, biofilm, antimicrobial peptide, orthopedic implant, staphylococcus aureus

Despite the rising demand for orthopedic implant procedures over the past decade, bacterial infections remain a major cause of implant failure, necessitating prosthetic replacement. This causes discomfort and potential risks for the patient, and results in increased costs and greater antibiotic usage post-surgery. Therefore, it is crucial to prevent the attachment of bacteria to avoid their development into an infection.

Studies have shown that multilayer coatings with DNA reduce bacterial adhesion. However, a mere reduction is not sufficient. Even a few adhered bacteria can develop an infection. Adding an active antimicrobial agent to the coating could improve its efficiency. The SAAP-148 peptide has shown promising antimicrobial properties. A multilayer coating incorporating DNA and SAAP-148 could lead to a highly effective solution.

We tested this by preparing glass slides with three bilayers of PEI and PSS, four bilayers of DNA and SAAP-148, and an additional peptide coating layer as the top layer. Subsequently, we performed a bacterial adhesion experiment under flow with an overnight culture of Staphylococcus aureus DSM 20372 that was centrifuged and diluted to an OD600 of 0.6 in PBS. The S. aureus suspension was pumped through a microfluidic chamber with the coated glass slide as the bottom surface for 2 h. The adhesion of bacteria was recorded every 5 min using bright-field microscopy. After 2 h of S. aureus adhesion, the glass slide was washed with PBS, and live/dead staining of the adherent S. aureus was conducted.

In comparison to uncoated glass, the coated slides showed an 82% reduction in bacterial adhesion after 2 h. The coating further killed around 83% of all S. aureus that were attached to the slide. The results show that a combined coating of DNA and SAAP-148 is a promising candidate for preventing bacterial infections on prosthetic implants.

Acknowledgements: We thank Hochschuljubilämsfonds of the City of Vienna, Austria for funding the project. We also extend our thanks to Lena Christina Heibl and Carmelo Covato for their support in the flow experiments.

Differentiation of the syndrome basses richesses agents in sugar beet

Theresa Kaufmann, Rafael Toth, Michael Kube

UHOH, Germany

Education level: MSc

Keywords: Tuf gene, phytopathogenic, bacterial strain

Two bacterial pathogens, 'Candidatus Arsenophonus phytopathogenicus' (Gammaproteobacteria) and additionally 'Candidatus Phytoplasma solani' (Mollicutes), are associated with the important disease syndrome basses richesses of sugar beet (Beta vulgaris subsp. vulgaris). Beside the eponymous drastically reduced sugar content, the disease is characterised by yellow and necrotic leaves, leaf deformation, proliferation, malformed taproot and phloem decline. Mixed infections by the pathogens and abiotic stress can lead to complete crop loss. The epidemic is driven by the vector Pentastiridius leporinus (cicada), whose populations have increased dramatically over the last decade and are spreading from southern and eastern Germany towards the north. SBR is a threat to the economically valuable sugar beet crop in Germany.

Little is known about the genetic diversity of these two phytopathogenic bacteria. Therefore, we focused on the development of endpoint PCR assays that enable strain identification and differentiation based on elongation factor Tu (tuf). This gene was chosen with respect to its high number of informative sequence positions and its successful application in other studies. DNA was obtained from sugar beet root tip samples derived from different regions in Germany. Primers were designed (NCBI's PrimerBlast and Primer3Plus) for the partial amplification of tuf gene. The optimised amplification conditions were determined by gradient PCR and gel electrophoresis.

Amplification specificity and sensitivity were compared with available real-time PCR assays and product assignment was verified. A selection of the obtained tuf amplicons have been sequenced and analysed for strain differentiation, providing initial insights into the current situation of the ongoing SBR epidemic in Germany and proving key information for the search of tolerant sugar beet accessions.

Acknowledgements: We thank the "Society for the Promotion of Plant Innovation" (GFPi) and the "Industrial Community Research" (IGF) for the coordination and support of our work in the project (funding: N11959/22).

ORAL SESSION 3.2

Friday 22 November 2024 at 14:40 – 15:40

B3030 Orion

Determination of functional patterns in Pinus pinea from the Spanish Northern Plateau: Relationships between secondary growth, defences and reproduction

Anna Fontova-Musté

UdL, Spain

Education level: BSc

Keywords: Pinus pinea, trade-offs, climate change, resin ducts, pine nuts

Nowadays, the increasing trend in climate aridification, due to rising temperature and decreasing precipitation, is threating the survival and production of Mediterranean forests. This work focuses on stone pine (Pinus pinea) as a representative Mediterranean species of high economic value, managed as multifunctional forests, with timber and pine nuts being the main commercial products. In order to determine how global warming affects the relationships between radial growth, pinecone production and investment in defences (through the study of resin ducts), we evaluated their functional relationships in five monospecific stands in the province of Valladolid (Spain) with different site qualities during the period between 1960 and 2016. The anatomical (tree-ring) traits studied, related to growth and investment in defences, show a high positive relationship with pinecone production, but with a 3- year lag. Therefore, wood production (secondary growth), cone production (reproduction) and the number and relative frequency of resin ducts (investment in defences) seem to be perfectly compatible in stone pine and do not currently compromise the defensive capacity of the trees against biotic agents. We also observed a progressive homogenisation of the inter-annual variations of the traits studied at regional level, which was attributed to an intensification of adverse climatic influences, in particular drought stress induced by global warming in the Iberian Peninsula. Similarly, the intensification of drought could simultaneously impair the growth, defence and reproduction of trees, as suggested by future projections of pinecone yields.

Acknowledgements: Jordi Voltas, Tatiana A. Shestakova

Impact of human activities on dragonfly larval performance: A comparison of natural and man-made habitats

Annemarie Josková, Filip Harabiš, Jana Hronková, Anna-Marie Poskočilová, Adam Tetaur

CZU, Czech Republic

Education level: PhD

Keywords: Freshwater invertebrates, ecological restoration, intensive fish farming, body condition of dragonflies

Anthropogenically induced environmental changes have occurred in such a short evolutionary time, that organisms cannot adapt to these changes. Consequently, they can face habitat selection challenges exacerbated by human activities leading them to a preference of suboptimal habitats, despite the fact they are using verified cues. The aim of our research was to assess the impact of human activities, namely fish farming and habitat restoration on dragonflies (Sympetrum spp.). We compared the body condition and mortality of larvae reared in (semi-)natural habitats (oxbow lakes and ponds without management) with those in man-made habitats (restored post-mining areas, intensive fish-farming ponds). The experiment was conducted in three main localities in the Czech Republic: The Sokolovsko region (where we assessed the effect of restoration after coal mining on dragonflies), Polabí (the effect of restoration after sand mining) and South Bohemia (impact of fish farming). Our findings indicate that natural localities are usually more diverse, containing both high- and low-quality habitats. In contrast, man-made localities are more uniform providing only sub- optimal conditions for larvae, which was reflected in high mortality and poor body condition of larvae. By demonstrating that human induced changes in habitat conditions significantly affect larval performance, dragonflies have proven to be valuable indicators for monitoring the impact of human activities on freshwater ecosystems and for the restoration of degraded freshwater habitats.

A new era for forestry or a risk for the economy? – European Green Deal through the eyes of young foresters

Weronika Juszczyk, Przemysław Pluta, Beniamin Chrzanowski

SGGW, Poland

Education level: BSc

Keywords: European Union, regulation, forestry students, IFSA, natural resources, climate change

Europe's geopolitical situation requires establishing a balance between natural resources and their exploitation. EU has taken steps in this direction by developing methods of counteracting the impact of humans on the environment.

The high-profile discussion around the European Green Deal's forestry provisions gave us a reason for conducting a research aimed at gauging public statement in various EU countries on this subject and gathering opinions on planned measures among young forestry students.

During the Northern European Regional IFSA Meeting 2024, interviews with forestry students representing various European countries were conducted. The interviews complemented a survey conducted among similar audience. The questions concerned their attitudes towards the objectives of the European Green Deal, as well as their perspectives on possible changes in natural resource management in their countries. The survey succeeded in collecting responses from 16 EU member states. A polarisation of responses was noted, which can be presented as a division into eastern and western Europe. The first mentioned group is very sceptical of the European Green Deal, meanwhile the other is far more positive about the new objectives.

Students were also asked about options for balancing exploitation and forest protection. They leaned towards the topics of forest multifunctionality and fast- growing tree plantations. The majority of respondents was in favour of the presumed restrictions not affecting their home countries to the same extent due to their great diversity in both economic and natural terms.

The research outlined the forestry students' statement on the expected direction the EU should take when creating the European Green Deal. The need to differentiate actions according to the resources and nature of a country's economy was indicated. An important aspect of the research was that, by engaging in dialogue, a beneficial solution can be reached for all of the EU state members.

Acknowledgements: PhD Paweł Staniszewski, Members of International Forestry Students' Association.

ORAL SESSION 3.3

Friday 22 November 2024 at 14:40 – 15:40

B3034 Orion

Market acceptance and trade channels of sub-optimal fruits and vegetables: a case study on carrots

Ilaria Serafini

Unitus, Italy

Education level: MSc

Keywords: Food loss, direct quantification, private quality standards, producer organisation

This study assesses the impact of private cosmetic quality standards on fruits and vegetables supply chain. These standards imposed by retailers generate significant amounts of suboptimal products that are safe and edible but do not comply with the aesthetic requirements. Through a field study on carrots, we assess the mass and economic value of suboptimal products and discuss alternative marketing channels. Approximately 14% of food losses occur during the early stages of the supply chain (FAO, 2019) and a key role is played by Producers Organization (PO).

This study is conducted at a PO in Central Italy and provides a direct quantification of mass and value of carrots downgraded or lost due to non-compliance with quality standards imposed by retailers. Data is collected over 18 days (July, August, and September 2023).

The quantification consists of 2 steps. In the first, for each bin handled, mass and value of carrots delivered, discarded for safety reasons, downgraded for quality standards, and sold for fresh market is assessed. In the second, by downgrading, carrots rehandled for food industry and losses (from rehandling) are assessed.

We collected 182 observations, for a total of 263,755 kg. 58.78% is sold for fresh market, 34.64% is downgraded and 12.57% is discarded as losses. By rehandling, 84.73% of the downgrades is sold to industry (at a lower sales price) and 15.27% is discarded as losses. Downgrading and rehandling resulted in a significant economic loss for the PO, and in turn for producers.

Since customers seem ready to accept suboptimal products (local markets and online platforms), these results suggest that adjusting aesthetic standards could reduce food losses and increase profitability for producers (de Hooge et al., 2018). Enhanced supply chain actors and supportive policies collaboration is essential to promote sustainable practices.

Acknowledgements: I would like to thank my supervisors Dr. Clara Cicatiello and Roberta Pietrangeli for all their help and support and for giving me this opportunity. Their extensive knowledge and expert advice has been instrumental in the completion of this work.

Parents facing financial hardship's perception of the cost of a transition towards a more plant-based diet

Qhadira KISSANGOU CHUMO, Basile VERDEAU, Sandrine MONNERY-PATRIS

AGRO, France

Education level: MSc

Keywords: Price perception, financial hardship, parents, plant-based diet, transition

The current global context requires a transition towards more plant-based diets to make food systems sustainable. The availability and acceptability of the recommended diets are decisive for this change. In fact, low-income consumers find it difficult to harmonize their eating behaviors and values because of their limited resources.

Price is the first criterion that determines food choices in households facing financial hardship and constitutes thus one of the barriers refraining low-income parents from transitioning in their diet. Price perception is based on its actual value and other factors like the product's lastingness and the duration of satiety. Hence, questioning the perception of the cost of a more sustainable diet is key to understanding the barriers parents in precarious situations face. However, few studies have investigated the influence price perception may have on diet changes.

This study focuses on a low-income neighborhood in Dijon. Approximately 25 in-depth interviews will be conducted from June to August 2024. To ensure homogeneity, a sample of parents living with at least one child in primary school and experiencing financial difficulties was targeted. The sample size could be adapted during the study to ensure data saturation. Participants will be questioned in an hour-long interview about their food habits, their beliefs about healthy and sustainable food, their perception of food prices, their willingness to adopt a more plant-based diet and children's influence on that aspect. Directed sorting tasks will help initiate the discussion on health, the environment and food prices. Authors will analyze the interview transcripts independently using a thematic approach.

This work will provide an insight into the barriers precarious parents face regarding a sustainable diet. It will also allow a better understanding of how parents facing financial hardship estimate the cost of food. Levers to encourage behavioral changes should arise from the observations.

Designing sustainable transitions

Battling Bunt: Unravelling Wheat's Defense Against the Dark Spore Menace

Gizem Serin

BOKU, Austria

Education level: BSc

Keywords: Common bunt, Tilletia caries, resistance breeding, organic farming

In the enduring struggle between wheat farmers and the persistent threat of common bunt (Tilletia caries), a fascinating story emerges, weaving together ancient farming methods with modern genetic research. For centuries, farmers have battled this fungal disease, sneaking into crops and turning promising harvests into 'bunt balls' filled with spores with dark color and a smell like rotten fish. The availability of effective fungicides controlled common bunt since the mid-20th century. However, the current shift to organic farming has brought it back, endangering organic wheat production worldwide.

Our study aims to understand the strength of bunt and find resistant varieties, suitable for organic farming. We generated wheat populations descending from crosses of old bunt-resistant landraces with regionally adapted modern cultivars. We inoculated seeds with bunt spores, planted field trials with several 100 progeny lines in 1 m2 field plots in two replications at the BOKU experimental farm. Starting two weeks after flowering we observe disease severity on each field plot by counting 100 spikes per plot as healthy or bunt infected. Additionally, we will use a DNA microarray to obtain DNA fingerprints covering several 1000 genome-wide single-nucleotide markers of all experimental lines.

The results of this work will: 1) identify improved progeny lines with high resistance to common bunt; 2) shed light on the inheritance of the trait bunt resistance in these populations; 3) and finally identify the chromosomal regions and selection markers indicative of effective bunt resistance genes.

The field work is currently in progress, the results for my presentation will be ready by November. This work will lead to new knowledge and novel breeding material for boosting breeding of modern, resistant cultivars. By combining old with new, we hope to make wheat crops more resilient to common bunt, ensuring organic wheat farming remains viable for future generations.

ORAL SESSION 4.1

Friday 22 November 2024 at 16:05 – 17:05

B3020 Orion

Cell-based agriculture as solution to resource crisis in the agro-food chain

Tibo Roelants, Alex Proot, Chloé Tiré, Stinne Trappeniers

UGent, Belgium

Education level: BSc

Keywords: Cultivated Meat, Cell-Based Agriculture, Sustainable Food Production, Protein Transition, Systemic Approach

Both conventional meat production and consumption are under pressure. Health risks, climate and environmental issues, as well as animal welfare, are hot topics in the public debate. In the future, cell-based agriculture could play an important role in the associated protein transition. Various forms of cell-based agriculture exist, such as single cell proteins and cultured meat. Using a systemic innovation approach that brings together complementary innovations in a larger, mainly technology-oriented, innovation system, the scale-up of cultured meat is studied using quantitative and qualitative components. In this simulation, all red meat consumed in Belgium is replaced by cultured meat. We assume 23 g of red meat consumed per Belgian per day. The values obtained from this calculation are compared with values for the current production of beef specifically. This quantitative part analyses the technological upscaling in terms of quantities of nutrients, reactors, energy and water. According to the assumptions made, 2,24$*10^9$ L of Essential 8 medium in 770 reactors of 20.000 L will be needed to perform the partial scale-up. Less water, i.e. 40$*10^9$ L, is required compared to conventional meat production. This is a 75% reduction compared to conventional beef production. The extent to which energy use differs depends on the sources used. The qualitative section explores the socio- cultural, governmental and marketing pillars of the systemic innovation diagram. Consumer acceptance as well as the ethical aspects of the production process will play an important role in integrating cultured meat into our diet. Moreover, regulation within the European Union is also important for its structural embedding. However, more research on both optimisation of the production process and sensitisation of consumers is needed.

Acknowledgements: Prof. Liesbeth Jacxsens, Prof. Stefaan De Smet

Rearing house crickets using feed enriched by rapeseed and flaxseed oils

Jakub Folke, Lenka Kouřimská, Martin Kulma

CZU, Czech Republic

Education level: MSc

Keywords: Farming insects, diet, fatty acids, macro and microelements, tocopherols, insect diet

The dietary composition is known to have an significant influence on nutritional value of edible insects. Thus, the beneficial substances may be incorporated into insect biomass via their artificial supplementation into their diet. In this investigation, rapeseed pomace, rapeseed oil, and flaxseed oil were used as partial replacements for soybean meal and soybean oil in the diet of house crickets (Acheta domesticus). The study aimed to evaluate the temporal effects of these dietary supplements by subjecting the crickets to enriched experimental diets i) throughout their entire lifespan, ii) for ten and iii) five days before their harvest. Substituting soybean oil with either rapeseed oil or a combination of rapeseed and flaxseed oils exhibited a positive impact on the fatty acid composition. All experimental crickets demonstrated reduced levels of saturated fatty acids (SFA) and elevated levels of linolenic acid and monounsaturated fatty acids (MUFA). Prolonged supplementation correlated with higher MUFA levels and lower SFA levels. Additionally, dietary enrichment resulted in increased concentrations of α- and γ - tocopherols. Notably, the biomass harvested from crickets provided with experimental diets throughout their entire lifespan exhibited higher yields compared to the control group.

Acknowledgements: Martin Kulma

Implementation of Sorghum in Bakery Products

Mehdi Hassan

BOKU, Austria

Education level: MSc

Keywords: Sorghum, Bakery Products, Climate-Smart Crops, Nutritional Value, Sustainable Agriculture, Food Security

Grains are essential for human nutrition, providing energy, protein, and micro-nutrients. Sorghum (Sorghum bicolor), traditionally used in African and Indian diets, is gaining attention in Central Europe as an alternative grain for human consumption. With its high field yields and resilience to heat and drought, sorghum is a promising complement to conventional cereals amidst climate change and population growth. Rich in secondary plant metabolites such as polyphenols, sorghum acts as an antioxidant, combating oxidative stress and related diseases. However, its functionality and sensory properties fall short of European standards, and its digestibility is lower than wheat's, possibly due to its phenolic content and phenolic acid-starch/protein cross-linking.

This study aims to enhance the functional and nutritional qualities of sorghum for bakery and pasta products. Adapting milling and pre-processing techniques, such as soaking and germination, their effects on total phenolic content, in vitro digestibility, and end-product quality were evaluated.

The total phenolic content (TPC) and total dietary fiber (TDF) of sorghum cultivars were assessed before germination. Various treatments were applied to address mold issues during germination trials, resulting in a successful large-scale germination method. Following germination, milling was performed, and baking trials were conducted using different flour blends of wheat and sorghum. The resulting bread was analyzed for texture, pore structure, volume, and IRIS properties. The TPC of the resulting loaves was evaluated and compared to that of ungerminated cultivars, revealing significant differences.

By aligning these improvements with European tastes and nutritional requirements, this study aims to establish sorghum as a valuable ingredient in Western diets. This research contributes to the global effort to create sustainable, nutritious food options that address the challenges of climate change and population growth, positioning sorghum as a key player in the future of food security.

Acknowledgements: Assoc. Prof. Dr. Regine Schönlechner, Dr. Lisa-Maria Call, Eleonora Charlotte Pichler, Gemaima Cruz Evangelista, Edonise Krasniqi, Linsha Retnaraj-Lailambika, Jeanne Mazot

ORAL SESSION 4.2

Friday 22 November 2024 at 16:05 – 17:05

B3030 Orion

African Women Abuse Their Freedom: Gender Dynamics and Sustainable Business in Southern Kenya's Non-Timber Forest Products Sector

Bruna Jesus dos Santos

SLU, Sweden

Education level: MSc

Keywords: Community Based-Learning, Feminist Economy, Forest Value Chains, Livelihood Strategies, Market Access, Natural Resource Use

This study investigates the gender dynamics and socio-economic challenges women face in the Non-Timber Forest Products (NTFP) sector in southern Kenya through the lens of the feminist economy theoretical framework. By conducting 48 individual interviews and three focus group discussions (FGDs) in Mombasa, Kilifi, and Makueni counties, the research highlights women's critical roles in producing and marketing NTFPs, such as tamarind and coconut oil. Despite their significant contributions, women encounter numerous obstacles, including limited access to financial resources, land ownership issues, and socio-cultural barriers that restrict their economic opportunities and decision-making power. The feminist economy framework helps uncover the undervalued economic contributions of women in the NTFP sector. It analyzes the gendered power relations affecting their access to resources and decision-making power. The study's methodology, which included participatory observations, the Gender Action Learning System (GALs) framework, interviews, and FGDs with key informants, was designed to ensure a comprehensive understanding of the socio-economic dynamics at play. This approach provides robust insights into the gender dynamics and socio-economic challenges in the NTFP sector in Kenya. To address these issues, the study documents strategies recommended by the women themselves to enhance their forest business and improve their livelihood. These include enhancing women's access to education and training in sustainable practices, promoting gender-sensitive policies supporting women's land rights and business projects, and fostering community-based programs encouraging equitable participation in NTFP value chains. These actions can improve women's status in the NTFP sector and enhance rural resilience and sustainability in Kenya. The research highlights the need for better market conditions, including certifications and direct market access for women, fostering economic empowerment and sustainability. The findings from this study aim to inform policymakers and stakeholders, including those supporting women in developing business and political strategies, about the critical need for gender equity in the NTFP sector.

Acknowledgements: I sincerely thank Anders Roos and Chemuku Wekesa for their invaluable guidance and support. I also thank Mark-Herbert for her encouragement and feedback. Special appreciation goes to Tyree Vasconcellos, Dominic Saf, and Priscila Nasoro for supporting data collection. With heartfelt thanks to all interviewers and participants for making this research possible. Lastly, I am grateful to SLU Global for funding my fieldwork in Kenya.

Natural based solutions for in situ bioremediation of Hydrocarbon polluted urban area

Alessandra Filieri, Davide Lelli, Cristina Russo

Unitus, Italy

Education level: MSc

Keywords: Bioaugmentation, In-situ, Hydrocarbons, Bioremediation, Pollution

Bioremediation techniques use the natural biological activity of microorganisms and are environmentally friendly and low-cost, providing a means to treat in-situ hydrocarbon-contaminated soils with high efficiency. This study presents the design of a multipurpose phyto-bioremediation project. The treated site was a former coal gasification plant (AMGA), located in a densely urbanized area of the city of Pesaro (Italy). This site's soil was contaminated on the top and deep by linear (2412 mg/kg) and aromatic (16547 mg/kg) hydrocarbons. The remediation approach developed in this study is based on the combined and synergetic use of two bioremediation techniques: bioaugmentation and phytoremediation. Both are in-situ technologies that avoid excavation by reducing the risk of volatile compounds dispersion and contributing to recover and redevelop the polluted area. In this project, eight different plant species for the phytoremediation approach and, a bacterial consortium consisting of three different microorganisms for the bioaugmentation strategy were selected. Bacteria were selected in laboratory-scale experiments to assess their hydrocarbon-degrading capacity; thereafter genomic analysis of isolates confirmed the presence of genes suitable for remediation treatment and further accessory characteristics. The consortium was inoculated into the designed area, into the trenches used for phytoremediation intervention. A monitoring phase of two years is following to assess health and activity status of the soil, thus hydrocarbon clastic microorganisms and enzymatic activities are measured. This case of study is a clear example of open-living-lab that can also be defined as an emerging open innovation approach that involves multiple stakeholders, including users, to co-create value that ultimately leads to innovation. In this specific case, the living lab gives a solution that not only reduces risk, but also improves ecosystem functionality and social capacity.

Acknowledgements: Silvia Crognale, Paolo De Angelis, Dario Liberati, Regional Agency for the Environmental Protection of Marche (ARPAM), municipality of Pesaro

Resilient use of natural resources

Influence of climate on the drought resistance of Central European tree species using tree ring and carbon isotope analyses

Philipp Bernd Josef Keutner

BOKU, Austria

Education level: MSc

Keywords: Tree ring analysis, carbon isotopes, water supply, drought response, growth ring width, beech, oak, douglas fir, spruce, pine, forest biomass, climate and carbon sequestration

The composition of heavy and light carbon isotopes in tree rings reflects a tree's water supply during the time the tree ring was formed, due to stomata opening and therefore the ability of the tree to favor lighter isotopes from the atmosphere. To investigate the relationship between tree growth and water supply, competition from neighboring trees had to be precisely recorded as a further influence on growth and taken into account in the statistical analysis. In addition, climate time series for the study area are incorporated as independent variables. Since the tree ring analysis also reveals the respective year of tree ring formation, time series for the growth and the isotope ratio can be created as well.

A total of approximately 2000 samples (year-rings) from 25 trees, with five beech, oak, spruce, pine and douglas fir each, are examined for their isotope ratio and growth ring width. The locations of the tree species include both good and bad growth relative to their age. The variety of variables allow to determine if and how much each factor influences tree growth but also the interactions between the individual factors and their cumulative effects on tree growth. Statistical methods such as linear and nonlinear models, multivariate analyses, and time series analyses will be used to quantify the complex relationships between water availability, competitive pressure, climatic conditions, and tree growth.

First results show very diverse reactions to droughts depending on the species. Further investigations could be important not only for forestry and ecological management of forests but also for understanding the impacts of climate change on forest ecosystems. By reconstructing past environmental conditions based on tree rings, valuable information can be obtained, contributing to the development of strategies for adapting to future climate changes.

Acknowledgements: Ass. Prof. Dr. Mathias Neumann, Dr. Eva-Verena Müller

ORAL SESSION 4.3

Friday 22 November 2024 at 16:05 – 17:05

B3034 Orion

Attempting to use 3D printing technology to produce fish analogues with microbial proteins

Zuzanna Kulis, Magdalena Trusińska, Katarzyna Rybak, Małgorzata Nowacka, Katarzyna Pobiega

SGGW, Poland

Education level: BSc

Keywords: Three-dimensional printing, microbial protein, fish analogue, vegetarianism, veganism

Further global population growth by the middle of this century is inevitable. Unfortunately, further growth in agricultural production will not reflect actual demand, and already a key problem is the global shortage of animal protein. In addition, the vegetarian and vegan diets that have become popular in recent years may lead to iron and zinc deficiencies, which may affect the increased risk of mental health disorders. Single-cell microbial protein SCPs, derived from microbial biomass or extracted from microorganisms such as bacteria, yeast, and molds, may be an appropriate alternative. SCPs are produced with the intention of being used as a substitute for protein-rich animal foods and for meat preparations made from meat by-products. In the process of designing meat substitutes with better nutritional value and sensory profile, three-dimensional printing (3DP) may prove valuable.

The aim of the work was to obtain a fish fillet analogue, using 3D printing technology, containing plant and microbial protein with a balanced nutritional composition. The scope of work included designing the composition of the 3D printing ink, printing the model using a Foodni printer, and then texturing the resulting products. The study showed the possibility of adding microbial protein as an ingredient in inks for 3D printing fish analogues. Inks with the addition of microbial protein were characterised by increased nutritional value compared to pastes designed on the basis of plant protein. Such products could find application as personalised foods.

Acknowledgements: This study was supported by the Ministry of Science and Higher Education (Poland) from the state within the program "Student Research Clubs Create Innovations" in the years 2023–2024 (grant number SKN/SP/570267/2023).

I would like to sincerely thank PhD Katarzyna Pobiega from the Department of Biotechnology and Food Microbiology of the Warsaw University of Life Sciences for her assistance and supervision in conducting the research.

Will there be distortions of competition between EU Member States resulting from the National Strategic Plans for the Common Agricultural Policy 2023-2027? Focus on France, Germany, Spain, Romania and Poland

Mathilde Maeght, Marine Herbert, Laura Le Martelot, Salomé Olivier

AGRO, France

Education level: MSc

Keywords: Common agricultural policy, CAP Strategic Plans, distortion of competition, GAEC, eco-schemes

The 2023-2027 reform of the Common Agricultural Policy (CAP) has led to numerous major changes, like the creation of National Strategic Plans. They aim to enhance CAP adaptability to Member State's specificities, enabling priority-setting and implementation alignment with EU's agricultural sustainability objectives. Each Member State having its own strategic plan, a number of voices have been raised about the possible distortions of competition that it could generate between EU members. This paper assesses whether the regulatory differences of CAP Strategic Plans could lead to distortions of competition between farmers from France, Germany, Spain, Poland and Romania, meaning that it may favour farmers in one country over another, either in terms of the amount of subsidies received or in terms of criteria to receive them. Comparisons and economic modelling have been carried out, with a focus on GAEC (Good agricultural and environmental conditions), young farmers support and eco-schemes. Results indicate that despite CAP Strategic Plans' flexibility and heterogeneity, which make it difficult to identify distortions of competition between EU members, the differing ambitions of the latter lead to farmer disparities and potential shortfalls. Firstly, GAEC are more ambitious in some countries than in others, making it easier for some farmers to be eligible for CAP subsidies. Young farmers set up in large farms seem also to be favoured in countries like Poland or Germany. As part of eco-schemes, Polish off-ground livestock farms seem to have an advantage over their European competitors. Besides, only Spanish eco-schemes provide greater support for farms located in constrained areas. However, in order to assess the environmental ambitions of the Member States, it would be interesting to carry out a cross-sectional analysis of the measures, as some countries being more ambitious when it comes to GAEC may be less so when it comes to eco-schemes.

Acknowledgements: Laroche Dupraz Catherine, Lassalas Marie and Rider Aude.

Empowering Change: Agroecological Approach to Coffee Pulp Composting, A case study of Rusizi District Rwanda

Kushal Poudel, Ioanna Mauratiadou, Tor Arvid Breland, Dario Valarezo, Dominique Barjolle

NMBU, Norway

Education level: MSc

Keywords: Coffee pulp, adoption of practice, compost, action research, agroecology

Coffee is an important cash crop contributing to the livelihood of millions of smallholder farmers, particularly in developing countries. Nonetheless, its processing creates a substantial amount of waste material, posing a significant environmental threat. Coffee pulp waste holds the potential for conversion into cost-effective and easily manageable high-quality compost. This study aims to understand factors affecting coffee pulp compost adoption and develop compost interventions leading to empowering smallholder coffee farmers. The research uses a participatory, and action research approach guided by a soft system methodology including 10 field visits, 30 semi-structured interviews, and a workshop with 15 farmers, coffee washing station leaders and local government officials in the Rusizi District of Rwanda.

The study reveals that major factors of supporting coffee pulp compost adoption are willingness to improve coffee farming, availability for no-cost, perceived benefit and preference for sustainable soil management practices while the hindering factors are know-how of composting, financial capacity and remoteness of farm. Designing composting interventions should focus on the use of locally available structural materials and training on the composting methods which is critical for widespread adoption. Shared visioning and co-creating action plans empower and provide agency to the local stakeholders to enact the transition themselves. The findings suggest that building farmer and cooperative capacity to reduce external dependency and improving market access are key to driving agroecological transition in the resource-poor setting. This study highlights that integrating factors of adoption and agroecological understanding ensures that circular economy models like coffee pulp composting are culturally relevant, collectively owned, and capable of empowering smallholder coffee farmers.

Acknowledgements: Diane Niyogisubizo, Stratron Habumugisha, Rosine Uwera, Charan Krishna

ORAL SESSION 5.1

Saturday 23 November 2024 at 09:00 – 10:00

B3020 Orion

Evaluation of the growth development of 10 field-grown potato cultivars under drought stress in South Africa

Bianca Smuts

SLU, Sweden

Education level: MSc

Keywords: Multispectral imaging, drought stress, vegetative indices, photosynthetic parameters, tuber evaluation, potato yield

Potatoes' domestication and subsequent cultivation have shaped ancient civilisations and continue as a cornerstone in today's modern economies. Through hybridisation, breeders and farmers have exploited the potato's genetic versatility to overcome the need to produce higher yields while resisting biotic and abiotic variables. With temperatures set to increase and the rapid onset of drought jeopardising potato production, methods for faster selection of superior cultivars and genotypes will be highly sought out to reduce the time it takes to release a new cultivar to the market. In this study, different potato cultivars were selected and grown in South Africa under varying field-drought conditions. Photosynthetic parameters were measured using non-destructive handheld proximal sensing devices, accompanied by aerial drone imaging, which also measured photosynthetic performances. The cultivars were observed in real-time, revealing the influences of drought stress. Destructive harvest analysis revealed that drought stress decreases yield by up to 33%, especially during tuber bulking, which decreases yield more than stress during tuber initiation. Tuber quality evaluations displayed that stress during tuber bulking also decreased the frequencies of some deformities for most cultivars; however, a select few had increased abnormalities. Results revealed that remote and proximal sensing could be used as complementary methods, with multispectral drone imaging having the clear advantage of surveying large fields and proximal sensing being very precise in which photosynthetic parameters were affected by drought. The destructive harvest analysis revealed that the potato cultivar Sound had a continually high yield in all treatments with low tuber deformities.

This paper aims to highlight the valuable addition of remote sensing for cultivar selection and evaluation in academia and private enterprise. Notably, it provides real- time time series and is remarkably quick and easy to use, empowering potato breeders, farmers, and researchers to make informed decisions and enhance their productivity.

Acknowledgements: Anthony Kalcic, STINT/NRF, Erik Alexandersson

Extreme weather threatens Brazil's soybean systems

Kilian Kaspar Wallner, Anna Kojer, Rogério de Souza Nóia Júnior

BOKU, Austria

Education level: BSc

Keywords: Climate change, extreme weather, soybean, food security

Brazil supplies half of the world's exported soybeans. However, national soybean production has been increasingly affected by extreme weather events. Between 2018 and 2023, the states of Paraná and Rio Grande do Sul, which together contributed 28% to the country's soybean production, were among the top 10 regions globally with the highest interannual soybean yield variability. This study aims to identify the main climatic drivers behind the yield variability in Brazil at the municipal level and to quantify their future frequency under climate change. By analysing the frequency, variability, and impact of these factors on soybean production from 1984 to 2023, we uncover the causes of yield variability and decline using Pearson's correlation analysis. Our findings highlight significant concerns regarding interannual variabilities in heat and drought, which can reach up to 200% in Rio Grande do Sul and Paraná. These indices show strong negative correlations between soybean yield and climatic events during the cultivation period (October-February), with correlation values ranging from

-0.5 to -1, negatively affecting yields. Over the past decade, the historical frequency of heat and drought events has nearly doubled and tripled in Rio Grande do Sul and Paraná, respectively. Future projections based on Representative Concentration Pathway (RCP) scenarios 2.6, 6.0, and 8.5 indicate a further increase in the frequency of these adverse climatic events, posing an additional threat to soybean in Brazil. This drastic increase observed in the last decade, and projected to rise further with climate change, will threaten Brazil's soybean systems and may hinder global progress towards food security.

Acknowledgements: Prof. Dr. Senthold Asseng

Properties of ohmic baked goods relevant for industrial application

Elena Marek

BOKU, Austria

Education level: MSc

Keywords: Ohmic baking, wheat products, product quality, storage stability

Ohmic baking is an innovative rapid baking technology that utilizes only a fraction of the energy consumption that is required by conventional baking methods, while achieving enhanced product quality in cakes and bread. Previous studies have predominantly focused on the quality assessment of gluten-free ohmic-baked products whereas the effects of the ohmic baking process on wheat-based products remain incompletely understood. Therefore, this study focused on the quality analysis of ohmic baked wheat bread and cakes in comparison to conventionally baked goods, aiming to identify relevant product properties for further industrial implementation. Physical properties (volume, color, texture) were measured and compared for conventionally and ohmically baked products. Additionally, a sensory evaluation using a 9-point hedonic scale was conducted with 70 participants to assess the consumer acceptance. Furthermore, the storage stability and staling behavior was investigated by measuring moisture migration and starch retrogradation. While ohmically baked goods typically attain greater volume, a lighter color, and increased springiness in texture, consumers generally preferred conventionally baked goods in the sensory evaluation. On average, ohmically baked goods were rated 1.4 points lower than conventionally baked goods in overall liking, with both types being rated positively on the liking scale. However, certain groups of participants showed a preference for ohmically baked cake and brownies over their conventionally baked counterparts. The staling behavior of ohmically and conventionally baked bread differs fundamentally. In ohmically baked goods, the crumb and crust exhibit more similar moisture content compared to conventionally baked goods, resulting in less moisture migration. Additionally, starch gelatinization during ohmic baking is reduced, potentially due to the shorter baking time, leading to decreased retrogradation during storage. The results indicate that ohmic baking presents a promising method that could effectively be implemented in the industry, offering energy savings without compromising the quality of baked goods.

Acknowledgements: Jäger, Henry, Univ.Prof. Dr.Ing., Kate Waldert, MSc.

ORAL SESSION 5.2

Saturday 23 November 2024 at 09:00 – 10:00

B3030 Orion

Impact of silver nanoparticles and ions on development and maturation of guppy (Poecilia reticulata)

Bogumił Łosiewicz, Tomasz Bartoszek

SGGW, Poland

Education level: BSc

Keywords: Ecotoxicology, guppy, histology, silver ions, silver nanoparticles

The aim of the study was to examine the impact of silver nanoparticles (AgNPs) and silver ions (Ag+) on morphology, growth and sex traits development of guppy (Poecilia reticulata) from the day of hatching for the next 60 days. Juvenile fish were exposed to AgNPs concentrations of: 0 (control group), 0.01, 0.05, 0.1, 1 ppm and 0.01ppm of Ag+. On the last day of the experiment fish were euthanized, measured and weighed, then subjected for histological processing (whole fish). The highest mortality rate was observed in 1ppm silver nanoparticles and 0.01ppm silver ions groups and oscillated around 40% compared to 10% in control. Fish in AgNPs 0.05, 0.1, 1 ppm groups showed the least number of individuals with developed secondary sexual characteristics with over 70% of undefined sex specimens in whole group. Also exposed individuals had less developed oocytes and testes in comparison to control group. Similar dependency showed fish weight and body length in which individuals of those 3 groups were the lightest with the lowest value of 0,029± 0,023g in AgNPs 0.05 group, however they were also the largest ones in context of body length with 11,68± 3,31 mm even exceeding in this parameter control group. Despite that fish from AgNPs 0.05 group were the smallest ones in total length with reaching 12,59± 2,00mm. All exposed groups showed more proliferating nuclei of hepatocytes than control group. Obtained results indicate that exposure to AgNPs may delay sexual maturation and disturbs morphology, growth of fish as well as induces detoxification reaction.

Acknowledgements: This work was supported by the National Science Centre, Poland, grant 2015/19/D/NZ8/03871. I would like to express my deepest appreciation and gratitude to the thesis supervisor professor Maciej Kamaszewski who supervised my work on the research project.

CARBON AND NITROGEN STABLE ISOTOPES: A NEW WAY TO PREDICT THE INDIVIDUAL FEED EFFICIENCY OF EUROPEAN SEABASS (DICENTRARCHUS LABRAX)?

Gatien DEBAILLEUL, VANDEPUTTE, François ALLAL, Sarah NAHON, Alain VERGNET

AGRO, France

Education level: MSc

Keywords: Aquaculture, feed efficiency, stable isotopes, European seabass, Dicentrarchus labrax

The main challenge to improve feed efficiency in fish breeding programs is our capacity to accurately measure individual feed intake on numerous fish. In previous studies, individual feed efficiency has been evaluated on fish reared in isolation.

However, this method is tedious and difficult to use outside laboratory conditions. Thus, we combined rearing in isolation with the measurement of the natural abundance of carbon and nitrogen stable isotopes (δ13C and δ15N) of our fish tissues calculated by mass spectrometry. The goal was to find a link between isotopic signatures and feed efficiency which would allow us to access individual feed efficiency even in collective rearing.

To test the correlation between individual feed efficiency and stable isotopes, 178 European seabass (Dicentrarchus labrax) were raised in individual aquariums during six weeks. The quantity of food ingested by each fish was recorded daily. Fortnightly, seabass were weighed and their feed conversion ratio was calculated. Following the six weeks in individual aquaria, fish were reared for 9 weeks in a collective tank. At the end of the experiment, scales, fin, muscle and blood were sampled on each fish.

We evidenced a very strong negative correlation between individual feed efficiency and body weight gain in isolation ($R = -0.95$, $p < 0.001$). δ15N values of muscle sampled at 15 weeks showed a negative correlation with individual feed efficiency ($R = -0.25$, $p < 0.05$) while no correlation was found neither with δ15N in fins, nor with δ13C in fin or muscle.

At this point, carbon and nitrogen stable isotopes in muscle and fins do not seem to be a reliable predictor of feed efficiency in seabass. This does not corroborate previous studies on rainbow trout. Further studies are necessary to better understand such differences between fish species. Blood and scales samples remain to be analysed.

Acknowledgements: Teacher in charge: Bastien SADOUL. Technician that helped us analysing the isotopic signatures: Christophe MENNITI.

Resilient use of natural resources

Short-term nutritional impact of ethyl ester oil supplementation in Atlantic salmon

Alina Noor, Esmail Lutfi

NMBU, Norway

Education level: MSc

Keywords: Aquaculture, ethyl ester, global food security, aquafeed, sustainability

The Norwegian pelagic industry is a leading producer of pelagic fish products including concentrated marine omega-3 fatty acids (FAs) supplements for human consumption. During manufacturing of these supplements, a valuable side stream product such as Ethyl Ester (EE) oil containing important lipid components, is produced. Approximately 10,000 tons of EE oils are produced annually in Norway and there is a great potential to employ these byproducts in aquaculture feed industry to contribute to sustainability and make responsible use of fish oil sources.

The present study aims to maximize the utilization of byproducts by incorporating increasing levels of EE oil (4, 12, 20, 30 & 35% of total lipid in the diet) into Atlantic salmon (parr-stage) feed. The research seeks to evaluate its potential effects, tolerance thresholds, and overall impact on fish performance. We will also focus on bioavailability and digestibility of these alternative lipid ingredients to determine their suitability for inclusion in feeds. The oxidative stability of EE oils was also tested.

Results from accelerated storage trial (100ml of oil in vials, placed in darkness with open lids at 40°C) demonstrated relative stability compared to other marine oils and indicated its suitability for inclusion in our research feeds. The experimental trial is currently conducted on small rapidly growing salmon parr (10g) feeding on commercial diet (control group) and five experimental EE-containing diets (in triplicates, 100 fish per tank). After 5-6 weeks, effects of EE oil on lipid uptake, FA digestibility, growth, and overall health of salmon parr will be analyzed.

To conclude, understanding effects of EE oils on overall health and fish performance will give valuable insights into their application in fish feed industry. The knowledge obtained will potentially increase the sustainable use of marine resources and promote reliance on locally produced feed ingredients with low CO_2 footprint.

Acknowledgements: John-Erik Haugen, Astrid Nilsson, Elin M. Wetterhus, Gerd M. Berge, Tone-Kari K. Østbye and Bente Ruyter

ORAL SESSION 5.3

Saturday 23 November 2024 at 09:00 – 10:00

B3034 Orion

Intraguild predation between predatory mites: Which species native to Austria profits from climate change induced higher temperatures?

Clara Königmair, Lili Gundacker

BOKU, Austria

Education level: BSc

Keywords: Predatory mite, intraguild predation, climate warming, temperature, heat stress, Austrian apple orchards

Intraguild predation (IGP) means that the members of a predator guild sharing similar food sources are not only food competitors, but they can also prey on each other. The composition of a predatory mite guild mainly depends on this specific type of predation. Predatory mites are nowadays often exposed to higher temperatures due to climate warming, which may affect the strength and direction of IGP. For example, a heat-sensitive species is more likely to be the prey under higher temperatures, as opposed to a heat-resistant species, which can manifest as the more dominant predator. Such interactions were studied in a laboratory with four predatory mite species native to Austrian apple orchards: Amblyseius andersoni, Euseius finlandicus, Kampimodromus aberrans and Typhlodromus pyri. The predator (adult female) - prey (protonymph) pairs were placed in small lockable cages and the survival of the nymphs was evaluated every hour for three hours in total at 25°C (optimal temperature) and 33°C (heat-stress). The adult female mites were locked up 14 hours beforehand to ensure that they had the same hunger level. All possible interspecific combinations were tested. Our preliminary analyses indicated that the adult Euseius finlandicus turned out to be especially heat-sensitive resulting in a high mortality rate during the period of starvation. Their high activity level could be a reason for their high mortality rate. Kampimodromus aberrans is the least aggressive predator and most vulnerable prey probably due to their comparatively low activity rate. Amblyseius andersoni is the most aggressive predator. A probable explanation is their larger body size both as adult and as protonymph. Surprisingly, temperature did not affect the IGP rates. A possible explanation could be that the temperature effects are only detectable at higher temperatures than 33°C. Alternatively, the number of replicates might be insufficient compromising statistical power.

Acknowledgements: Mag. Dr. Andreas Walzer: supervisor of our bachelor's thesis.

Characterization of granadaene-producing A. thoenii and A. jensenii strains from the dairy environment

Gregor Nowotny, Carola Bücher, Konrad J. Domig, Johanna Burtscher

BOKU, Austria

Education level: BSc

Keywords: Acidipropionibacteria, granadaene, haemolysis, PCR

Acidipropionibacterium jensenii and A. thoenii are dairy-associated propionic acid bacteria (dPAB), which are found in raw milk and products thereof. Wild-type dPAB strains can lead to a variety of defects in selected raw milk cheeses, including red and brown spots. These spots have often been identified as colonies of A. jensenii and A. thoenii. Within these two species, some strains produce a pigment called granadaene, which is encoded by the cyl-like gene cluster. This pigment is a hemolysin, also found in group B streptococci (GBS).

This work aimed to characterize pigmented A. jensenii and A. thoenii strains, including wild-type isolates deriving from the dairy environment and strains acquired from international culture collections. In total, 24 A. jensenii and 21 A. thoenii strains were tested for their hemolytic activity and their ability to form pigmented colonies under anaerobic and microaerophilic conditions using two different culture media. The atmospheric composition during cultivation influenced pigmentation. Under microaerophilic conditions pigmentation was more intense. Approximately 50% of the strains tested were pigmented, and all pigmented strains were hemolytic, as were two unpigmented strains. Nine primer pairs were tested for their ability to amplify the cyl- like gene cluster, out of which two successfully confirmed the presence of the cyl-like gene cluster in pigmented strains. In addition, Matrix-assisted laser desorption ionization-time of flight mass spectrometry and RAPD-PCR fingerprinting showed a high diversity among the acidipropionibacteria strains.

The paucity of data available on pigmented acidipropionibacteria, as well as the discovery of unpigmented but hemolytically active Acidipropionibacterium strains demonstrate the need for further research on granadaene-producing A. thoenii and A. jensenii strains. These results change the perception of pigmented colonies in the cheese body from an undesirable optical defect to a potentially harmful risk for the consumer.

Acknowledgements: This work was created within a research project of the Austrian Competence Centre for Feed and Food Quality, Safety and Innovation (FFoQSI). The COMET-K1 competence centre FFoQSI is funded by the Austrian federal ministries BMK, BMDW and the Austrian provinces Lower Austria, Upper Austria and Vienna within the scope of COMET - Competence Centers for Excellent Technologies. The programme COMET is handled by the Austrian Research Promotion Agency FFG.

Legal analysis of the new Spanish figure of the farm veterinarian and its involvement in the fight against antimicrobial resistance

David Velaz Bravo

UdL, Spain

Education level: BSc

Keywords: Farm veterinarian, antimicrobial resistance, animal production system, interdisciplinary collaboration, public health

This research project addresses the role of the new figure of the farm veterinarian in the context of antimicrobial resistance (AMR). The project aims to analyze from a legal perspective the new figure of the farm veterinarian that has been developed in Spain, based on the legislation on animal health and the fight against antimicrobial resistance of the European Union. With animal health and public health closely interconnected, farm veterinarians are vital in preventing and controlling AMR within animal production systems.

Through a comprehensive literature review of the European regulations and the Spanish newest legislation, the implications of AMR in veterinary practice are analyzed. The study identifies the primary sources and mechanisms of AMR in livestock, emphasizing the complexity and persistence of the issue. Economic, social, and environmental impacts of AMR are highlighted, underlining the urgency for effective management strategies.

Farm veterinarians' roles extend beyond individual animal care to herd health management and public health responsibilities. This study underscores the need for interdisciplinary collaboration among veterinarians, farmers, researchers, and policymakers. Integrated health management programs combining veterinary expertise with advanced data analytics and surveillance systems are discussed for monitoring and responding to AMR trends effectively.

Continuous education and training are also essential for empowering farm veterinarians to tackle AMR. The research advocates for ongoing professional development to keep veterinarians updated on the latest advancements in AMR research, diagnostic techniques, and therapeutic alternatives.

In conclusion, this research highlights the indispensable role of the figure of farm veterinarians in Spain in safeguarding both animal and public health against AMR. By adopting a holistic and proactive approach, supported by continuous education and interdisciplinary collaboration, farm veterinarians can significantly contribute to the global effort to combat AMR and ensure the sustainability of animal production systems.

Acknowledgements: Laura Salamero Teixidó

ORAL SESSION 6.1

Saturday 23 November 2024 at 11:20 – 12:20

B3030 Orion

Nature-Inspired Innovation: Applying Biomimicry to the Design of 15-Minute Cities

Katarzyna Sęk

SGGW, Poland

Education level: MSc

Keywords: Biomimicry, 15-minute city, Urbanism, Sustainability, Construction

The integration of biomimicry into the design of 15-minute cities heralds a revolutionary shift in urban planning, drawing inspiration from nature's ingenious solutions to create vibrant, sustainable, and resilient urban spaces. Biomimicry, the practice of emulating nature's time-honored patterns and systems, provides a blueprint for cities where essential services and amenities are within a 15-minute walk or bike ride. This innovative approach has been successfully implemented in diverse urban projects around the world, demonstrating its transformative potential for civil engineering. By harnessing nature's principles—such as adaptability, efficiency, and symbiosis—cities can achieve a harmonious balance with their environment, significantly reducing their environmental footprint improving the quality of life for residents. Incorporating biomimicry into urban design not only addresses current challenges such as climate change, resource scarcity, and urban sprawl, but also paves the way for future-proof cities that can adapt to evolving needs. This nature- inspired approach fosters innovation and creativity, resulting to smarter, greener, and more liveable cities. By setting a new standard for civil engineering excellence, biomimicry in the development of 15-minute cities offers a promising path to a more sustainable and equitable urban future. Through these microscale innovations with macro impact, the potential for improving urban life is immense, promising a brighter, more harmonious coexistence between humanity and the natural world. The concept of 15-minute cities is critical to promoting sustainable urban development and enhancing the well-being of communities by ensuring that essential services are easily accessible within a short walk or bike ride.

Acknowledgements: Dr hab. inż. Magdalena Daria Vaverková, profesor Uczelni

Exploring variables responsible for the inter-personal variability in postprandial glucose response: a machine learning approach

Chrisja Naomi van de Kieft

WUR, The Netherlands

Education level: MSc

Keywords: Postprandial glucose response, machine learning, person-specific meal responses, continuous glucose monitoring

Cardiometabolic diseases, like type 2 diabetes, obesity, and atherosclerosis, impose a burden on healthcare and they are expected to rise in prevalence. One of the risk factors of cardiometabolic diseases is an elevated postprandial glucose response (PPGR). Several studies have found that lowering the PPGR can reduce the risk of cardiovascular diseases. However, it was discovered there is a large inter-individual variability in PPGR to the same meal. The variables responsible for the inter-individual variability have not been sufficiently investigated yet. In this thesis, machine learning models were developed to investigate the important variables that are responsible for the inter-individual variability in the PPGR. For these models, data from the RepEAT study has been used, where 59 healthy middle-aged participants who were overweight followed a nine-week dietary intervention, consisting of three repetitive periods of three weeks. During these nine weeks, glucose was measured using continuous glucose monitoring sensors, which was used to develop regression models to predict the PPGR. The first model was used to investigate the meal content, the second model investigated the important phenotypical characteristics and the third model investigated the effects of physical activity on the PPGR. When adding the phenotypical characteristics, the model performed significantly better than using solely meal content factors. Comparing the models resulted in a significant p-value of 0.00037. Additionally, the physical activity caused a significant decrease in model performance compared to meal content only, resulting in a significant p-value of 3.444e-10. Carbohydrate content of a meal was found to be the most important variable in the prediction of the PPGR. IHL was found to be able to predict the PPGR independently of insulin resistance status, meaning that the IHL might be partly responsible for the inter-individual differences in PPGR seen in previous studies. How this mechanism works is not known.

Acknowledgements: Lydia Afman

Microglia's role in the pathogenesis of Parkinson's Disease

Hildegunn Haugan, Margith Elain Tobiassen Kohle

NMBU, Norway

Education level: MSc

Keywords: Parkinson's Disease, Microglia, Inflammation

Parkinson's disease is a neurodegenerative disease that affects 1% of the population above 60 years old. Parkinson's disease is a neurodegenerative disease where the main pathology is the loss of dopaminergic neurons in the substantia nigra and the aggregation of alpha synuclein.

Microglia are the brain's immune cells that remove toxins and contribute to several reparative mechanisms within the brain. Activation of microglia causes inflammatory responses that contribute to the health of the brain's environment. Observing the gene expression of microglia and dopaminergic neurons induced with inflammation can give insight into the neuronal environment within the brains of Parkinson's patients. This study aimed to answer questions regarding the role of microglial activation on gene expression of the genes Park7, Gdnf, Trem2 and Tlr4, and how the activation of microglia affects the differentiation of neurons and their expression of the genes PARK7, GDNF and TRL4.

Parkinson's-related genes were analyzed through qPCR analyses with RNA from microglia (murine BV2 cell line) and dopaminergic neurons (human LUHMES cell line). The cells used for the analyses were treated with inflammatory cytokines that induced either anti- or proinflammatory activation.

The analyses exhibited an upregulated gene expression in proinflammatory activated microglia for the genes PARK7, TLR4 and TREM2, whereas the expression of GDNF was not observed in microglia. This might indicate that these genes could be restorative towards the many proinflammatory mechanisms that play a part in the progression of PD. Dopaminergic neurons displayed gene expression of PARK7 and GDNF, although they did not seem to express TLR4. The differentiation of dopaminergic neurons was verified using neuron markers in qPCR analyses of samples extracted at specific timepoints.

Acknowledgements: Kaja Nordengen, Tone Berge, Chiara Cappelletti, Martine Narum.

ORAL SESSION 6.2

Saturday 23 November 2024 at 11:20 – 12:20

B3034 Orion

POST-FIRE REGENERATION RECOVERY IN VESUVIO USING SENTINEL 2 AND PLANET DATA

Abiola Bridget Adewuyi

Unitus, Italy

Education level: PhD

Keywords: Wildfire, post-fire regeneration, Sentinel-2, Planet imagery, NDVI, NBR

Post-fire forest regeneration is a critical process that determines the recovery and resilience of fire-prone ecosystems. This study investigates the post-fire regeneration patterns in Vesuvio, Italy, using Sentinel-2 and Planet satellite imagery. We assess the initial burn severity and monitor vegetation recovery across different forest types, including deciduous oak, Mediterranean pine, mixed, and chestnut forests, as well as scrub and herbaceous vegetation. The normalized difference vegetation index (NDVI) and normalized burn ratio (NBR) were employed to quantify the level of fire damage and track post-fire recovery. The results reveal that regeneration patterns vary significantly among forest types and are strongly influenced by fire severity.

Deciduous oak forests exhibited enhanced recovery, particularly in areas affected by high-severity fire. In contrast, Mediterranean pine forests showed slower recovery rates, with high severity burns negatively impacting regeneration. Mixed forests displayed heterogeneous recovery patterns, while chestnut forests were found to be susceptible to high-severity fires, experiencing delayed recovery. Scrub and herbaceous vegetation demonstrated rapid post-fire regeneration, especially in high- severity burn areas. These findings underscore the importance of considering forest type and fire severity when assessing post-fire recovery dynamics. Long-term monitoring using high-resolution satellite imagery provides valuable insights into forest resilience and can inform targeted restoration efforts in fire-prone ecosystems.

Acknowledgements: I am deeply grateful to those who have played a pivotal role in the completion of this project. Foremost, I wish to thank my supervisor, Prof. Anna Barbarti for her exceptional guidance and unwavering support. I also acknowledge university of Tuscia for her invaluable resources and facilities. I am profoundly thankful to my family and friends, whose steadfast support and patience have been my anchor throughout this journey.

Modelling water storage capacity in small constructed wetlands – today and in the future

Alina Kuehn

SLU, Sweden

Education level: MSc

Keywords: Hydrological modelling, constructed wetlands, water storage capacity, climate change, extreme precipitation

Wetlands contribute essentially to ecosystem services. Simultaneously, wetlands are decreasing at an alarming speed. Due to their potential to reduce runoff and prevent flooding, wetlands have lately gained more attention. This study aims to model and assess the water storage capacity and thus the flood buffering capacity of constructed wetlands in the Mälardalen, Sweden, under present and future climate scenarios. PERSiST, a semi-distributed rainfall-runoff model, was employed to reproduce water level observations for constructed wetlands with hourly driving data for a 30-year period. Based on a conceptual model depicting water level patterns and their underlying processes, observed water level data for 2023 was calibrated against hourly air temperature and precipitation ERA5-Land data. With a Nash-Sutcliffe efficiency higher 0.1 and a satisfactory visual inspection, credible parameter ranges were determined and used for a Monte Carlo analysis. Results were inspected with a Kolomogorov-Smirnov d statistic for sensitive parameters. A total of three Monte Carlo analyses were run for each constructed wetland and an ensemble of the ten best performing parameter sets was chosen to model future climate scenarios. Driving data for the baseline scenario was produced with ERA5-Land data for the period 1971- 2000. This data was adapted with Regional Climate model data from SMHI to generate RCP scenarios and extreme precipitation stretch scenarios. Results for a subset of three ponds for the climate scenarios showed no indication of drying out nor a major difference between baseline and RCP scenarios. Stretched RCP and extreme precipitation stretch scenarios presented major variations in water level behaviour. Factors influencing water storage capacity are the relative area of a constructed wetland, purpose and design and interactions with their surrounding environment. Current pond design of constructed wetlands in Mälardalen shows resilience against an increase of temperature and precipitation. Further research is needed regarding extreme precipitation.

Acknowledgements: Emma Langergård, Martyn Futter, Joachim Ingwersen

POSTER SESSION 1

Friday 22 November 2024 at 14:40 – 15:40

Ground Floor, Orion

Implementation of Sorghum in Pasta Products

Enemona Greg Ademu, Regine Schönlechner, Lisa-Maria Call, Gemaima Evangelista Cruz, Lucie Jurkaninová

CZU, Czech Republic

Education level: MSc

Keywords: Austrian sorghum, starch digestibility, protein digestibility, total phenolic content

Sorghum, a climate smart, drought-resistant, and gluten-free grain, has significant potential for enriching pasta with higher fiber content, essential nutrients, and antioxidants. In this study, eight (8) Austrian sorghum cultivars were used to prepare durum wheat-sorghum blend (60:40 ratio) pasta. The proximate and rheological properties of sorghum flours and durum-sorghum pasta were evaluated, as well as starch and protein digestibility. Water absorption value (WZ), as measured by Farinograph, ranged between 51.5% - 55.5% for durum wheat and sorghum flours. Extensograph results revealed that all sorghum flours, except one, produced dough with lower resistance and extensibility compared to traditional durum wheat. The durum-sorghum pasta produced from all eight (8) sorghum cultivars achieved good cooking and texture qualities. Average cooking time (CT) of the durum wheat-sorghum pasta blends was between 3.4 and 4.5 minutes. However, cooking loss (CL) values were observed to be above the ideal threshold (≤ 8%) in the pasta samples and correlation analysis showed statistically significant ($p \leq 0.05$) non-zero correlations (-0.68) between CT and CL. Slight colour variations were observed among the different pasta types. The incorporation of sorghum flour resulted in improved protein digestibility in four out of eight cultivars and starch digestibility in three out of eight cultivars when processed into pasta. Preliminary sensory tests indicated sorghum addition did not significantly affect the taste, texture, or overall acceptability of the pasta. This research, therefore, highlighted the potential of using sorghum as a functional ingredient to develop nutritionally improved and widely acceptable pasta products. However, future work is needed at further improving the ratio formulations and up-scaling production processes for commercial applications.

Differences in salinity tolerance among Chenopodium quinoa Willd. (quinoa) accessions

Caroline Blecker, Anna Tabea Mengen, Sandra M. Schmöckel

UHOH, Germany

Education level: BSc

Keywords: Hydroponics, quinoa, salt tolerance

Soil salinity causes yield losses and restrictions on arable land worldwide. Additionally, abiotic stresses are expected to become more common due to climate change, which has a significant impact on food security. Chenopodium quinoa Willd. (quinoa) is a nutritious crop, which originates from the Andean regions, encompassing various environmental conditions. Quinoa is characterized by broad genetic variation and high tolerance to drought and salinity. To assess their differences in salinity tolerance and the underlying physiological mechanisms, this study investigates 70 diverse quinoa accessions.

A hydroponic experiment with a randomized complete block design and six replications was carried out. The accessions were grown for 20 days until six-leaf stadium and were then treated with 200mM NaCl. Seven days after the treatment, the physiological responses associated with plant stresses and tolerance mechanisms were quantified. Before harvest, measurements for leaf greenness, efficiency of photosystem II and stomatal conductance were carried out. After harvest, fresh weight separated for root and shoot, root length, osmolality, Na+, K+ and chlorophyll content were determined. Throughout the growing period, growth stages were scored to identify potential differences in development. The ability of the plant to maintain biomass in response to salinity was used as an index for tolerance that allows comparison of different accessions. Differences in the mentioned parameters indicated a range in tolerance and, furthermore, the tolerance mechanisms among the used accessions.

The screening for salinity tolerance plays an important role on quinoa breeding, as it helps to develop accessions adapted to environmental conditions under climate change. In addition, for a more comprehensive genetic understanding of the tolerance mechanisms, further research is necessary.

Drinks with low- and non-nutritive sweeteners do not elicit a glycemic response while they vary in gastric emptying

Hester Boekhoud

WUR, The Netherlands

Education level: MSc

Keywords: Low-nutritive sweetener, Non-nutritive sweetener, Glycemic response, Gastric emptying, MRI

Substituting sugar-sweetened beverages with low-nutritive (LNS) or non-nutritive sweetened (NNS) beverages may reduce glycemic response by lowering food energy density, leading to less extreme blood sugar peaks. It is unclear whether LNS/NNS have similar effects.

The double-blind study used a randomized cross-over design with six treatments. Measurements included blood collection to determine glucose and insulin levels and MRI scans to assess gastric emptying rates.

Treatment A significantly increased blood glucose and insulin levels, identifying it as the sucrose drink. None of the other treatments increased glucose or insulin levels. Treatments A and E slowed gastric emptying compared to the other treatments.

Various sweeteners do not impact glycemic response but differ in their effects on gastric emptying rates.

Acknowledgements: Paul Smeets

Need for Speed – Can speed breeding revive safflower's popularity as an oilseed crop?

Wanda Haller

UHOH, Germany

Education level: MSc

Keywords: Speed breeding, seed dormancy, dormancy breaking, molecular markers, hybrid identification

Safflower (Carthamus tinctorius L.), a historically important oilseed crop, has been relegated to the background of Western agriculture and has acquired the status of a "minor crop". To revive interest in safflower and provide new varieties for farming, speed breeding is a promising approach. Unfortunately, seed dormancy, which is common in safflower, can be a significant challenge. Here, the effect of five dormancy-breaking treatments on the germination of safflower seeds harvested at two time points (3 and 4.5 weeks after flowering) of four cultivars was investigated. In addition, single nucleotide polymorphism (SNP) markers were identified to distinguish true F1 hybrids from their homozygous parents. Our analysis showed that dormancy was present in seeds harvested 3 weeks after flowering. The dormancy- breaking treatments significantly improved germination rates and uniformity. In particular, applying dry heat to safflower seeds for a short period of time proved itself to be the treatment with the greatest effect on seed germination. Germination increases of up to 30% could be denoted. In contrast, seeds that were harvested 4.5 weeks after flowering showed no signs of dormancy, so the treatments had no effect on the germination. We identified four SNP markers that effectively discriminated F1 hybrids from their parents, improving the efficiency of breeding programs. In conclusion, the results indicate that dormancy breaking treatments in combination with molecular markers to test for hybridity are a great addition to a safflower speed breeding program in terms of saving time and resources.

Acknowledgements: Prof. Dr. Tobias Würschum, Dr. Hans Peter Maurer, Dr. Kim A. Steige, Prof. Dr. Hans-Peter Piepho, Silvia Koch, Stefanie Sommer, Thomas Grafe, Julio Rojas Sanabria.

Potential of the microalgae Phaeodactylum Tricornutum as an alternative source of eicosapentaenoic-acid in the context of the DGE recommendations and the "planetary health diet" with a focus on consumer acceptance

Annalena Janentzky

UHOH, Germany

Education level: BSc

Keywords: Microalgae, omega-3-recources, sustainable nutrition, food security

The challenge of achieving food security in the future will require fundamental changes in the dietary patterns of the population. The "planetary health diet" provides guidance for this in terms of a reference diet that is characterized by a low amount of animal products. This work will discuss the role of microalgae in complementing the planetary health diet to cover possible nutritional deficits especially the potential of the microalgae PT (Phaeodactylum Tricornutum) as an alternative source of EPA while considering consumer acceptance. For this purpose, a literature review on the acceptance of microalgae in different food items was conducted and the EPA and DHA supply according to fish consumption recommendations by the DGE and the planetary health diet was calculated. Then, the daily required intake of PT as an alternative source of EPA was determined. The acceptability of this amount in a serving of filled pasta was tested in the context of a taste study and the microalgae was integrated into three different fillings. The literature review shows that the use of processes that mask the typical taste and colour of microalgae as well as the integration in familiar products like pasta and bakery products show potential to improve acceptance. The required amount of the microalgae PT (2.5 g), which provides the same daily amount of EPA as fish consumption according to the DGE, was very well accepted in one serving of filled pasta, especially in combination with a pesto filling. This may be attributed to the successful masking of the characteristic taste of PT in this filling. The microalgae PT has a great potential to contribute to the supply of EPA in addition to fish consumption.

Acknowledgements: My Supervisor Dr. Lena Kopp supported me a lot during the process of writing my thesis.

Lysozyme as a key selection factor of breast milk for infant gut microbiota

Petr Kopecký, Štěpánka Dvořáková, Nikol Modráčková, Eva Vlková, Šárka Musilová

CZU, Czech Republic

Education level: MSc

Keywords: Lysozyme, antimicrobial factor, gut microbiota, probiotics

Lysozyme is one of the most important peptides of breast milk, providing protection to infants during their first days of life and helping shape the gut microbiota.

The aim of our study was to test the ability of bacterial strains to growth in presence of lysozyme. Our hypothesis was that there would be different levels of resistance among the strains to this enzyme. To investigate this, we used the growth curve method, monitoring bacterial growth under various concentrations of lysozyme. All tested bacteria were infant origin isolated from infant faeces. Bacterial cultures were inoculated into growth media supplemented with varying concentrations of lysozyme. Growth curves were then generated by measuring optical density at regular intervals over a defined incubation period. In parallel, control experiments were performed using lysozyme-free growth media to establish baseline growth patterns and determine the specific effects of lysozyme on bacterial growth.

Bacterial strains were divided into collection strains and wild strains. The results showed that most of the collection strains were sensitivity to the enzyme, while almost all wild strains were resistant to lysozyme. Specifically, most selected clostridial strains exhibited sensitivity to lysozyme, whereas all lactobacilli strains were resistant. Additionally, both egg white-derived lysozyme and human-derived lysozyme were tested, contributing to a better understanding of this enzyme's interaction with different bacterial strains.

Resistance to lysozyme appears to be a promising selection factor for designing new probiotic strains for newborn infants. This work enhances our knowledge of bacterial resistance to lysozyme and may have practical applications in the field of probiotics for infant nutrition. Understanding the interactions between bacteria and antibacterial substances is crucial for developing effective probiotics.

Acknowledgements: This work was supported by grant LUAUS23014 of the Ministry of Education, Youth and Sports of the Czech Republic.

The usage of innovative methods for yeast cell wall disintegration

Zuzanna Korzeniowska, Zuzanna Macherzyńska, Aleksandra Michońska, Anna Pakulska, Katarzyna Pobiega

SGGW, Poland

Education level: BSc

Keywords: SCP, amino acids, disintegration, Saccharomyces

The high demand of dietary protein due to the ever-growing population, in addition to the spread of awareness about the negative impact of animal protein obtaining practices, result in more people resigning from consuming meat. These meat- substituting diets, currently lack the proper nutrition, and if not planned properly, may result in exogenous amino acid, as well as vitamin B12 and iron deficiencies. To solve this issue, for the past few years more attempts have been made to develop unconventional microbiological methods of nutrition, such as animal husbandry and crop farming, as well as microorganism protein.

Single cell proteins are known as biomass or protein extracts of dietary single-cell microorganisms (pure or mixed microalgae, yeasts, mushrooms or bacterial cultures). These microorganisms can be used as protein-rich foods, food ingredients or dietary supplements for human and animal consumption.

The aim of this study was to increase the yield of cellular protein production by using thermal (e.g. microwave method) and non-thermal (e.g. ultrasound method, pressure method, mechanical method) pretreatment methods for Saccharomyces cerevisiae biomass, as well as combined techniques.

High yields of microbial protein were demonstrated using mechanical and ultrasonic methods (extraction at 25% protein from biomass). Increasing the duration of yeast cell wall disintegration increases the extractability of the cell protein. The use of combined methods, i.e. mechanical disintegration using zirconium-glass beads, in combination with the ultrasonic method can increase the extraction of protein from yeast cells.

Acknowledgements: This study was supported by the Ministry of Science and Higher Education (Poland) from the state within the programme "Student Research Clubs Create Innovations" in the years 2023-2024 (grant number SKN/SP/570267/2023).

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I would like to thank my supervisor dr. inż. Katarzyna Pobiega for her contribution during the reaserch for this project.

Gastrointestinal stress survival of Cronobacter sakazakii food and clinical isolates under simulated adult and infant digestion conditions

Martin Ladurner, Eva Wagner, Konrad J. Domig

BOKU, Austria

Education level: PhD

Keywords: Cronobacter sakazakii, powdered infant formula, food safety, gastrointestinal stress resistance

Cronobacter sakazakii is an opportunistic foodborne pathogen primarily associated with contaminated powdered infant formula (PIF). Although rare, infections in neonates manifest as necrotizing enterocolitis, sepsis, or meningitis and are often fatal. Infections also occur in (vulnerable) adults but are likely to be overlooked due to a lack of reporting requirements.

Due to its high tolerance to desiccation, acidity, and heat, C. sakazakii is commonly found in food and poses a serious public health threat to certain consumer groups. However, there are no microbiological criteria regulating the presence of Cronobacter spp. in foods other than dried infant formulae and dried dietary foods for special medical purposes intended for infants under six months of age.

To investigate their potential to reach the target of infection, the intestine, several C. sakazakii food and clinical isolates were characterized regarding their gastrointestinal stress survival. Therefore, the gastric and intestinal passages were simulated in a static in vitro digestion model. After each phase, the bacteria were quantified using culture-dependent (plating) and independent methods (PMAxxTM real-time quantitative PCR, impedance flow cytometry). All isolates showed high survival rates during adult and infant gastrointestinal stress. In addition, they were able to multiply during infant stress, suggesting that even small numbers of bacteria in PIF may be sufficient to cause an infection. The lower gastric pH in the adult model induced the entry into a non-culturable state but did not reduce the number of living C. sakazakii. Throughout the experiments, no significant differences were observed in the survival of food and clinical isolates.

These findings support the hypothesis that foodborne C. sakazakii represents an underestimated health threat and suggest the introduction of microbiological criteria regarding C. sakazakii in selected product categories.

Acknowledgements: I want to thank Eva Wagner and Konrad J. Domig for the great supervision and EQ- BOKU VIBT GmbH for enabling the MALDI TOF-MS (Bruker Biotyper System) measurement.

Nitrous oxide emissions after ploughing from a long-term organic grass-clover ley system - Implications of anaerobic digestion of cattle slurry on climate change and plant production

Kari Løe

SLU, Sweden

Education level: MSc

Keywords: Nitrous oxide emissions, Anaerobic digestion, Organic fertilizers, Organic farming, Greenhouse gasses

Anaerobic digestion (AD) of animal manure is a process that yields both biogas and a fertilizer rich in plant available nitrogen (N). However, the long-term implications of AD of animal manure on farmland is not extensively studied. During the AD process, the percentage of plant available N in the form of ammonium (NH4+) is increased, and the C/N-ratio is decreased, making digestate a plant fertilizer with good potential to increase plant growth and productivity. Yet, when N fertilizers are applied to agricultural soils, there is a risk for N losses through leaching, ammonia (NH3) volatilizations and nitrous oxide (N2O) emissions. In cultivated grasslands, nutrients accumulate in organic matter during the ley period and rapidly decompose after ploughing. Ploughing the ley increases nutrient mineralization, enhances soil fertility but may also cause increased N2O emissions. N2O is a potent greenhouse gas, as it has 310 times the insulating effect as carbon dioxide (CO2). About 75% of global N2O-emissions come from farmland, which makes it crucial to understand the processes through which N2O is created in a warming world with an increasing need for food production. Therefore, this study aims to quantify the extent of N2O-losses from a grass-clover ley system after ploughing and examine to what extent using AD of cattle slurry affects N2O-emissions. The work is carried out in a long-term experiment established in 2011 in Norway. N2O-emissions are measured using static chambers in three treatments; undigested cattle slurry, AD cattle slurry, and a negative control without fertilizer. We hypothesize that treatments with untreated slurry will have higher N2O-emissions than those with AD slurry, due to the higher organic carbon content in untreated slurry, which supports denitrification. The work will be carried out during the summer of 2024, and the results are expected to be finalized in November 2024.

Acknowledgements: Tatiana Rittl (supervisor), Sofia Delin (supervisor), NORSØK (Norwegian centre for organic agriculture)

Investigating the mechanism of adaption to water deficit tolerance in different Chenopodium quinoa accessions

Freyja Röntgen, Lukas John, Sandra M. Schmöckel

UHOH, Germany

Education level: BSc

Keywords: Quinoa, transpiration, water deficit adaptations, drought stress, facultative CAM

Due to climate change and the growing human population, food security is gaining increasing relevance. Chenopodium quinoa Willd. (quinoa), a highly water-deficit- tolerant crop distinguished by its full amino acid profile, holds potential to contribute to food security under changing environmental conditions. In our study, we investigated the water deficit tolerance mechanisms in seven quinoa accessions using a greenhouse experiment. Four of these accessions, previously identified as tolerant based on the maintenance of above-ground biomass production, did not exhibit significantly enhanced osmotic adjustment or ion homeostasis compared to the three less tolerant accessions. This observation led us to explore other adaptation mechanisms, including the facultative crassulacean acid metabolism (CAM) photosynthesis which may confer water deficit tolerance in quinoa. To deepen our understanding of the water deficit adaptation mechanisms during this experiment, the plants were positioned on a balance system developed to monitor transpiration over time. As a result, we observed significantly higher weight loss during the nighttime in the tolerant accessions. Furthermore, measurements of gas exchange and stomatal conductance did not differ after seven days of stress, possibly indicating a higher stomatal density per area in stressed plants compared to control plants. To enhance our understanding of gas exchange at night and its relation to photosynthesis in tolerant quinoa accessions, we initiated a dedicated follow-up experiment focusing solely on investigating nocturnal transpiration of a particularly promising tolerant accession identified in our previous experiment. To investigate the type of photosynthesis in more detail, a malate assay is still pending, along with the analysis of water use efficiency to fully identify adaptation mechanisms to water deficit in highly tolerant quinoa accessions.

Creating food in a changing world

A Comparative Study on Advancements in Tofu Production Methods: Chemical, Microbial, and Enzymatic Approaches

Queenchilu Tayang

BOKU, Austria

Education level: MSc

Keywords: GDL (glucono-delta-lactone), Lactiplantibacillus plantarum, Bromelain, coagulation methods, Rheological properties, Microbiological fermentation, Gelation kinetics, physiochemical properties

Tofu, a staple food in many Asian diets, is traditionally made by coagulating soy milk. The choice of coagulant can significantly affect its texture, flavour and nutritional properties. The aim of this study was to compare the physicochemical properties, formation kinetics, yield and quality parameters of tofu produced by three different methods: chemical coagulation using GDL (glucono-delta-lactone), microbiological fermentation using Lactiplantibacillus plantarum and enzymatic coagulation using bromelain. Soy tofu was produced using each of the three methods varying temperature, concentration and processing conditions. The effects of coagulant and processing on rheological properties, chemical composition, microstructure, gelation kinetics and water-holding capacity were determined.

The results showed that each process had a significant effect on the properties of the tofu. Chemical coagulation with GDL produced the firmest and most uniform texture, microbiological fermentation with Lactiplantibacillus plantarum produced a softer texture, and enzymatic coagulation with bromelain produced the softest tofu. Expectedly, the degree of protein degradation varied between the methods, with GDL showing no protein degradation. The kinetics also varied between the methods, with the chemical process being the fastest and the enzymatic process being the slowest. SAOS measurements were largely in line with texture analyser results, while LAOS measurements showed distinct differences in the sample breakdown. While all methods were viable for tofu production, the choice of method can be tailored to meet specific consumer preferences and nutritional needs.

Acknowledgements: Dr. Philipp Lawrence Fuhrmann

Development of a mid-infrared spectroscopic method for mycotoxin screening in maize

Yllka Visoka, Rudolf Krska, Stephan Freitag

BOKU, Austria

Education level: MSc

Keywords: Mycotoxins, Maize, Mid-IR Spectroscopy, Method optimization, PCA, PLS

Mycotoxins are toxic secondary metabolites of fungi, naturally occurring and nearly unavoidable. The prevalence of detected mycotoxins in food ranges from 60% to 80%, with maize being often monitored due to its importance as a food and feed crop. Various analytical techniques are used to detect and quantify mycotoxins. Due to the prevalence of mycotoxins, there is a growing demand for rapid, non-destructive, and cost-effective methods to assess contamination in food and feed. This study aims to develop an attenuated total reflection (ATR) mid-infrared (MIR) spectroscopic method for mycotoxin screening in maize. MIR indirectly detects mycotoxin contamination by measuring alterations in samples caused by fungal growth. This study uses aqueous extracts of maize samples, and thus, a simple sample handling procedure was developed. Initially, 5 gr of ground kernels were mixed with 20 mL of ultrapure water and extracted for varying durations, followed by centrifugation. The obtained extract was then analyzed using ATR MIR spectroscopy. Method optimization was guided using multivariate statistics such as principal component analysis (PCA).

We found that the optimal method was based on 30 minutes of extraction, followed by analysis using 100 microliters of extract. Afterwards, the maize samples, both high and low mycotoxin contaminated, were extracted, and the obtained MIR spectra were analyzed using multivariate statistics such as partial least squares (PLS). These findings underscore the potential of MIR as a rapid, simple, and non-destructive method for mycotoxin screening.

POSTER SESSION 2

Friday 22 November 2024 at 16:05 – 17:05

Ground Floor, Orion

Investigating the Neuroprotective Effects of Graphene Oxide and Nanodiamonds on C6 Glioma Cells: Contributions of Ascorbic Acid Composites

Sylwia Jankowska, Michał Motrenko, Martyna Klimek, Barbara Strojny-Cieślak, Michał Pruchniewski

SGGW, Poland

Education level: MSc

Keywords: Graphene oxide, Nanodiamond, Ascorbic acid, Glioma

Ascorbic acid (vitamin C) is essential for maintaining cellular health and combating oxidative stress. In this study, we explored the combination of ascorbic acid with carbon nanomaterials, including graphene oxide and diamond nanoparticles, and their effects on C6 cell line.

Graphene oxide, a derivative of graphene, is known for its increased biocompatibility, while nanodiamonds possess biologically inert surfaces and a high surface area, making them ideal candidates for drug delivery and biomedical imaging applications.

Similarly, nanodiamonds are known for their high biocompatibility, low cytotoxicity, and functionalized surfaces, which make them suitable for targeted drug delivery. Their neuroprotective properties, characterized by anti-inflammatory and antioxidant effects, have been proposed in recent years, indicating a promising area of research.

We conducted experiments on C6 cell lines to assess the biocompatibility of graphene oxide and diamond nanoparticles, both independently and in combination with ascorbic acid. Cell viability and morphology were evaluated using MTT assay and May- Grunwald Giemsa staining, with additional imaging performed using light microscopy. Additionally, the antioxidant activity was measured using the DPPH assay. Our results indicated that the combination of ascorbic acid with graphene oxide and diamond nanoparticles enhanced the biocompatibility and positive effects on cell viability and morphology. This combination particularly benefited cell survival and structural integrity.

These results underscore the potential therapeutic applications of carbon nanomaterials combined with bioactive compounds in neuroprotection and regeneration, highlighting the importance of further mechanistic investigations to elucidate their precise mechanisms of action and optimize their efficacy in treating neurodegenerative diseases.

Acknowledgements: Barbara Strojny-Cieślak, Michał Pruchniewski

Comparative analysis of apolipoprotein APOA1 in the domestic dog (Canis lupus familiaris) and humans: Are domestic dogs a good animal model for research on human amyloidosis?

Jagoda Zagrodzka, Karolina Węglińska, Weronika Jabłońska, Martyna Gryglas

SGGW, Poland

Education level: MSc

Keywords: Domestic dog, amyloidosis, human, apolipoprotein

Amyloidosis involves abnormal protein deposits, called amyloidosis, accumulation in tissues and disrupting organ function.

The aim of the study was to conduct a meta-analysis of the strength of associations of the APOA1 lipoprotein with other proteins in the domestic dog, to determine the level of co-expression at the mRNA level of the APOA1 gene and to assess whether the domestic dog is an appropriate animal model for studies on human amyloidosis.

Using the STRING 12.0 program, a meta-analysis of the protein interaction network was performed to identify potential connections of the APOA1 protein in the context of the pathogenesis of amyloidosis.

The predictive power of the association of apolipoprotein AI with ABCA1 is 0.997. It is a PL membrane translocase, and its enzymatic activity leads to the transfer of PL molecules from the cytoplasmic leaf to the extrafacial leaf of the plasma membrane (PM). The presence of active ABCA1 in the PM promotes the binding of apoAI to the cell surface. Coexpression of the domestic dog APOA1 gene with human APOC3 is 0.813. The mutated APOC3 gene is also responsible for amyloid deposition in the whole kidney. However, co-expression of the dog and human APOA2 gene is 0.784, which leads to the formation of amyloid deposits in the glomeruli and in the walls of arteries. The meta-analysis allowed us to determine to what extent the molecular mechanisms associated with APOA1 in the domestic dog and humans are similar, confirmed that the domestic dog is a suitable model for analyzing the course of amyloidosis in humans. These results may provide valuable information on the pathogenesis of amyloidosis and support the development of new therapies for this disease in humans.

Acknowledgements: PhD DSc Joanna Gruszczyńska, PhD Beata Grzegrzółka.

Project No. SKN/SP/601848/2024 financed by Ministry of Science and Higher Education.

Meta-analysis of APOA1 and APOA2 linkage in laboratory models - implications for amyloidosis research

Weronika Jabłońska, Martyna Gryglas, Jagoda Zagrodzka, Karolina Węglińska

SGGW, Poland

Education level: MSc

Keywords: Amyloidosis, protein co-expression, functional interactions, laboratory animal comparison, APOA

The liver and intestines are major sites for the synthesis of apolipoproteins (APOs), crucial for lipoprotein formation. Human APOs, which include 22 genes, including APOA1 and APOA2, can alter during synthesis, impacting the function of encoded proteins and causing diseases. Amyloids include abnormal protein folding, which generates fibrillar amyloid that disrupts tissue structure and function. Some animal species serve as models for human amyloid disease. Amyloidosis is rare in rats but more common in rabbits, manifesting as amyloid deposits in the kidneys (glomeruli and interstitial areas).

The study aimed to analyze the association between APOA1 and APOA2 in three model species: laboratory rats (Rattus norvegicus), house mice (Mus musculus), and European rabbits (Lepus cuniculus). The STRING 12.0 program was used to study co- expression at the mRNA level of the mentioned genes and the functional relationships of the proteins.

In Mus musculus, the functional linkage level between APOA1 and APOA2 was 0.999, and the co-expression level was at a very high level of 0.790. In Rattus norvegicus functional linkage level was 0.983, with a genes co-expression level of 0.324. Lower values, both a functional linkage level of 0.996 and a co-expression level of 0.052, were recorded in Lepus cuniculus.

The high functional linkage and co-expression levels of APOA1 and APOA2 in mice and rats suggest these proteins act synergistically. In Mus musculus, both genes show similar expression patterns. In Lepus cuniculus, differences in gene co-expression may imply less genetic stability regarding amyloidosis. In conclusion, house mouse and laboratory rat show a high level of functional linkage of APOA1 and APOA2 proteins and co-expression of these genes, while European rabbit shows a lower level of these parameters. The results indicate that it is necessary to focus on the mouse as a model organism.

Acknowledgements: PhD DSc Joanna Gruszczyńska, PhD Beata Grzegrzółka.

Discovering life's code

Looking for the needle in the haystack – genotypic and phenotypic testing of CRISPR/Cas wheat mutant lines for gene identification

Hannah Gartner

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Education level: MSc

Keywords: Fusarium head blight, resistance breeding, CRISPR/Cas

Fusarium head blight (FHB) is a serious fungal disease affecting wheat and other cereals, leading to severe yield and quality losses, and posing harmful effects on human and animal health due to the production of mycotoxins. Although various Fusarium species are linked to FHB, Fusarium graminearum is frequently observed to predominate.

To combat the disease with long-lasting and economically viable solutions, FHB resistance breeding is a highly pursued yet challenging approach. The most resistant lines are linked to poor agronomic traits, and FHB resistance is a quantitative trait controlled by multiple quantitative trait loci (QTLs). We aim here to find the causal gene behind a major resistance QTL.

In previous work, a resistant wheat line was treated with ethyl methane sulfonate (EMS) to generate thousands of mutant lines. The location of mutations in lines that lost their FHB resistance helped narrow down the causal region. To investigate the involvement of two candidate genes in FHB resistance, targeted deletions and sequence changes were introduced using CRISPR/Cas.

In the course of this work, the genotypes and phenotypes of the mutant lines were analyzed. DNA was extracted and amplified with PCR, followed by restriction digestions and gel electrophoresis to determine the presence of the expected mutations, and ascertain the homozygous or heterozygous status of the plants. Concurrently, greenhouse trials involved inoculating spikelets with Fusarium graminearum conidia to observe symptom development. The results showed that no mutation caused susceptibility to FHB suggesting that the two investigated candidate genes do not influence FHB resistance.

Acknowledgements: I am extremely grateful to Prof. Hermann Bürstmayr for granting me the opportunity to write my thesis under his supervision, and to Dr. Barbara Steiner for her invaluable guidance in the greenhouse and throughout the thesis writing process. I am also grateful to Simone Zimmerl and Sophie Hampejs for their essential support and assistance in the lab work. Your contributions have been crucial to the success of this research.

Toxic cyanobacteria in aquatic food webs

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EMU, Estonia

Education level: MSc

Keywords: Cyanotoxin, cyanobacteria, qPCR, fish, *Microcystis*

The study focused on qPCR methodology to measure the number of mcyE gene copies, which encode microcystin production in Microcystis. The research was conducted in Lämmijärvi, a part of Lake Peipsi, which is the fourth largest lake in Europe (3555 km2). investigated the food chain components evaluating the presence of mcyE gene copies in lake water, zooplankton, and fish stomach contents. The goal was to understand the presence and consumption of toxic Microcystis in the food web of a eutrophic lake having a reoccurring cyanobacterial bloom dominated by Microcystis. A specific objective was to test and optimize the qPCR methodology for analyzing water samples and the stomach contents of various consumers for toxic cyanobacteria. This is the first study of its kind in Estonia.

The results showed that in 2021, mcyE gene copies were present in Lämmijärvi water during the whole growing period from May to October. mcyE gene copies indicating the consumption of toxin-producing Microcystis were also detected in nearly all samples of zooplankton and most abundant fish gut content. This indicates that toxic Microcystis cells are transmitted through the food chain to fish in Lämmijärvi. Given the high risks of toxic cyanobacteria blooms in Lake Peipsi, further studies on fish cyanotoxin contamination should continue, expanding also the species and sample sizes and lake areas.

Acknowledgements: Veljo Kisand, Tiina Nõges

Application of CRISPR/Cas9 system for direct mutagenesis in Arabidopsis thaliana MnmG gene- genotyping and phenotype characterization of acquired mutants

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SGGW, Poland

Education level: BSc

Keywords: Chloroplast, translation, tRNA, CRISPR/Cas

The CRISPR/Cas system, originating from bacteria, is currently one of the most popular tools for precise mutagenesis in eukaryotic cells. In this project we utilized CRISPR/Cas9 system to obtain Arabidopsis thalina mnmG mutants that lack a functional MnmG (AT2G13440) protein. The target gene encodes a putative orthologue of bacterial protein involved in chloroplast tRNA modification at wobble position. It participates in modification of uridine to cmnm5s2U34.

The mutagenesis of MnmG gene in A. thaliana resulted in trans-heterozygous plants in the first generation, harbouring one allele with 152 bp deletion and the other with 3990 bp fragment inversion. Interestingly, only inversion mutant plants were present in the second generation, suggesting that deletion allele was not heritable due to genetic mosaicism of the first generation of plants or lethality of deletion mutants.

Next, we analysed the splicing of mnmG transcripts from wild-type plants and the mutants with large inversion. The experiment showed that transcription of mnmG gene occurs in both tested genotypes. However, we could not obtain the whole mnmG transcription products from the mutants and analysis of its fragments indicated altered splicing consistent with the modified gene structure.

Finally, we performed the phenotype analysis of obtained CRISPR-Cas9 and T-DNA mnmG mutants in control and stress conditions. The experiments revealed no significant changes in photosynthesis efficiency in plants growing in optimal conditions. However, we observed increased susceptibility of mutant plants to a chloroplast translation inhibitor. Thus, our results suggest that A. thaliana MnmG is an important factor for chloroplast translation.

Physical stability of Pickering emulsions stabilized by fumed silica particles: a microfluidic study

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WUR, The Netherlands

Education level: BSc

Keywords: Pickering emulsion, microfluidics, silica nanoparticles, emulsion stability, low internal phase emulsion

The trend of replacing surfactants with solid particles has risen over the years, considering the use of solid particles as Pickering emulsion stabilizer have exhibited better stability, lower toxicity, and is more eco-friendly in comparison to conventional emulsions. Silica nanoparticles (SNP), as a Pickering stabilizer, is cost-effective and has shown good flexibility because it is easily modified through physical or chemical treatment. Hence, in this study, SNP was used to investigate the effect of different solid particle characteristics in producing low internal phase Pickering emulsion (LIPE) via microfluidic technology. It was found that partial hydrophobic SNP (in comparison to hydrophilic SNP), increase in SNP concentration, and the use of microchip that was equipped with meandering channel, all resulted in a decrease in coalescence frequency, thus making the Pickering emulsion more stable. Its combination led to the most stable Pickering emulsion produced in this experiment. However, one interesting finding was that a lower total flow rate resulted in a higher droplet stability, only when microchip with straight coalescence cell was implemented. This phenomenon might be caused by a lower adsorption time for the solid particles to be absorbed to the interface, which resulted in a less stable emulsion droplet. This implied that emulsion droplets formed through microchip with straight coalescence cell were more prone to coalesce in a higher total flow rate, whereas there were more elastic collisions instead of coalescence events between the droplets formed after flowed through a meandering channel, due to more stabilized emulsion droplets. Overall, these findings substantiate the effect of degree of SNP hydrophobicity, concentration, flow rate, and type of microchip for improving the stability of Pickering emulsions and its potential application in food emulsions stability and drug delivery enhancement for pharmaceuticals industry.

Chemical processing and utilization of wood waste focusing on biochar

Jaroslav Stradal

CZU, Czech Republic

Education level: BSc

Keywords: Biochar, sorption, waste lignin, composite materials, biofuels, nanocellulose

This bachelor thesis deals with the utilization of waste material based on lignin and cellulose and its further processing using machinery and chemicals. It concerns the processing of wood waste resulting from the processing of living healthy, diseased or completely dead trees after their felling by a mining machine, waste mainly from the wood-processing industry, from agriculture, etc. This lignocellulosic material can be an input raw material e.g. for the production of agglomerated materials, wood-plastic (WPC) composites, sulphate pulp, bioethanol or many chemical substances. Pyrolysis of residual wood biomass produces not only pyrolysis gas or bio-oil, but also biochar, the so-called biochar, which has a lot of use especially in the field of soil properties improvement. Practical part is devoted to determination of sorption properties of biochar supplied by ENERGO Zlatá Olešnice .r.o. Experiment of the process of watering and drying of samples at various relative humidities (33, 55, 75, 85 and 97 %) and temperature 20 °C was realized in the climatic chamber. From the relative changes in humidity of samples during sorption and desorption was constructed sorption and desorption isotherm and from them was finally constructed hysteresis loop expressing the dependence of desorption isotherm on the course of sorption. It was confirmed that biochar during desorption slows the evaporation of water, which is important e.g. in terms of stabilization of the soil environment and preservation of biological functions of the soil. It was determined that the analyzed biochar sample during desorption in the range of relative humidities of 97–33 % holds the amount of water in the range of 6,2–13,3 mm. % compared to the original state. The highest amount of water, i.e. just 13,3 mm. % is retained by the biochar sample at a relative humidity of 85 %.

Acknowledgements: Ing. Tereza Jurczyková, Ph.D., Ing. Kateřina Hájková, Ph.D.

Drops of Diversity: eDNA metabarcoding potential for tree canopy biodiversity assessment

Mads Harald Voldengen, Torbjørn Haugaasen, Quentin Mauvisseau

NMBU, Norway

Education level: MSc

Keywords: eDNA, environmental DNA, metabarcoding, rainwash, tropics, the Amazon basin, PCR, Brazil, fieldwork, bioinformatics, QGIS, biodiversity monitoring, vertebrates

Environmental DNA (eDNA) metabarcoding is a novel approach for assessing biodiversity in challenging environments like tropical rainforests. This study is looking at the potential of using rainwash samples to assess vertebrate biodiversity in the Amazon. Traditional methods of biodiversity assessment in these areas are often labor-intensive, costly, and invasive. However, eDNA offers a less intrusive and potentially more cost-effective alternative by analyzing genetic material washed down by rainfall.

The fieldwork was conducted over five weeks along the Juruá River deploying tarps to collect rainwash samples from three separate rainfall events. The samples were later processed and analyzed using eDNA metabarcoding techniques using primers targeting COI and 12S rRNA genes. Preliminary results suggest that rainwash eDNA can successfully detect a variety of vertebrate species using different primers, providing valuable insights into the canopy biodiversity of tropical rainforests.

The findings indicate that eDNA metabarcoding can be used complimentary to traditional methods in tropical lowland forest environments for cost-effective biodiversity monitoring. This approach has the potential to significantly increase our understanding of biodiversity in lesser studied areas of the tropics.

Acknowledgements: This study was made possible by the cooperation of Norwegian University of Life Sciences, Instituto Juruá, Pará State University and University of Oslo.

The word limit is too low, but I would like to express my gratitude to my supervisors Torbjørn Haugaasen and Quentin Mauvisseau and my co-students Max Taylor, Steffen Johnsen and Joakim Vågen for making this research project possible.

Data-Driven Pest Defense: Using Transcriptomic Data to Identify Plant Genes Conferring Resistance to Two-Spotted Spider Mite

Adela Jezierska-Suwińska, Tomasz Ołdachowski

SGGW, Poland

Education level: MSc

Keywords: Two-spotted spider mite, plant resistance breeding, transcriptomics

Plant resistance breeding presents a promising alternative to current overuse of pesticides in agriculture. The two-spotted spider mite Tetranychus urticae Koch (TSSM), attacks a wide range of crop plants, threatening worldwide harvests. In the search for sustainable solutions against this parasite, understanding the mechanisms of its interaction with plants remains imperative.

Current advances in science produce vast quantities of bioinformatics data, which contain information invaluable for researchers worldwide. However, there is great inefficiency in that the data from these large transcriptomic experiments is used only once, within the original research project. Our approach consists of "recycling" the transcriptomic data of the "1001 genome project", which collected information from more than 1000 Arabidopsis thaliana ecotypes.

Transcriptomic data obtained from "1001 genomes project" was coupled with phenotype analyses on TSSM susceptibility provided by AI powered programme, which allowed for precise susceptibility evaluation of 135 ecotypes of A. thaliana to TSSM. The phenotyping data, was previously obtained for a different experiments of our group. Ecotypes Car-1, Iso-4, and Per were among the least susceptible, while Stp-0, Pal, and Rds were the most susceptible.

We identified 15 DEGs (Differentially Expressed Genes) candidates for susceptibility and 18 DEGs for resistance of A. thaliana to TSSM showing their up- and down- regulation in all resistant vs. susceptible comparisons. Of these, the genes of interest were as follows. AT4G37150 - a putative resistance gene characterized by higher expression in three resistant ecotypes. The gene encodes MES9 protein, which is involved in the salicylic acid signalling pathway in plants. AT1G72930 - putative susceptibility gene with higher expression in three susceptible ecotypes. The gene encodes AtTN10 protein, which might impair the plant immune response to pathogens. Our approach presents a possible way of recycling transcriptomic data from different experiments in search of gene candidates for future resistance breeding.

Acknowledgements: prof. dr. hab. Marcin Filipecki, dr. Marek Koter

Phytomycoremediation of Soil Polluted with Radionuclides

Karlygash Zhussupova

CZU, Czech Republic

Education level: BSc

Keywords: Radionuclides, soil remediation, acidogenic capabilities of fungi, chelation effect, fungal remediation

Soil contamination with radionuclides is one of the most pressing environmental issues faced globally today. A range of remediation techniques have been developed to tackle this problem, yet there is a continual need for innovative and effective approaches. This study explores a novel method for the remediation of radionuclide- contaminated soil by leveraging the acidogenic properties of certain fungi.

The proposed methodology involves cultivating specific fungal species that have an enhanced ability to produce organic acids under optimized conditions. These fungi are then introduced into the contaminated soil, where they proliferate and secrete organic acids. The acids chelate the radionuclides, making them more mobile and potentially more accessible for subsequent remediation steps.

Following the initial mobilization of the radioactive elements by the fungal activity, the next phase involves their immobilization, stabilization, or removal through various techniques such as extraction or leaching. One particularly promising approach in this phase is phytoextraction, where suitable plant species are used to absorb and remove the mobilized radionuclides from the soil. By combining fungal acid production with phytoextraction, this two-step process significantly enhances the efficiency and scope of soil remediation efforts.

The main objective of this thesis is to test the effectiveness of phytomycoremediation of radionuclides in a controlled experimental setting. The central hypothesis posits that the organic acids released by the fungi will increase the mobility and bioavailability of radionuclides, thereby facilitating their uptake by plants. Through this research, we aim to demonstrate that the integration of fungal and plant-based remediation strategies can offer a robust and efficient solution for the detoxification of radionuclide-contaminated soils. This approach not only improves the remediation process but also contributes to the development of sustainable and eco-friendly environmental management practices.

Acknowledgements: prof. Ing. Jiřina Száková, CSc.

POSTER SESSION 3

Friday 22 November 2024 at 17:15 – 18:15

Ground Floor, Orion

Biodiversity and Ecological Resilience of Quercus robur (L.) in the Castelporziano Presidential Estate (Roma, Italy): Past, Present and Future

Nour Zaher, Prof. Dario Papale, Prof. Paolo De Angelis, Prof. Elena Kuzminsky

Unitus, Italy

Education level: PhD

Keywords: Sustainability, Technology, Biotechnology, Biodiversity, Ecological Resilience, Remote Sensing techniques, Quercus robur (L.), Castelporziano Presidential Estate, Forest Ecosystems, Vegetative Propagation, Micropropagation, Historical Analysis, Drought

Biodiversity and ecological resilience are crucial for the sustainability of forest ecosystems, especially under climate change and environmental stressors. This study leverages advanced biotechnology, propagation techniques, remote sensing technology, and historical data analysis to enhance the understanding and monitoring of biodiversity in the Castelporziano Presidential Estate. Focusing on the Quercus robur species, known for its vulnerability to drought, the research aims to provide insights for future conservation strategies.

The objectives include enhancing the understanding of biodiversity and resilience using historical data and remote sensing techniques, and developing vegetative propagation techniques to support the selection of stress-tolerant specimens. The study area, Castelporziano, is a significant ecological and historical site located 25 km from Rome, Italy. This state nature reserve, covering approximately 6000 hectares, is rich in biodiversity and cultural heritage, with Mediterranean forests dominated by Q. robur.

Methods employed encompass vegetative propagation techniques for epicormic shoot emergence, micropropagation through forced flushing of branch segments, and historical analysis using satellite data. Remote sensing activities include data preprocessing, image classification, and mapping changes in oak forest health. The study assesses the usefulness of remote sensing imagery for monitoring applications, coupled with ground observations and morpho-physiological analysis of old trees.

Propagation experiments are re-evaluated based on monitoring results to analyze the role of population diversity in response to environmental constraints.

This research integrates technological advancements with conservation methods, contributing to the preservation of Q. robur and setting a precedent for future biodiversity preservation efforts. The findings provide a robust framework for the long-term sustainability of oak woodlands in Castelporziano, promoting ecological sustainability in Mediterranean climate regions. The study's holistic approach will shape future biodiversity conservation strategies and enhance the resilience of forest ecosystems.

Exploring the Neuroprotective Potential of Graphene Derivatives and Nanodiamonds in Primary Neural Cell Cultures: Insights from Ascorbic Acid Composites

Katarzyna Wojtaka, Maria Kuczyńskab, Julia Piskorzb, Barbara Strojny-Cieślakc, Michał Pruchniewski

SGGW, Poland

Education level: MSc

Keywords: Graphene, Graphene oxide, Nanodiamonds, Ascorbic acid, Chicken embryo

In recent years, nanoparticles have garnered significant attention in the context of biomedical applications. Nanodiamonds (ND), initially studied for their electrical properties, have found new applications in cell biology as carriers of biomolecules (including both drugs and genes) and as fluorescent markers. Alongside graphene derivatives, which represent promising materials that may support cell proliferation and tissue regenerative processes, nanodiamonds are distinguished by their high biocompatibility, making them potential candidates for advanced applications in biology and medicine. However, realizing their full potential requires a comprehensive investigation of their effects on cells and an evaluation of the potential risks associated with their use.

Carbon nanostructures, due to their small size, possess the potential to penetrate the blood-brain barrier (BBB), making them particularly interesting in the context of neurological therapies and neuroprotection. In our research, we evaluated the biocompatibility and neuroprotective properties of nanodiamonds and carbon derivatives, both independently and in combination with the antioxidant ascorbic acid. Experiments were conducted on primary cultures of neural cells isolated from 10-day-old chicken embryos, which provided more physiological experimental conditions and allowed for a more accurate representation of the cells' actual responses in their natural environment. This approach significantly enhances the reliability of the obtained results, especially concerning potential clinical applications. Consequently, the results from these studies may better predict the effectiveness of therapeutic interventions in vivo, which is crucial for developing new treatment strategies.

Cell viability and morphology were assessed using the MTT assay, May-Grunwald Giemsa staining, and light microscopy. The results indicate that graphene oxide and ND, particularly in combination with ascorbic acid, positively influence the survival of neural cells and favorably affect their structure and function. The application of these nanomaterials in conjunction with ascorbic acid could represent a potentially novel therapeutic strategy for the treatment and regeneration of damaged neural cells, opening avenues for future research into their application in treating neurodegenerative diseases and nervous system injuries.

How does bioinformatics prevent suffer of cystinuria in domestic dog (Canis lupus familiaris) with genes meta-analysis?

Martyna Gryglas, Gabriela Łyszkowska, Jagoda Zagrodzka, Weronika Jabłońska, Karolina Węglińska

SGGW, Poland

Education level: MSc

Keywords: Cystinuria, SLC3A1, SLC7A9, domestic dog

Cystinuria is a genetic disorder caused by a defect in the renal transporter responsible for the reabsorption of amino acids. In domestic dog, this manifests as painful urination and urinary tract infections. In extreme cases, it can lead to complete urethral blockage due to the formation of cystine stones in the kidneys. There are two types of cystinuria – type II-A (SLC3A1), and II-B, (SLC7A9). The aim of the analyses was to study the functional connections between the proteins, as well as to determine the level of co-expression of the genes responsible for cystinuria in domestic dog. The analysis was conducted using STRING v.12 and protein databases.

The predictive strength of the associations between the proteins SLC3A1 and SLC7A9 is high (0.999). Co-expression was also observed, and homology between them was noted in other organisms (STRING v.12). Both proteins showed functional associations with SLC6A19 and SLC1A7.

The total functional association score between SLC6A19 and SLC3A1 genes is 0.562, and between SLC6A19 and SLC7A9 it is 0.778. This indicates strong connections between these genes, suggesting potential dysfunction of the genes responsible for cystinuria in the event of mutations in any of these genes. The co-expression level of the mRNA of the SLC3A1 and SLC7A9 genes is 0.064, meaning these two genes are rarely simultaneously active in their cells. In other species, the co-expression of these genes is higher (0.117), suggesting that in domestic dog, these genes have less coordinated expression compared to other species. This suggests that cystinuria in domestic dog requires separate studies and should not rely on research in other model organisms. Analyzing mutations occurring in all these genes may expand diagnostic capabilities of cystinuria and speed up diagnosis.

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Acknowledgements: dr hab. Joanna Gruszczyńska, prof. SGGW, dr. Beata Grzegrzółka

Comparative analysis of amyloidosis in the domestic horse (Equus caballus) and the domestic dog (Canis familiaris)

Karolina Węglińska, Weronika Jabłońska, Jagoda Zagrodzka, Martyna Gryglas

SGGW, Poland

Education level: BSc

Keywords: Amyloidosis, domestic dog, domestic horse, immunoglobulins

Amyloidosis, occurring in humans and animals, is a disease causing protein misfolding and their deposition in an insoluble form in tissues. In domestic horse, systemic amyloidosis was analyzed, which has a reactive (AA) form and results from a mutation in nucleotide sequence encoding immunoglobulins (AL). In the horse, the most common amyloid fibrils immunoglobulin originated light chains. In the domestic dog, amyloidosis occurs in various forms in many breeds. Among them, amyloids were discovered precursors of which may be amyloid A (SAA), apolipoprotein, amyloidogenic pancreatic polypeptide (IAPP) and the light chain of immunoglobulin lambda.

The aim of the study was to conduct a meta-analysis, compare the importance of immunoglobulins in the development of amyloidosis and to determine other common amyloid precursors. The String 12.0 program was used for the associations of the INSR protein, located in the middle of metabolic pathway between immunoglobulin AL and proteins responsible for amyloid deposition analysis. In the dog predictive strength of associations of the INSR protein with amyloid proteins ranged from 0.94 to 0.99, in the horse it remained at a level of 0.97 to 0.99. A high level of association strength indicates a strong association between the INSR protein and amyloid proteins. The relationship between the two species concerns the strength of the links between the PTPN1 and PTPN11 genes (responsible for regulating cellular processes) which is 0.425, this indicates some overlap in co-expression between species. The analysis conducted proved the significance of immunoglobulin LA in the formation of amyloidosis in both species. The results of the study will contribute to a better understanding of the disease, will clarify whether analyses including two different species are significant for the development of amyloidosis.

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Pulsed electric fields as a pre-treatment for ohmic cooking of beetroot to improve heating uniformity and product quality

Sarah Elisabeth Prenner, Kate Waldert

BOKU, Austria

Education level: MSc

Keywords: Ohmic heating, pulsed electric fields, cell disintegration, electrotechnology, beetroot

Ohmic heating (OH) is an innovative electrotechnology which offers advantages in terms of faster and more energy efficient cooking compared to conventional heating. Performed on vegetables, however, uneven heating is often observed due to different tissue structures which lead to inhomogeneities in the electrical conductivity. With the application of pulsed electric fields (PEF), a more uniform electrical conductivity of plant tissue can be achieved, due to electroporation of cell membranes. A combination of both technologies could therefore improve the ohmic cooking performance and product quality of vegetables.

Whole unpeeled beetroots have been PEF treated at an electric field strength of 1 and 2 kV/cm, 50 pulses and a frequency of 2 Hz. These treatments resulted in a specific energy input of 1 and 4 kJ/kg, respectively. Afterwards, OH was performed at 12 kHz with a specific power input of 3 kW/kg for the initial heating phase and a subsequent holding time of up to 21 min at 90 °C applying 0.4 ± 0.1 kW/kg. Untreated beetroots were used as reference.

Temperature kinetics during cooking were observed to evaluate the heating uniformity. Analyses of heat distribution, texture, vitamin C content, moisture content and colour were carried out for the different pre-treated and cooked beetroots for product quality assessment.

The experiment showed that PEF as pre-treatment improved the OH process as a cell disintegration of 50 and 80 % (for 1 and 2 kV/cm respectively) resulted in a more homogeneous heating behaviour. The cooking time was reduced by 50 %. The uniform heat distribution led to a more homogeneous texture of the cooked beetroots.

Overall, the combination of both electrotechnologies proved to enhance the ohmic cooking performance of beetroots in terms of faster and more homogenous cooking. Additionally, an improved product quality was achieved.

Acknowledgements: Giancaterino Marianna, Dr.nat.techn; Henry Jäger, Univ.Prof. Dr.Ing.

Sustainable Feedstock Management and Gender-Inclusive Biogas Adoption in Sub-Saharan Africa: A Zambian Case Study

Yaliwe Nkhoma

CZU, Czech Republic

Education level: MSc

Keywords: Feedstock management, Biogas technology adoption, Sustainable energy solutions, Gender dynamics, Gender inclusivity

This study aims to investigate the relationship between sustainable feedstock management such as agricultural waste and gender-inclusive adoption of biogas technology in Sub-Saharan Africa, with a focus on Zambia. It addresses the urgent need for sustainable energy solutions in the region and recognizes the crucial role of biogas in mitigating environmental degradation and improving energy access. However, successful biogas projects require effective feedstock management and consideration of gender dynamics. The study outlines five objectives, including assessing feedstock availability, analysing socio-economic factors influencing adoption, evaluating impacts, and identifying opportunities for gender inclusivity. The target groups include communities, project implementers, local leaders, and household members. The methodology employs a mixed-methods approach, combining surveys, interviews, and focus groups. The scope is limited to Chilanga and Kafue districts, focusing on feedstock management, adoption dynamics, gender inclusivity, and impacts. The study's findings aim to inform policy and practice for sustainable development.

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Monitoring the intra-population variability of Norway spruce based on physiological, optical and phenological traits

Monika Pilátová

CZU, Czech Republic

Education level: MSc

Keywords: Norway spruce, reflectance, maternal effect, seed orchard

Climate change is currently impacting forestry significantly, and this trend is expected to intensify. One way to mitigate its adverse effects is by breeding climate-resilient genotypes and fostering locally adapted populations. Native populations of Norway spruce still hold substantial genetic potential, best assessed through a combined evaluation of adaptation traits (such as fertility and phenology) and production traits. This study utilizes physiological and spectral characteristics to indirectly evaluate the productivity of grafted spruce in the clonal seed orchards. Contact measurements of spectral parameters from assimilation organs and needle pigment extraction were conducted. Progenies from seed orchards were cultivated at the Sofronka arboretum. An image segmentation algorithm was applied to analyze RGB values from digital photos of the seedlings. The methods combined in this study offer an efficient and precise approach to evaluating spectral parameters as potential indicators of population productivity. Findings demonstrate significant genetic variability in spectral reflectance, pigment content, RGB values, and germination phenology. The assessment of ramets replicated across two seed orchards provided insights into genotype-environment interactions for observed traits and allowed for an evaluation of stress levels at individual sites.

Acknowledgements: Jan Stejskal

Modelling potato growth and yield in Response to climate change in Morocco: Adaptation and Evaluation of the Agricultural Production Systems sIMulator Model (APSIM)

Amandine OUEDRAOGO, Nassima DARRHAL, Khalid DHASSI, Saad DRISSI, Assia LOZZI

AGRO, France

Education level: MSc

Keywords: APSIM, Potato, Modelling, calibration, Sowing dates

Given the crucial role of potatoes in global food systems, where they serve as a staple crop for millions of people, the impact of climate change on potato production is of paramount concern. As climate change continues to alter environmental conditions affecting crop growth, there is an increasing need for revised management practices at the field scale. This study aims to model potato growth under Moroccan conditions using the Agricultural Production Systems sIMulator, the potato model (APSIM-Potato), developed and Calibrated in Australia. The APSIM model's ability to simulate potato phenological growth, development, and yield predictions in response to Moroccan climate variability was evaluated. Through rigorous calibration using local datasets, the model accurately simulates key growth stages and biomass accumulation. Initial calibration, incorporating detailed climate, soil, phenology, and management data, enables the model to realistically reproduce crop growth and yield parameters. The model identifies optimal planting times in February and March, highlighting its potential to predict potato productivity and optimize crop management amidst climate change. The results indicate that the APSIM-Potato model can effectively predict potato productivity and assist in optimizing crop management for better adaptation to climate change in Morocco. This research underscores the importance of using advanced simulation tools for agricultural planning and provides a valuable framework for improving crop resilience in the face of environmental variability.

Acknowledgements: Anne JAFFREZIC: Professor of soil science, Institut Agro Rennes-Angers, UMR SAS INRA, Rennes, France., Assia LOZZI: Department of Production, Protection & Plant Biotechnology, Hassan II Institute of Agronomy and Veterinary Medicine, Morocco

The effect of biochar on the quality of soil organic matter in the forest ecosystem

Ivan Šebesta, Hana Johanis, Ondřej Drábek, Jakub Horák, Václav Tejnecký

CZU, Czech Republic

Education level: MSc

Keywords: Biochar, spruce, oak, organic carbon

Forests are currently under the influence of climate change and associated disturbances. Forest soils become more susceptible and soil quality decreases. Biochar has been shown to help mitigate these changes. Biochar is a form of charcoal, remaining after the pyrolysis of biomass. Biochar can improve water retention, soil chemical properties (e.g. pH, cation exchange capacity) and carbon sequestration and thus plays a crucial role in limiting climate change by reducing carbon dioxide in the atmosphere. The aim of this contribution is to describe/assess the influence of biochar application on the quantity and quality of soil organic matter in forest soils under spruce and oak.

Soil samples were collected in experimental plots after 4 years of biochar application (1 kg m-2. Six plots under spruce (Picea abies) and six plots under oak (Fagus sylvatica) with biochar application and similar controls were sampled. We collected the organic horizon, and two mineral layers in the depths of 0-5 cm and 5- 20 cm.

The methods used were: Fourier transform infrared (FTIR) spectroscopy and modified spectroscopic method for the determination of water-extractable forms of organic carbon (WEOC - DOC). Low molecular mass organic acids (LMMOA) were determined. LMMOA represent an important component of the active organic carbon in soil.

Rapid changes in quantity and quality of soil organic matter were determined mainly in the organic layer. High response to biochar application were observed in soils under oak.

In conclusion - it was proved that biochar has a positive effect on the soil environment. The use of biochar is thus a promising tool for improving the quality of forest soils.

Acknowledgements: Václav Tejnecký

Leveraging environmental data to predict crop performance in untested environments

Junita Solin, Martin Boer, Bart-Jan van Rossum, Vahe Avagyan, Fred van Eeuwijk, Willem Kruijer

WUR, The Netherlands

Education level: MSc

Keywords: Genotype-environment interactions, environmental data, prediction, penalized regression, mixed models

Designing resilient crops requires a sufficient understanding of how plants respond to various environmental drivers, such as weather and soil factors, and agronomic practices. The complexity of this dynamic has long posed a challenge in plant breeding to develop varieties adapted for specific growing conditions. Automatic weather stations and satellites have provided a new stream of data that enables a more accurate characterization of the environment. Environmental information has significant potential to improve our understanding of G×E and to accurately predict crop performance in new environments, however, how to effectively integrate this information remains an open question. In this study, we present penalised factorial regression as an accurate and efficient method for predicting crop performance across diverse environments. We estimated the sensitivity of each genotype to different environmental covariates (e.g. night temperature, soil water pressure) and applied a penalty function to handle the large number of weather and soil covariates in environmental data. Using two large multi-environment trials datasets: first, maize trials across Europe and second, simulated wheat data on a few locations in the Australian wheat belt, we could show that penalised factorial regression is an attractive approach. The predictive abilities were at least as high as the existing method and, moreover, the computation was considerably faster. Integrating environmental information will improve the estimation of phenotypic changes due to environmental variation, and accelerate the development of resilience varieties.

Acknowledgements: JS received a scholarship from Wageningen University Fellowship Programme and the Anne van den Ban Fund for pursuing her Master study. FvE contributed to this study as part of EU-INVITE project, part of the Horizon 2020 Framework Programme of the European Union under grant agreement No 817970. FvE and MB worked on this study as part of the GRDC INVITA UOQ2003-11RTX Collaborative Research Agreement.

Effect of the Artificial Mycorrhizal Inoculation on the Prosperity of Selected Tree Species on Afforested Former Agricultural Land

Trojan Václav

CZU, Czech Republic

Education level: MSc

Keywords: Afforestation of non-forest lands, suburban forests, support of seedling, growth, fungi, Symbivit, Ectovit

This thesis focuses on the promotion and development of plantations of forest tree species; on land previously used for agricultural purposes; through artificial mycorrhizal inoculation by means of commercial products. The project was initiated in the autumn of 2020 in the area V Ladech, Prague – Horní Počernice. A diverse mixture of primarily deciduous tree species was used, with a predominance of the Quercus robur (L.) The thesis goal was to investigate the effectiveness of commercially available mycorrhizal products, Symbivit and Ectovit, to support the health and growth of selected tree species, particularly in to enhancing tree growth prosperity and to overcoming the stress associated with planting, which is typical for agricultural lands. Four years after planting, the overall mortality rate was approximately 17 %.

The lowest mortality was observed in Tilia cordata (Mill.), Fraxinus excelsior (L.), Ulmus minor (Mill.), and Cerasus avium (L. Moench), while the highest mortality was analysed in trees such as Pseudotsuga menziesii (Mirb. Franco), Pinus sylvestris (L.), and Fagus sylvatica (L.) The best results in average height and root collar diameter growth were recorded in the Larix decidua (Mill.) and Cerasus avium (L. Moench.) The positive effect of applying mycorrhizal preparations Ectovit and Symbivit was not documented. This applies not only in terms of dendrometry characteristics but also from the perspective of a fungal fruiting body analysis. The control variant appeared to be statistically higher quality in most dendrometry characteristics compared to either two mycorrhizal variants. Mycorrhizal colonization was found in all sampled root systems of the Quercus robur (L.) across all three variants (Ectovit, Symbivit, Control), indicating a strong colonization capability of mycorrhizae in this location even without using supplemental preparations in young trees. The diversity of fungal communities and the occurrence of mycorrhizal fungi were affected primarily by the transfer of mycorrhizal fungi from external sources, most likely from a forest nursery.

Acknowledgements: Vilém Podrázský, Martinu Baláš, Vítězslavě Pešková, Josef Gallo

POSTER SESSION 4

Saturday 23 November 2024 at 09:00 – 10:00

Ground Floor, Orion

Long-term soil phosphorus (P) mining in agriculture – Impacts on P fractions, P leaching risk, and soil organic carbon stocks

Angelica Ramirez Moguel

UGent, Belgium

Education level: MSc

Keywords: P mining, soil P stocks, soil organic carbon levels, phosphatase activity

Many European regions, including Belgium, have seen an increase in phosphorus levels in their soils, mainly as a result of intensive livestock breeding and excessive manure applications. This excess P is at risk of leaching and threatening ground and surface waters. In order to cut back diffuse P losses over the long term, soil P stocks must be significantly decreased. However, there is not much field evidence that confirms that there is a rapid reduction in the P pool available to plants by reducing the P fertilizer input to zero while cropping. Due to the need for long-term field P mining experiments, three experimental sites were established in 2015 in Flanders (Belgium), on sites with a sandy loam soil texture in the provinces of West-Flanders (Inagro), East-Flanders (PCG) and Antwerp (PSKW) to conduct field trials with null P fertilization and alternatively with P fertilization according to the local P fertilizer limits. A previous four-year analysis has been done on these plots; in this master thesis, we will look at the effects of full P mining on the current soil P status, P dynamics, and the consequences of P depletion for the long-term soil organic matter evolution. We will try to answer the following questions: (i) how did P mining (i.e. also no addition of organic material) influence SOC content, (ii) how did P mining influence the potential P leaching risk, and (iii) how did P mining influence the ratio Porg/Pinorg and the phosphatase activity.

Acknowledgements: Stefaan De Neve, Tomas Van De Sande, Lore Lauwers, Ellen Goovaerts.

Gender equality and Gender Mainstreaming in agriculture and rural areas in Austria: perceptions of Rural Youth Austria

Julia Eberharter, Charlotte Voigt, Barbara Stadlmayr, Stefanie Lemke

BOKU, Austria

Education level: MSc

Keywords: Gender equality, Gender Mainstreaming, agriculture, Rural Youth Austria, rural sociology

Gender Mainstreaming (GM) is a means of achieving gender equality in society through incorporating a gender perspective at all levels, including legislation, policies, and programmes. While there is ample research on the implementation of GM in agriculture and rural areas in Austria, there is a gap on how different societal groups perceive GM. A better understanding of diverse perceptions can provide insights into successes but also barriers regarding GM and pathways to transforming gender relations. Youth as future actors and decision-makers in rural areas are essential for transformation. We explore the role of gender equality and GM among Rural Youth Austria (RYA), the largest Austrian youth organisation. Specific research questions are: how does RYA address gender equality and GM?; how do members of RYA perceive gender equality and GM?; what challenges and prospects for the future regarding gender equality and GM do members of RYA identify? We conducted 16 group discussions (n=69) with members of RYA in 2023 and two semi-structured interviews with national representatives of RYA. The socio-ecological framework guided interview design and data analysis, investigating four levels: personal, organisational (RYA), political, societal. Results indicate that members of RYA in general barely feel personally affected by gender inequality. However, statements reveal a gendered division of work, equal pay, or farm succession. There are ambiguous opinions on political enforcement of gender equality through GM. Members of RYA perceive socialisation as essential for gender equality in society, while societal expectations regarding different genders and a political focus on specific measures in the implementation of gender equality and GM, for example applying gender-sensitive language, are perceived as hindering. While RYA addresses gender equality in their principles and projects, members prioritise different foci. For the future, communication and awareness-raising regarding gender equality and GM in RYA and society will be essential.

Welcome in our Backyard: Influence of pro-environmental attitude and community identity on individual willingness to participate in Renewable Energy Communities

Adèle Galiègue

WUR, The Netherlands

Education level: BSc

Keywords: Renewable Energy Community, Energy Transition, Behavioural Economy, Environmental Attitude, Community Identity

In line with the EU's goal to be carbon neutral by 2050, France has taken massive steps to decrease its reliance on oil and gas, including a recent law on the creation of Renewable Energy Communities (REC). In these communities, a neighbourhood collaboratively generates and consumes energy from renewable sources, fostering community resilience and environmental sustainability. Despite these benefits and the growing attention toward RECs, the individuals' participation is RECs is very low in France. My thesis attempts to understand why this is the case by examining whether pro-environmental attitude and community identity affect willingness to join RECs through a survey conducted in the Pévèle-Carembault area in Northern France, where there is very little take up of RECs. My results show a positive influence of environmental concern, attitude toward renewable energy, collaborative engagement and home ownership on the willingness to participate in RECs. These imply that to increase the take up of RECs, policymakers and professionals should emphasize the environmental benefits and collective engagement of RECs. This can be done by public campaigns raising environmental awareness and addressing ecological anxieties combined with the development of public funds for the development of collaborative projects.

Acknowledgements: Anna Lou Abatayo (supervisor)

Nutritional enhancement of Sorghum through germination as a sustainable solution for bakery products in Europe

Edonisë Krasniqi, Mehdi Hassan, Lisa Call, Eleonora Charlotte Pichler, Regine Schönlechner

BOKU, Austria

Education level: MSc

Keywords: Grains, climate change, Pre-processing, polypehnols

This study is conducted within the subtheme of Designing Sustainable Transitions. As the objective is to investigate and capitalize on the potential of incorporating sorghum into bakery products, thereby addressing the critical challenge of sustainably feeding the increasing global population.

Our findings aim to highlight sorghum's potential as a complementary grain in bakery products, contributing to sustainable food systems and offering a viable alternative to conventional cereals in Central Europe.

Grains are fundamental to human nutrition, supplying essential energy, protein, and micronutrients. Sorghum (Sorghum bicolor), traditionally utilized in baked goods and porridges in African and Indian diets, remains underutilized in Central Europe where it is primarily processed for (bio)ethanol or used as animal feed. Recent interest in sorghum as a sustainable grain alternative has increased due to its high yield, resilience to heat and drought, and potential benefits in addressing food security amid climate change. Sorghum's high content of secondary metabolites, such as polyphenols, offers additional health benefits by protecting tissues from oxidative stress.

This study investigated the effects of different pre-processing techniques, such as soaking and germination, on the total phenolic content (TPC) of sorghum, phytic acid and Total Dietary Fiber (TDF). The research focused on sorghum cultivars harvested and cultivated in Upper Austria in 2023, analyzing eight different cultivars differing in color, affecting the visual appeal, flavor, and nutritional content. While white varieties tend to be slightly higher in protein and fiber, colored varieties (red, orange) are richer in antioxidants and phytonutrients.

Sorghum varieties exhibited high phenolic content, with notable variations observed between raw samples and those subjected to germination. Similarly, phytic acid fractions, including free and total forms, demonstrated distinct distributions before and after germination.

Acknowledgements: The research project CLIC (project name: CORNET II 35-2023) is financially supported by FFG (Austrian Research Promotion Agency) within the CORNET funding network. The authors want to thank FEI and ecoplus for project coordination.

Impact of Culturing Conditions on Lipid Synthesis by Yeast in Lactose-Based Medium

Magdalena Michalska

SGGW, Poland

Education level: MSc

Keywords: Single cell oils, microbial oil, oleaginous yeasts, biodiesel, dietary fat, lactose

Single cell oils (SCO) are an environmentally friendly, vegan source of fat derived from yeast, molds or algae. They can be used in the fortification of food products such as meat analogues, cocoa butter substitutes and milk formula, or the production of biodiesel fuels. A routine screening and early development technique for biotechnological processes is shake flask culture. Different rotational speeds and working volumes in flasks may cause different values of hydrodynamic force, thus affecting cell growth. This is especially important in the case of dimorphic fungi and, consequently, affects the efficiency of biosynthesis of individual metabolites. In our research, we focused on two yeast strains: Cryptococcus curvatus DSM10132 and Trichosporon domesticum PCM2960. The first strain is widely used for the production of SCO and is well-described in the literature, meanwhile the second strain was isolated previously from kefir, identified, and deposited in the WFCC Member Collection. The cultivations were performed in baffled shake flasks on a lactose-based medium at two different shaking frequencies and with three different filling volumes, after which biomass growth and lipid production were analyzed. For T. Domesticum, the highest biomass yield was obtained in cultures shaken at a frequency of 100 RPM, while for C. Curvatus, it was obtained from cultures shaken at 150 RPM. Lipid content in T. Domesticum cells was greater than in C. Curvatus cells under the conditions chosen as best suited for their growth. No significant differences were observed between different filling volumes for either of the strains.

Acknowledgements: Iwona Gientka

Application of irreversible, thermochromatic ink, for process optimization of microwave assisted freeze drying

Rosina Neubauer

BOKU, Austria

Education level: BSc

Keywords: Microwave freeze drying, foam drying, temperature uniformity, hot spots, thermochromatic ink

The aim of this thesis is to demonstrate and avoid the problematic of temperature inhomogeneity for microwave freeze drying of foams, using irreversible, thermochromic ink ITC 60. Therefore, the written paper is structured into three parts: the description of the problematic, the problem analysis and the process optimization. The intensity of ink coloration enables the visualization of areas with different thermal stresses. In order to show the effect of non-uniform temperature distribution, the enzyme activity of heat sensitive ß – galactosidase, the microscopic structure, the remaining water content and the protein content were analysed and compared to thermal image recordings. A significant difference could be seen regarding the enzyme activity and the macroscopic structure between segments of different coloration intensity. For the investigation of the temperature distribution and visualization, foams were dried at a high microwave-input power and maximum process temperature of 70 °C.

In total four different coloration cases were detected. The case with an intensive, central ink coloration had longer drying time, which was caused by an early reaching of maximum process temperature, resulting in early pulsed microwave-input-power. In general, the development of intensive, central coloration could be detected at 80 % of total drying time. Simultaneously, an exponential temperature rise, before 0,2 [-] water content, led to a higher probability for intensive ink coloration. The other three coloration cases showed warmer outer product segments, which occurred during the last 5 % of the drying. Only the peak temperature at the rim was determining, which case resulted. Based on the investigative results the following dryings were held at constant temperature level of 20 °C followed by a temperature increase up to 70 °C. A constant temperature for 15 min had a significantly reduced probability of intensive- colored segments in the middle, with no additional extension of the drying time.

Acknowledgements: supervisor: Isabel Kalinke (Technical University Munich); examinant: Prof. Dr.-Ing. Ulrich Kulozik (Technical University Munich)

Assessing the effect of functional floral diversity of weeds on pollinator communities across a gradient of farming practices in vineyards in southern France

Lucie Raymond, Laure Martin-Lefevre, Elena Kazakou

AGRO, France

Education level: MSc

Keywords: Floral functional traits, weeds, vineyards, pollinators

The diversity of weed floral resource is a key element shaping pollinators communities. Maintaining weeds in perennial agroecosystems such as vineyards can enrich and diversify floral resources in the cultivated Mediterranean landscapes. To (i) preserve pollination process and (ii) offer weed management strategies focus on pollinator conservation, it is essential to better understand weed response to viticultural practices and the structure of both weed and pollinator communities.

Despite the growing interest in preserving pollination process, knowledge about the determinants of floral resources is scarce, particularly among weeds. The project's objective is to quantify the potential floral resources of weed communities in Mediterranean vineyards across a gradient of practices, for pollination process.

By using a network of vineyard plots in the Occitanie region, we measured different sets of weed floral functional traits related to flowering phenology (e.g., flowering onset), attractiveness (e.g., flower area and color), accessibility (e.g., flower symmetry, flower height), and productivity (e.g., pollen quantity per floral unit, pollen nitrogen content). We also carried out transects to observe the direct interaction between weeds and pollinators.

We anticipate that various weed management strategies will exert discernible impacts on the weed floral functional diversity, consequently affecting pollinator communities. The expected results are that (i) the floral functional diversity of weeds is negatively correlated with intensive practices, (ii) the floral functional diversity of weeds is positively correlated with the diversity of pollinator communities. Our preliminary observations further suggest that certain wild pollinators rely on certain weed species.

Acknowledgements: Laure Martin-Lefevre's thesis, of which my internship is a part, is funded by the Occitanie region, ANSES, and Institut Agro Montpellier, for which I am very grateful. I express deep gratitude to Laure Martin-Lefevre and supervisors Elena Kazakou, Guillaume Fried, and Mélodie Ollivier. I would also like to thank Hubert Vo Van and Léa Genty. Your support, help and expertise have been essential.

Investigating the internal and external influencing factors on organic farming development in Iran in the last ten years

Neda Rafizadeh, Faezeh Rahmati

UHOH, Germany

Education level: MSc

Keywords: Organic Farming Development, 7S Method, STEEPV Method, Farmers' Attitudes, Agricultural Policy, Policy Recommendations

The purpose of the current study is to contrast changes in organic agriculture in Iran and to analyze the obstacles and problems, that the whole organic agricultural system has encountered in the past ten years, also Identifies factors, of organic agriculture development in Iran during the last ten years.

Comparing the data and information from 2013 until 2021 indicates that organic agriculture in Iran has experienced a steady and low development until 2016 with 18871 hectares of land under cultivation, but after this time the measure of organic production is fixed and decreased. As a result, organic farming not only has not progressed, but it has also regressed in Iran during past years.

This literature review synthesizes findings from both English and Persian research publications and statistical reports, providing a comprehensive analysis across various fields.

Impact factors of organic agriculture development are divided into internal and external factors. In this research, internal factors are measured by the 7S technique, and external factors by the STEEPV method. The internal factors are contained in Strategy, Structure, Systems, Skills, Staff, Style, and Shared Values and external factors can be divided into six groups according to the GBN method: Social, Technological, Economic, Environmental, Political Aspects, and Values.

Regarding literature, important factors influencing the development of organic farming are farmers' and peoples' attitudes to organic agriculture, synchronic, and cooperation between governmental and private organizations, according to the experience of other countries.

The results and recommendations from this research can be utilized by policymakers in the future to plan and organize infrastructures such as markets and certification bodies, as well as inform and educate the community about organic farming.

Acknowledgements: Arezou Babajani, Sabine Zikeli

Implementation of Sorghum in bakery products: Chemical Analysis and Baking Trials

Linsha Retnaraj Lailambika, Lisa-Maria Call, Eleonora Charlotte Pichler, Regine Schönlechner

BOKU, Austria

Education level: MSc

Keywords: Sorghum, bakery products, climate-resilience, nutritional benefits, baking trials, sustainable agriculture, food diversification

Sorghum, known for its climate-resilient properties and nutritional benefits, is increasingly being explored as a versatile ingredient across various food applications. This thesis investigates sorghum's potential as a complementary component to wheat in bakery products through chemical analysis and baking trials. Stone-milled samples of eight sorghum cultivars (Icebergg, Armorik, Ggolden, Es Shamal, Leggend, Benggal, Dodgge and Justus) were analyzed for protein, fat, starch, dry matter and ash content, with W700 wheat serving as a control. Results indicated relatively similar nutritional values among sorghum varieties, distinct from W700 wheat.

Baking trials included two types of bread for each sorghum variety: standard and sweet milk bread, using a blend ratio of 40% sorghum and 60% wheat flour, along with 100% W700 wheat control. Post-baking analyses involved volume assessment, texture analysis, color determination and pore structure evaluation. Standard sorghum breads generally exhibited reduced volume, denser coloration and distinct texture characteristics compared to the control, whereas sweet milk breads showcased favourable sensory attributes. The dough for sorghum sweet milk bread presented significant difficulties during kneading due to its high viscosity and tendency to stick to surfaces, whereas standard sorghum bread dough was easier to handle for shaping and molding. Variations in crumb firmness and elasticity were evident among sorghum-based breads in comparison to the control.

This study highlights sorghum's potential as a climate-resilient alternative in bakery products, owing to its ability to thrive in heat and drought conditions. Optimizing dough handling techniques and exploring additives or pre-processing methods can significantly enhance the texture and volume of sorghum-based bakery goods.

Incorporating sorghum into bakery formulations not only diversifies product offerings but also harnesses its nutritional benefits, contributing to a sustainable and resilient food supply chain. In addition, sorghum's gluten-free nature makes it a valuable option for developing products that cater to gluten-sensitive consumers.

Acknowledgements: The authors acknowledge financial support from FFG (Austrian Research Promotion Agency) through the CORNET funding network for the research project CLIC (project name: CORNET II 35-2023). They extend their gratitude to FEI and ecoplus for their contributions to project coordination.

Assessing the agronomic potential for soil carbon sequestration through management practices in German arable farming - a farmer's perspective

Sarah-Maria Scheid

WUR, The Netherlands

Education level: MSc

Keywords: Soil carbon sequestration practices on arable farmland in Germany, Cover crops, Tillage practices, Agroforestry, Carbon Credits, Barriers and Drivers for soil carbon sequestration practices, Farmer's perspective

Increasing carbon sequestration in agricultural soils is a promoted practice to mitigate climate change. However, there are major uncertainties about the carbon storage potential of soils. This Master thesis investigates the status quo of the soil carbon sequestration practices, including cover crops, tillage practices and agroforestry practices among farmers on arable land in Germany. Increasing soil organic matter through these practices enhances soil health. However, the adoption rates are influenced by barriers such as soil conditions, climate and financial infeasibility.

Through an online survey of 194 farmers and 20 in-person semi-structured interviews, the research aims to provide valuable insights into the agronomic potential for soil carbon storage. The relative adoption gap for cover crops was 20.4%. This was defined as farmers' potential to cultivate cover crops on their arable land. Most of the cover adopters plough occasionally (over 60%) regardless of the tillage practice. The main barrier to using cover crops is poor cover crop establishment. Modern agroforestry systems are rare, but 60% of the farmers have landscape elements on their farmland. The main barriers to modern agroforestry are biophysical competition for the area, water, and light, and the main driver is biodiversity. Carbon credit adoption is scarce (4.4%). The potential for increasing the use of cover crops and

non-inversion tillage is almost reached and limited due to constraints outside the farmer's scope of change. Farmers appear to be sceptical about agroforestry, direct seeding and carbon credits, mainly due to financial and spatial uncertainties.

Recommendations include improving legal frameworks, financing agroforestry, and providing more education for farmers. Future research should focus on specific practices and regional challenges to enhance the implementation of soil carbon sequestration methods.

Acknowledgements: I would like to thank my supervisors, Renske Hijbeek and Marti Vidal Morant for their great support and advice during the process of this thesis. I would also like to recognise friends and colleagues who distributed the survey; otherwise, collecting so many participants would not have been possible. I could not have completed this project without all the farmers who made themselves available for in-person interviews and farm visits.

Digitalization of innovative continuous thermal sterilization: assessing ohmic heating assisted sterilization

Anna Smertina, Jorge Rivera, Henry Jäger

BOKU, Austria

Education level: BSc

Keywords: Ohmic heating, CFD, optimization, innovative food processing, nutrient retention

The contemporary era is distinguished by globalization, digitalization, and the evolution of social and technological change. Amid these advancements, the escalating climate crisis is a major societal challenge that endangers global food security and safety. Therefore, the United Nations introduced a set of sustainable development goals to be attained by 2030. In order to achieve these goals, it is essential that the food industry, one of the most energy- and resource-consuming sectors of the global economy, takes action to secure safe and high-quality food products by reducing its carbon footprint. One strategy to achieve this goal is the implementation of renewable energies through ohmic heating (OH), an emerging technology that uses electrical current to volumetrically heat foods.

Despite its potential, the characterization and optimization of OH is a challenging task, that requires an understanding that extends beyond the conventional measurements. It is important to understand the distribution of temperature and electrical current to ensure nutritious and safe OH-treated food products. This study investigated these thermal and electrical fluxes using computational fluid dynamics (CFD) to generate a digital model of an OH sterilization process.

The proposed model introduces a new adaptive boundary condition for the voltage. This enables accurate prediction of processing conditions without the usual preliminary measurements of the electric duty cycle. The model was validated using temperature and electric parameters obtained during sterilization trials. The error of the in-silico predictions was on average 3.00 ± 0.33%. The model revealed synergistic interactions between system design, fluid dynamics and volumetric heating.

This study provides valuable insights into digitalization processes in food technology and enables further studies in this field. Moreover, it lays the groundwork for a more sustainable and resource-efficient research and process development.

Acknowledgements: Jorge Luis Rivera Azurdia, Ragnar Witlaczil

Immerse in nature - VR goggles and 3D models in nature and forestry education

Jakub Wolski, Przemysław Pluta, Damian Zieliński

SGGW, Poland

Education level: BSc

Keywords: Modern technologies, didactics, forestry, innovation, public opinion

The implementation of technologies such as VR goggles and 3D models in nature and forestry education offers new possibilities of teaching and learning. Therefore, a study was conducted to gather opinions and feelings of people using these tools during nature and forestry education.

The survey was conducted during the "Dni SGGW" family picnic. For this occasion, special 3D models were created, which respondents could view and interactively explore using VR goggles. Respondents evaluated the 3D models and the idea of using them in education. They also shared their feelings that accompanied them during the presentation.

During the two-day survey, 180 questionnaires from random respondents were collected. The survey results showed that the vast majority of respondents found VR goggles and 3D models to be innovative and effective educational tools. Respondents appreciated the ability to realistically visualize and understand complex of forestry processes that are difficult to observe in everyday life. This answers prevailed regardless of the recipient's category of age or level of education.

The study indicates a high level of acceptance and positive reception of this method of conducting nature and forestry education among respondents. The results suggest that VR goggles and 3D models can significantly enrich educational programs.

Moreover, the popularization of these technologies in nature and forestry education will contribute to the development of new didactic methods that engage students more, this way learning is more interesting and takes more interactive aspect.

Integrating VR and 3D with traditional forms of teaching can create a hybrid educational model that better meets the needs of contemporary students and prepares them for future professional challenges in the field of forestry and nature conservation.

Acknowledgements: mgr. inż Grzegorz Zawadzki, Aleksandra Rutka

POSTER SESSION 5

Saturday 23 November 2024 at 10:10 – 11:10

Ground Floor, Orion

Adaptation of the circular terrabioponic cultivation system with 3D textiles

Ashmita Acharya, Emily Hoquante, Natalia Katsarou

UHOH, Germany

Education level: MSc

Keywords: Hydroponics, Terrabioponics, 3D textiles, Urban gardening

In response to an increasing global population and developing food market dynamics, there is the necessity for innovative methods to produce with sustainable means in urban areas. One option is the circular terrabioponic system that combines soil cultivation (terra) and organic nutrient solution (bioponics).

The objective of this study was the adptation and further development of a modular terrabioponics system using light-weight 3D textiles to reduce the weight of the cultivation system.

This research started with an experiment in a greenhouse using four terrabioponics cultivation systems with three planting containers in every system. Vermicompost and 3D textiles were used as substrate. The textiles were used in two arrangements, namely horizontal and vertical in two systems each. Lettuce and radish were grown, and the yield was measured. During the experiment, the crops were checked for nutrient deficiency and pathogens. The data was analyzed using ‘Kolmogorov- Smirnov-Test’ and ANOVA.

We observed a higher rate of radish bulb growth in the vertical setup compared to the horizontal followed by relatively higher lettuce growth in the vertical and vice-versa. While a significant difference in weight gain of lettuce was seen in various systems, the arrangement of the substrates did not have a significant effect on biomass yield of lettuce. A higher competition for light and nutrient between the plants in the same container affected the result.

We conclude that the 3D textile can be a suitable substrate for growing lettuce in light-weight circular terrabioponics system.

Acknowledgements: Dr. Bastian Winkler

Impact of agrivoltaics altered microclimate – studying growth and development adaptations of winter wheat

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UHOH, Germany

Education level: MSc

Keywords: Agrivoltaic, winter wheat, Agri-PV, field experiment, photosynthesis efficiency, land-use, renewable energy, gross primary production

As land increasingly becomes a scarce resource globally, tensions surrounding land use are rising. Agrivoltaics (APV) is a dual land-use system that integrates food and renewable energy production. While photovoltaic (PV) module technology continues to progress, research on microclimatic alterations and their effects on crop development and growth within the APV domain remains limited. Changes in microclimatic conditions in APV fields are multifaceted and specific to both the site and the crop, but they are inevitable. Most prevailing changes arise from the overshadowing of PV modules, limiting light availability. Although most APV findings are derived from simulations and controlled field models, this study was conducted at a commercially managed APV farm in southern Germany, encompassing 2,500 m^2 of farmland. A deeper understanding of APV crops is essential for applying technological innovations that enhance crop growth and health, thereby improving land-use efficiency from both energy production and agricultural perspectives. This study measured and analyzed winter wheat's CO2 fluxes during various phenological development stages and under different light availabilities. The collected data was used to draw conclusions regarding the photosynthetic efficiency of winter wheat and to compare the efficiency rates of crops in APV and reference fields. The results indicate that plants within the APV environment exhibit increased photosynthetic efficiency across all evaluated developmental stages and under both high and low light conditions. This demonstrates that winter wheat plants benefit from the altered APV environment and have the potential for increased overall productivity within this system. This thesis provides unique field data for simulations that enhance crop growth predictability and the effective application of this dual land-use system. The study indicates that crops thrive in the APV environment, showcasing these systems' potential to establish an economically viable model that addresses global challenges by optimizing the limited resource of land.

Acknowledgements: I'd like to thank Jun.- Prof. Dr. Andreas Schweiger for his input when designing the research method and carbon flux chambers. Special thanks go to my institute colleague Suraj Chaudhary for his invaluable assistance in the field, come rain or shine. Your contributions were essential to this work.

This-ability: to overcome underdeveloped factors of labour market for people with disabilities

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SGGW, Poland

Education level: BSc

Keywords: People with disabilities, labour market, inequality, prejudice

In 2012, there were 111,521 unemployed people with disabilities, representing 5.22% of all unemployed individuals in the country. By 2023, this number had decreased to 60,835, but their proportion increased to 7.72%, indicating that the overall reduction in unemployment did not equally benefit those with disabilities.

In order to explore the phenomenon, we examined the labour market from the perspective of the disabled unemployed, creating identical resumes (with the same qualifications, educations and courses, identical relevant job experience) of people with mild and moderate disabilities and people without disabilities, distinguishing between men and women, and then applied them to the same job offers. This allowed us to study the phenomenon not only from the perspective of the division between the fully able-bodied and the disabled, but also from the gender differentiation.

The findings show that in the short term on a sample of 200 job offers, responsiveness to job applications averaged 21%, including the 3% considered. Among those rejected at this stage were only men with moderate disabilities at 13%. Despite the declaration of an equal opportunity policy by an increasing number of companies, the increase in the share of the disabled in the group of unemployed shows that they are applying an ineffective and often even reverse policy. The barriers faced by a disabled candidate in the labour market are much greater than those faced by non-disabled candidates and discourage the disabled from becoming active in the labour market.

In conclusion, the issue of unemployment among people with disabilities in Poland remains a significant challenge. Despite some improvements over the years, the data reveals persistent disparities, particularly in gender differences. Addressing these challenges requires a concerted effort to eliminate prejudices in the workplace create inclusive job opportunities and provide targeted support where it is needed.

Acknowledgements: Ph.D., hab. Associate Professor Joanna Rakowska

How omnivores shape the interaction between plants, herbivores and their natural enemies

Esmee Venema

WUR, The Netherlands

Education level: BSc

Keywords: Biological control, plant protection, omnivores, plant defence responses, induced defences, plant volatiles

This thesis explores the influence of omnivores on the performance of herbivores and natural enemies via induced plant responses. The aim was to understand how the omnivorous predator Orius laevigatus affects the performance of two specialist herbivores through induced plant responses and how these responses influence the natural enemy of Pieris brassicae, Cotesia glomerata. The research included two experiments using Brassica nigra plants. The first experiment divided plants between three and five weeks old into clean and omnivore-induced treatment groups. Half of these plants were exposed to Pieris brassicae caterpillars for seven days, after which their weights were measured to assess the impact of omnivore induction on herbivore performance. The other half of the plants were exposed to Brevicoryne brassicae aphids for 14 days, with the resulting offspring being counted and compared between treatments. The second experiment was setup as a two-choice experiment with a Y- tube olfactometer, using Cotesia glomerata wasps. The olfactometer tested the parasitoids preference among various plant-treatment combinations. The caterpillars had a significantly lower weight on omnivore-induced plants than on clean plants, the number of aphid offspring was also significantly lower on induced plants. Parasitoids prefer the omnivore-induced plants over clean plants when the host is absent. When the host is added, parasitoids prefer the host plant over the omnivore-induced plant. Additionally, plant volatiles induced by either the omnivore or herbivore could be distinguished by the parasitoid. The parasitoids also prefer herbivore-induced plants over omnivore-induced plants. Our study shows that the omnivore Orius laevigatus can indirectly affect the performance of specialist herbivores P. brassicae and B. brassicae via induced plant responses. The omnivore significantly influences the attraction of the parasitoids of one of the herbivore species. Our results suggest that O. laevigatus induces plant volatiles, which did not interfere with the host-locating capabilities of parasitoid C. glomerata.

Acknowledgements: Erik Poelman, Nina Xiaoning Zhang, Gabriele Bolletta

A comparative study of gender dynamics between multi-generation family farms and first-generation farms in Brittany

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AGRO, France

Education level: MSc

Keywords: Gender dynamics, farming configurations, decision making, division of labor

This study explores the intricate gender dynamics within the agricultural sector, focusing on the Brittany region of France. The research compares gender roles in two distinctive farming configurations: Multi-Generation Family Farms (MGFs) and First- Generation Farms (FGFs). Despite existing studies on the socio-economic and political contexts of family farms and gender, there is a notable research gap in understanding the comparative gender dynamics between these configurations. This study addresses this gap by investigating potential similarities and differences, highlighting the evolving nature of gender roles in agriculture. The study employs a qualitative approach, emphasising primary field research as the principal method for data collection. Semi-structured face-to-face interviews and direct observations will be used to gather relevant data. The primary units of analysis are farming couples from either MGF or FGF configurations, irrespective of their marital status. In MGFs, farms are typically passed down through male heirs, characterised by male dominance. In contrast, FGFs, acquired through non-family lineage, challenge traditional agricultural norms. This research adopts snowball and purposive sampling to identify potential participants. Both members of the farming couples will be observed and interviewed to facilitate a comprehensive examination of their involvement in on-farm and off- farm activities. By addressing the gap in comparative analysis of gender dynamics between MGFs and FGFs, the study aims to uncover distinctions in labor organisation and decision-making processes.

Acknowledgements: Master thesis program under the supervision of Professor Catherine Darrot.

Unveiling Senescence Dynamics in Cut Inflorescences of Bigleaf Hydrangea 'Royal Surprise' (Hydrangea macrophylla)

Sutrisno

SGGW, Poland

Education level: PhD

Keywords: Cut flowers, vase life, water balance, water uptake, transpiration, carbohydrates

The bigleaf hydrangea is increasingly sought-after as a cut flower due to its stunning and long-lasting inflorescences. Selecting the appropriate cultivars, cutting dates, and developmental phases is crucial for maximizing their decorative value. This study aimed to determine the longevity of the 'Royal Surprise' cultivar's cut inflorescences when harvested in July and September, at both the "Fresh" and "Antique" phases. Hydrangea inflorescence shoots were placed in calibrated cylinders with distilled water, using 11 replicates. During the experiment, cut flowers were observed and weighed daily, with the water level maintained at a constant volume of 250 cm^3 to assess water balance. Additionally, for each phase and cutting date, flowers from three inflorescences were collected for biochemical analyses, involving the preparation of 0.5 g samples. These analyses measured dry matter content, reducing sugars, total sugars, and starch content. The results showed that inflorescences cut in autumn and at the "Antique" stage had a longer vase life. As inflorescences aged, water uptake and transpiration decreased, leading to a reduction in fresh weight. The harvesting date and cutting phase significantly affected water balance parameters. The longevity of cut hydrangea inflorescences was linked to the carbohydrate content of the flowers. Inflorescences of the 'Royal Surprise' hydrangea cut in September at the "Antique" phase exhibited higher levels of reducing sugars, total sugars, and starch than the "Fresh" phase. Conversely, inflorescences cut in July at the "Fresh" phase accumulated more carbohydrates.

How to correctly support feeding behavior in dogs?

Nina Cieplak

SGGW, Poland

Education level: MSc

Keywords: Canis lupus familiaris, eating behavior, enrichment, feeding toys

It has been proven that feeding toys supports enriching dog's daily routine. They help stimulate dogs' brain as well as elongate the time of eating. Specific types of toys that require the dog to chew on them can also prevent dental diseases. Licking the toys supports stress relief, which can be beneficial in stress-inducing situations, such as visiting a vet clinic or during a storm. Although it still hasn't been proven that using the toys leads to specific hormones release (such as oxytocin or serotonin), it is still considered to be making dogs feel more relaxed.

The aim of this study was to evaluate the impact of feeding toys on dogs' eating behavior.

An online survey was conducted to collect data about owner's subjective opinion about the effects of feeding toys on dog's eating behavior. The number of correctly completed questionnaires was 54 and only these answers were included in the analysis.

51.9% of the respondents indicated that their dogs' eating speed decreased after using the feeding toys. Behavioral problems occurred in 46.3% of the respondents' dogs, of which 84.3% declared that after using the feeding toys problems got eliminated or minimized.

Analysis of the received answers showed that feeding toys effectively slows down the pace of dog's eating. It can eliminate or minimize behavioral problems. Introducing feeding toys to dogs from puppyhood can prevent behavioral problems.

Acknowledgements: This study was part of my bachelor's thesis. I would like to thank my thesis supervisor, PhD Marlena Zielińska-Górska, which was truly an immense help throughout the whole process.

Behavioural context of tail postures and movements in wild boar (Sus scrofa)

Kateřina Matoušová

CZU, Czech Republic

Education level: BSc

Keywords: Animal welfare, wild boar, emotion, animal communication, stress

In wild boar (Sus scrofa) and domestic pigs (Sus scrofa domesticus), it is possible to observe specific tail positions and motions. While the associations between tail positions and motions and specific behaviours have been well documented in domestic pigs, they remain unstudied in wild boar.

The first aim of this thesis was to examine the association between tail positions and motions and specific behaviours and attempt to determine their functional significance in wild boar. The second aim was to test the effect of age on tail positions and motions.

Data was collected by camera traps that monitored the activity of wild boars in front of the traps. Altogether, 1087 videos were coded using scan sampling recording, among others, tail positions and motions and behaviour of individuals. Data were analysed using Fisher´s exact test and binomial generalised mixed-effects models (GLMM).

There was a significant relationship between tail positions and motions and behaviours ($p < 0,001$). Specifically, horizontally erected tail more likely occurred during fast locomotion (GLMM, est. = 2,673, $p < 0,001$), and passively hanging tail more likely occurred during feeding (GLMM, est. =1,707, $p < 0,001$) and excavation behaviour (GLMM, est. = 0,807, $p < 0,001$).

This bachelor thesis proved that specific tail postures and motions are linked with specific behavioural contexts in wild boar. However, to examine the association between other tail postures and motions, collecting more data and continuing research would be necessary.

Acknowledgements: Mgr. Michaela Másílková, Ph.D.

Living on the edge: exploring weed trait selection in strip cropping

Esther Moinat

WUR, The Netherlands

Education level: MSc

Keywords: Arable flora, community assembly, intercropping, agroecology, biodiversity

Agricultural intensification, combined with a focus on weed eradication, has led to the loss of diversity within weed communities. Weeds can deliver ecosystem services, and their community composition can possibly contribute to reducing the yield gap. This is because a higher evenness of the weed community can lead to reduced weed pressure. Therefore, we strive to promote weed communities with a high diversity and evenness. How traits and consequently, species are selected can help us understand how to promote such communities in cropping systems. This study aimed to explore how strip cropping influences the weed community. We assessed the effect of the edge of the strip compared to the middle on potential weed seedbank density, species richness, and trait selection. Soil cores were collected in the strips, and emerged seedlings were counted and identified on species level. The RLQ and fourth-corner analysis was used to assess the links between the position in the strip and weed traits. The results show no difference in density and species richness between the edge and the middle of the strip. The position in the strip and year significantly influences species distribution. However, in this study, we observed no direct trait selection effect caused by the position in the strip. Suggesting that the influence of the position in the strip on trait selection might be an indirect effect caused by other factors. Processes, such as weed seed predation and management practices, can potentially explain the differences in species distribution. Further research is required to explore the link between trait selection and these processes in strip cropping.

Acknowledgements: Dr. Merel A.J. Hofmeijer

OPTIMIZING MICROPROPAGATION OF INDIAN SNAKEROOT (RAUVOLFIA SERPENTINA (L.) BENTH. EX KURZ) USING GAMMA RAY IRRADIATION

Nabilah Amany Samsurizal, Edhi Sandra, Supriyanto

SGGW, Poland

Education level: PhD

Keywords: Rauvolfia serpentina, gamma irradiation, radiosensitivity, bioactive compounds, Indian snakeroot

Rauvolfia serpentina is one of the tropical woody-perennial shrub and well-known as an important medicinal plant belonging to Apocynaceae family. The increase of Rauvolfia serpentina's demand leads to uncontrolled illegal harvest of this plant from its natural habitat. Micropropagation through tissue culture is an alternative method to produce genetically superior Rauvolfia serpentina plantlets for future cultivation, given the short planting period and high production quantity. This method can also enhance the genetic variety of this species by incorporating gamma irradiation treatment. This study aims to optimize the micropropagation of Rauvolfia serpentina using gamma ray irradiation by evaluating the radiosensitivity values, growth, and secondary metabolite content of the plantlets subjected to gamma irradiation. Radiosensitivity values were obtained using Curve Fit Analysis software, the effects of gamma irradiation on plantlet growth were tested through a completely randomized design with different doses and observation periods, and the secondary metabolite content was analysed using GC-MS. The results of this study showed that the radiosensitivity values of the plantlets were 21.6 Gy (LD50) and 23.5 Gy (RD50). Gamma irradiation significantly affected the height and number of shoots at a dose of 10 Gy over a 5-month observation period, while doses of 20 Gy to 25 Gy resulted in reduced growth of the plantlets. GC-MS analysis identified 35 active compounds in the control plantlets, 58 active compounds in the 10 Gy plantlets, and 41 active compounds in the 25 Gy plantlets. This study demonstrates that gamma irradiation can enhance the yield and chemical diversity of Rauvolfia serpentina, providing a potential avenue for the development of new pharmacologically active compounds.

Estimating soil properties under different moisture conditions using Vis-NIR-SWIR reflectance spectroscopy

Theresa Strobl

BOKU, Austria

Education level: MSc

Keywords: Agricultural soils, reflectance spectroscopy, soil survey, soil organic carbon, clay

Predicting soil properties using (Vis-NIR-SWIR) reflectance spectroscopy has gained importance in the last decades. Vis-NIR-SWIR is hereby referring to a wavelength range of 350-2500 nm on the electromagnetic spectrum. The method is based on the principle that certain soil constituents (e.g., Fe-oxides, organic carbon) absorb energy, resulting in a lower reflectance in specific wavelength regions. This information can then be used to predict soil properties such as soil organic carbon (SOC), or clay content for instance. Its key advantages over traditional wet chemistry methods are the low costs, rapid and non-destructive measurements as well as the possibility of simultaneous assessment of multiple properties. The technology is especially interesting for precision farming applications or the assessment of carbon stocks. The aim of this study is to investigate the prediction of soil properties (SOC, clay, CaCO3, PO4) under various moisture contents using hyperspectral data. Soil surface reflectance of 75 samples was measured in the lab with a spectroradiometer (Spectral Evolution PSR 2500) and analysed in R using multivariate statistical methods (MLR, PLSR, PCR). Results show a moderate prediction of SOC content (%) with an R2 of 0.58-0.74 and a RMSEtest ranging between 0.45-0.61, using the raw spectra and variable/wavelength selection based on literature. However, the models appear to underestimate soils with higher SOC values, which is most likely due to the SOC distribution in the data set. Excluding the nearly water-saturated treatment from the data set improves the models. The analysis thus far indicates that reflectance spectroscopy holds a lot of potential for soil survey, however, due to the high variability of soil and especially when dealing with moist soil, multivariate models using raw data do not deliver results satisfactorily enough. Data transformations and specific knowledge about relevant wavelengths are needed.

Acknowledgements: Franz Zehetner, Francesco Vuolo

Is scratching against substrate contagious behaviour in wild boar (Sus scrofa)?

Aleš Tichý

CZU, Czech Republic

Education level: BSc

Keywords: Cooperation, motor mimicry, emotional contagion, state matching, behavioural synchronization

Socially contagious behaviour is a significant element in the social life of various animal species, and it has an important function in group coordination. Wild boar (Sus scrofa) is socially living ungulates, in which complex social and prosocial behaviour have been observed. Yet, no one has studied the presence of socially contagious behaviour in this species.

The aim of this thesis was to study scratching as a potentially contagious behaviour in wild boar and specifically (1) to design suitable methods for research of socially contagious behaviour in this species; (2) to test if there is a synchronization of scratching, and hence, if scratching is contagious; and (3) to test, if sex and age category affect contagion of scratching.

This study used 4437 videos from camera traps, recorded in 6 different areas in Lesy ČZU, from September 2020 to May 2021. The recordings were coded to reveal the presence of scratching. Information about the time of scratching, sex and age of initiators and observers was noted based on designed methods. The data were then analyzed using the Chi-squared test or Fisher's exact test.

Scratching contagion appeared in only 10 % of the scratching observations. It was found that contagion occurred mostly in piglets, and contagion tended to chain in a group. It was also found that the type of scratching was mirrored, meaning if the initiator scratched with their leg, the observer was more likely to scratch with their leg as well; the same case was with scratching against the substrate.

The study did not directly confirm the presence of contagious behaviour in wild boar. The main reason for that was the limitations of the methods, specifically the presence of unmarked individuals. If contagious scratching were confirmed in the future, the presence of other types of contagious behaviour or emotional contagion could not be excluded. This fact could, for example, be considered in matters of animal welfare.

Acknowledgements: Mgr. Michaela Másílková Ph.D.

POSTER SESSION 6

Saturday 23 November 2024 at 11:20 – 12:20

Ground Floor, Orion

Resilient use of natural resources

Exploring Substrate Specificity in Lytic Polysaccharide Monooxygenases

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NMBU, Norway

Education level: PhD

Keywords: Lytic polysaccharide monooxygenase, biomass conversion, enzyme characterization, substrate specificity

Lytic polysaccharide monooxygenases (LPMOs) are redox enzymes discovered in 2010 to catalyze stereospecific hydroxylation of C-H bonds in a crystalline carbohydrate lattice utilizing O2 or H2O2. Despite the attempts to identify the structural determinants of substrate specificity and enzyme stability in LPMOs, this question needs to be further explored. ScLPMO10C, an LPMO from Streptomyces coelicolor A3, is catalytically active on cellulose. This study aimed to alter interactions with cellulose and stability towards oxidative damage of ScLPMO10C by introducing hydrophobic amino acid residues to the enzyme surface near the copper active site. The enzymatic activity on an expanded range of substrates was assessed and established to achieve this. Several LPMO activity assays were implemented. Our findings provide supplementary data for future research on LPMO substrate specificity and offer insight into the LPMO catalysis.

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Climate Growth Behavior of Douglas Fir (Pseudotsuga menziesii) - A Tree-Ring Analytical Study

Konstantinia Andreadou

UHOH, Germany

Education level: BSc

Keywords: Pseudotsuga menziesii (Douglas fir), Climate growth behavior, Drought indices, Radial growth, Climatic extreme years

The study analyzes 15 individuals of the species Pseudotsuga menziesii (Douglas fir) at the Rottenburg site (Baden-Württemberg) concerning climate growth behavior and presents methods for school implementation. The following climate parameters are examined: precipitation, temperature (minimum, average, and maximum), North Atlantic Oscillation, and Standardized Precipitation-Evapotranspiration Index. Additionally, drought indices (resistance, resilience, recovery) for three climatic extreme years (1991, 2003, and 2018) are determined.

The radial growth of Douglas firs is particularly sensitive to the average temperature in August ($r = -0.42$; $n = 35$; $p < 0.01$). High temperatures in August reduce the thickness growth of Douglas firs. They respond negatively to winter precipitation in the interval from December 12 to January 20 ($r = -0.56$; $n = 34$, $p < 0.01$). Winter precipitation often leads to a lower photosynthesis rate. During rainy weather, fewer sun rays penetrate through the clouds, resulting in lower radiation.

The analysis of drought indices shows that years with extreme climatic conditions have significant impacts on the growth of Douglas firs. In 2003, there was severe drought. Young Douglas firs are particularly resilient and have moderately recovered from it. A comparatively high recovery occurred after 2018. The relative growth after the extreme year 2018 was exceptionally high, which may be due to the very low growth that took place in 2018.

The transfer to school implementation shows that a ruler is sufficient to measure the annual ring widths accurately. In lower and middle school, working largely with graphs prepared in advance by teacher is recommended. In upper school, calculations can be performed in Microsoft Excel and then displayed in graphs.

Acknowledgements: Prof. Anke Steppuhn; Dr. Alexander Land; Daniel Reichle, Stefan Ehekircher; Lena-Marie Röhm

Key variables influencing strawberry recovery from heat stress: soil types and their potential microbial community impact supporting plant, monitoring by electrophysiology signal sensors

Candie ARRIBERT, Deborah HENDERSON

AGRO, France

Education level: MSc

Keywords: Electrophysiology sensors, heat stress, coco fibre, organic soil, microbial community

These trials are carried out as part of a 5-month Master 1 internship at the Institute of Sustainable Horticulture at Kwantlen Polytechnic University in Canada.

Greenhouse-grown strawberries response to and recovery from heat stress, are not well understood. Heat stress causes the carbon flow to be diverted from producing fruit to dealing with the stress. Some growers expect to lose 20% of yield and quality due to a heat event (Darragh Redfern, pers. Comm 2024. Greenhouse strawberry grower).

The focus of this research is on studying how strawberries respond to heat stress. The question what are the key variables influencing plant recovery from heat stress, particularly in the context of different soil types that are more or less conducive to the development of a supportive microbial community for the plant?

Different soils used: coco coir and organic soil (designed by West Creek Farm and with peat, coir, perlite, worm castings, biochar, probiotics and premium Gaia Green organics). The fertilizer used is standard industry hydroponic fertilizer.

Measurement parameters encompass assessing plant health indices, nutrient levels, water stress provided by electrophysiology sensors from Vivent Biosignal. Parameters such as runner, flower and strawberry production, wet and dry plant weights, root visual assessment ratings were conducted for all plants. Biosensing tools were connected to plants in the two coco treatments. CFU counts of bacteria and fungi and genomic tools were used to assess soil microbial populations.

The hypotheses of these trials:

- Electrical biosignals from heat-stressed and non-heat-stressed strawberry plants will different.
- The microbial community will be more diverse in an organic soil regardless of heat stress

These trials will conclude in July 2024. Results will be provided on the poster.

Acknowledgements: I extend my gratitude to Deborah Henderson, Director of the Institute for Sustainable Horticulture, and her dedicated team for their invaluable support throughout this project. Additionally, I would like to express my appreciation to Alja van der Schuren and Norm Janson of Vivent Biosignals, members of West Creek Farms, for providing essential resources and assistance.

Properties of ohmic baked goods relevant for industrial application

Marek Bartůněk

BOKU, Austria

Education level: MSc

Keywords: Ohmic baking, wheat products, product quality, storage stability

Ohmic baking is an innovative rapid baking technology that utilizes only a fraction of the energy consumption that is required by conventional baking methods, while achieving enhanced product quality in cakes and bread. Previous studies have predominantly focused on the quality assessment of gluten-free ohmic-baked products whereas the effects of the ohmic baking process on wheat-based products remain incompletely understood. Therefore, this study focused on the quality analysis of ohmic baked wheat bread and cakes in comparison to conventionally baked goods, aiming to identify relevant product properties for further industrial implementation. Physical properties (volume, color, texture) were measured and compared for conventionally and ohmically baked products. Additionally, a sensory evaluation using a 9-point hedonic scale was conducted with 70 participants to assess the consumer acceptance. Furthermore, the storage stability and staling behavior was investigated by measuring moisture migration and starch retrogradation. While ohmically baked goods typically attain greater volume, a lighter color, and increased springiness in texture, consumers generally preferred conventionally baked goods in the sensory evaluation. On average, ohmically baked goods were rated 1.4 points lower than conventionally baked goods in overall liking, with both types being rated positively on the liking scale. However, certain groups of participants showed a preference for ohmically baked cake and brownies over their conventionally baked counterparts. The staling behavior of ohmically and conventionally baked bread differs fundamentally. In ohmically baked goods, the crumb and crust exhibit more similar moisture content compared to conventionally baked goods, resulting in less moisture migration. Additionally, starch gelatinization during ohmic baking is reduced, potentially due to the shorter baking time, leading to decreased retrogradation during storage. The results indicate that ohmic baking presents a promising method that could effectively be implemented in the industry, offering energy savings without compromising the quality of baked goods.

Acknowledgements: Jäger, Henry, Univ.Prof. Dr.Ing., Kate Waldert, MSc.

Quantification of Greenhouse Gas Emissions from the Biebrza River channel and floodplain and its changes over historical times and future forecasts

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SGGW, Poland

Education level: PhD

Keywords: Emissions, sustainability, resilience, ecosystem monitoring

The emissions and accumulation of greenhouse gas (GHG) emissions, such as carbon dioxide (CO2) and methane (CH4), in the atmosphere continues to increase global average temperatures, making the understanding and quantification of fluxes to and from various environments essential. This study examines the quantification of greenhouse gas (GHG) emissions from the Biebrza River channel and floodplain, analyzing changes over historical periods and forecasting future trends. It underscores the importance of GHG emissions as indicators of ecosystem health and their impact on natural resource availability. To calculate these emissions, water levels were used as raw data, with measurements taken from 1947 to 2022, and the flooding area was calculated through an empirical formula developed in previous studies. The Mann- Kendall test revealed a slight increase in emissions over the study period. Using the emission factors provided by the Intergovernmental Panel on Climate Change (IPCC), the emissions of carbon dioxide and methane were calculated, resulting in an average annual emission of 3000 tons of GHGs. Integrating additional factors such as land type and use, climatic conditions, and vegetation will yield more precise values, which will be included in future analyses. This information contributes to the broader goal of achieving resilient and balanced natural resource use, addressing climate change challenges, and fostering environmental conservation. The findings aim to inform stakeholders, including policymakers and local communities, about effective strategies for maintaining ecosystem health and sustainability amidst evolving environmental pressures.

Acknowledgements: I would like to thank my supervisor, Mateusz Grygoruk, and my co-supervisor, Anna Sieczko, for their invaluable support and guidance throughout the research process. Their feedback and insights were instrumental in improving the quality and depth of this study.

The project investigates local knowledge of Moringa leaf extracts, analyzing their chemical composition and effectiveness on tomatoes under drought stress

Silvia Faravelli

SLU, Sweden

Education level: MSc

Keywords: Moringa, plant biostimulants, abiotic stress, smallholder farmers

Moringa is a tropical and subtropical plant with a wide range of nutritional, medicinal and industrial applications, throughout Sub-Saharan Africa. One possible use of moringa is as a biostimulant in crop production. Recently, there is growing interest in producing biologicals, such as plant biostimulants benefiting smallholder farmers with limited access to conventional chemical products. This independent work presents three aspects of moringa: traditional uses and knowledge among smallholder farmers, chemical composition of extracts and efficiency of extracts against abiotic stresses in tomatoes.

To explore the traditional uses and knowledge associated with two species of moringa, Moringa oleifera and Moringa stenopetala, a survey was conducted in Ethiopia and South Africa. Investigations about the chemical composition of different samples from various geographical locations, containing different Moringa species and using diverse solvents were assessed by Gas Chromatography-Mass Spectrometry. The efficacy of Moringa leaf extracts (water, ethanol and acetone at 100mg/ml) as a biostimulant was tested by germination and biopriming experiments in tomatoes under heat and drought conditions. A greenhouse study was performed, testing the application of water and ethanol Moringa leaf extracts (100mg/ml) in drought conditions.

The survey highlighted a knowledge gap regarding Moringa application as a plant biostimulant in both study areas. GC-MS analysis identified variations in composition among samples, with many compounds displaying antioxidant activity. The germination and biopriming study led to no significant effects on the seeds growth parameters. The application of water-extracted Moringa leaf extracts enhanced the fruit production of tomatoes in controlled greenhouse conditions, thanks to earlier flowering.

Further standardization of the extracts and more trials are needed to obtain reliable data to be shared with farmers in Ethiopia and South Africa, favouring education about the use of Moringa extracts as a plant biostimulant and fostering the application of plant biologicals in their agricultural practices.

Acknowledgements: I would like to thank Erik Alexandersson, Sajeevan Radha Sivarajan, Anna Manourova, Doc. Salmina Mokgehle, Doc. Awoke Gaudie and all the people from SLU, UMP, ARC and AMU that helped and supported me during my project.

Overview of solar and wind-driven water pump designs applicable for the arid and semi-arid areas of Africa, Asia, and Latin America

Danica Juhazyova, Doc. Ing. Vladimír Krepl, CSc

CZU, Czech Republic

Education level: BSc

Keywords: Solar, Wind Energy, Sustainable Energy, Arid and Semi-arid Areas, Water

This bachelor's thesis offers an overview of the problems associated with water shortages that are common in ten chosen arid and semi-arid countries of Latin America, Africa, and Asia, with an emphasis on sustainable energy solutions. The study examines the complex interaction between energy requirements and water demands in various less developed countries, highlighting the importance of solar and wind energy.

Using a thorough approach based on an extensive review of the literature, the study compiles information from a variety of academic sources, including encyclopedias, scholarly journals, and reputable reports that can be accessed via online databases like Web of Science, Google Scholar, yearbooks, World Bank publications, UN Organization's databases, the UN Digital Library, and JSTOR.

This thesis intends to provide important insights into potential pathways for reducing water scarcity through the implementation of sustainable energy initiatives by shedding light on the important relationship between energy and water dynamics in arid and semi-arid regions through this logical examination.

Acknowledgements: supervisor - Doc. Ing. Vladimír Krepl, CSc., consultant - Ing. Charles Amarachi Ogbu.

Issues of Peatland Restoration Across Scales: Hydrological Consequences and Knowledge Gaps – a Review

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Education level: PhD

Keywords: Peatland restoration, water table increase, site-specific analysis, hydrological monitoring, local conditions, restoration effectiveness, detailed assessment, long-term conservation

Peatlands are vital ecosystems, contributing significantly to global carbon storage, water regulation, and biodiversity conservation. Despite their importance, peatlands have faced extensive degradation due to human activities such as drainage, agriculture, and peat extraction, leading to substantial carbon emissions and loss of ecosystem services. Restoration efforts, particularly re-wetting and re-vegetation, have been implemented worldwide to reverse these damages and restore ecological functions. However, the effectiveness and outcomes of these efforts vary widely across different scales and regions, influenced by local climate, hydrological conditions, and initial degradation states. This review synthesizes current knowledge on peatland restoration, focusing on hydrological outcomes and identifying critical gaps in understanding. Through a comprehensive literature review and meta-analysis, data on pre- and post-restoration water table levels were analyzed using RStudio. The meta-analysis reveals that re-wetting significantly raises water table levels across various sites, with a mean difference (MD) of -0.76 to -0.80 meters, demonstrating the efficacy of restoration efforts. However, substantial heterogeneity (I^2 = 69%) suggests variability in outcomes, underscoring the need for tailored restoration approaches that consider local conditions. This study highlights the importance of continuous monitoring and adaptive management to enhance the long-term sustainability of peatland restoration initiatives. Future research should focus on refining restoration techniques to optimize hydrological outcomes and ensure the effectiveness of peatland restoration efforts across diverse ecological and climatic contexts.

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Convivial Conservation; a new journey beyond Rewilding? - A critical analysis of a Rewilding Europe project in the Romanian Danube Delta and its alignment with the convivial conservation proposal

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Education level: MSc

Keywords: Rewilding, Rewilding Europe, conservation governance, convivial conservation, Romania

Biodiversity is declining in Europe and the importance of protecting it is increasing and visible through strict and sometimes radical nature conservation proposals. Considering resistance against the strict approaches and the fact that biodiversity is still decreasing, the EU has to come up with new strategies to protect its natural landscapes; such as the concept of rewilding. However, the concept of rewilding, gaining scientific and political interest in Europe, has also received critiques from scholars alike. One of these rewilding projects by Rewilding Europe is the Romanian Danube Delta. Despite the interest of Europe in rewilding as a promising approach for nature conservation, the overall critique from scholars on the concept and practices of rewilding and these sometimes critical sounds from the local communities and authorities in the Romanian Danube Delta, remains overlooked. To be able to 'sustainably' protect the natural areas of the EU for the future generations, such as the Romanian Danube Delta, this study aims to reflect on the rewilding practices and the possibilities for alternative nature conservation approaches more suitable to the social and political context. One of these alternative approaches is Convivial Conservation, which visions are in line with the critique scholars and locals have on the effects of rewilding practices in the Danube Delta, such as social injustice, ecotourism, increasing disconnection between human and nature and neglecting the local political context. The Convivial Conservation vision is aiming to act 'beyond capitalism' and 'towards human-nature unity' within nature conservation in the current Anthropocene. In order to help to find a more durable and context sensitive way of conserving nature in the Romanian Danube Delta, this ethnographic research examines the potential and pitfalls of convivial conservation as an alternative approach to the current nature conservation approach based on rewilding and promoted by Rewilding Europe.

Acknowledgements: Dr. Sabrina Dressel (supervisor) and Dr. George Iordachescu (co-supervisor)

Controlling eutrophication: the combined action of algaecides and a P-binder for suppressing cyanobacteria and removing phosphate from lake water and sediment

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Education level: BSc

Keywords: Eutrophication, cyanobacteria, algaecide, P precipitation, phosphate

Human interference in the environment, such as inadequate wastewater treatment, soil erosion and intensive agricultural activities continue to increase the input of nutrients in natural systems, especially nitrogen and phosphorus. This nutrient overload leads to eutrophication in water bodies, which is the leading cause of water quality deterioration globally. One of the possibilities to limit nutrient concentration is to tackle the internal load from the bed sediment. However, water managers often face the challenge of implementing this measure during ongoing algal blooms, especially those involving toxic cyanobacteria. In such scenarios, chemical precipitation of phosphate alone is not effective, since the phosphorus is already assimilated within the algal biomass. Therefore, an initial measure to suppress algae and release phosphorus from their biomass is required. This research investigates the combined effects of these two sequential measures on lake water and sediment. In phase 1, aimed at suppressing cyanobacteria, the efficacy of two substances, alone and in combination, are evaluated. These are hydrogen peroxide (an oxidant) and Poly Aluminium Chloride (PAC, an aluminium salt). In phase 2, the novel product Zeofixer®, a lanthanum-based P-binder, is used for phosphate precipitation. The experiment is currently ongoing, with results to be published on July 7th, 2024.

Pathogen Suppressiveness and Rhizobiome Dynamics in Young Vegetable Plants Grown in Biochar x EM-Amended Peat-free Substrates

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Education level: MSc

Keywords: Cress Bioassay with Pythium ultimum inoculation, Different Biochar Dosage use, Acidified Biochar, Promoting the Local Materials and Businesses, Effective microorganisms

This research focused on investigating the pathogen suppression capabilities of biochar, particularly against Pythium ultimum, in a peat-free substrate provided by a local substrate production company. The substrate comprised bark humus, coconut, wood fiber, perlite, and sand, while the biochar was primarily sourced from Thurauen forests and cuttings. Bioassays were conducted using cress in 6 cm diameter pots with 3 biological replicates and 5 technical replicates to evaluate the pathogen suppression effect. After one week, cress fresh weight was measured to assess the efficacy of suppression. Optimal Pythium ultimum concentration was determined to achieve around 50% weight reduction while allowing cress growth. Subsequent bioassays examined soil suppressiveness using various substrate combinations, including biochar, acidified biochar, and effective microorganisms (EM), against Pythium ultimum inoculum. These findings suggest that while standard biochar and EM treatments alone may not significantly affect pathogen suppression, acidified biochar shows promise as an effective amendment for controlling Pythium ultimum in peat- free substrates. Further research is needed to understand the mechanisms by which Acidified Biochar enhances pathogen suppression and to explore its potential applications in seedling propagation.

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The ELLS Prize for Excellent Master Theses, donated by the former president of the University of Hohenheim, Prof. Dr. Prof. h.c. Dr. h.c. Klaus Macharzina, honours excellent Master theses in the area of life sciences written in English language.

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