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from molecules to ecosystems

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BOOK OF ABSTRACTS

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SUBTHEME: MOLECULE

Molecule- includes all the smallest perspectives of life on earth, but also some of the most important. Changing the world starts with the smallest particles, the very beginning of all life. This subtheme includes subjects like chemistry, nanotechnology, microbiology, virology, and genetics.

Main Author: Trevisan Fabio (Speaker)

University: Wageningen University and Research Centre

Co-Authors:

- Raphael Tiziani
- Tanja Mimmo
- Robert Hall

Carbon isotope fractionation in C4 and C3 plants subjected to nutrient deficiencies

Keywords: Carbon isotope ratio, nutrient stress

Abstract:

The cultivation of crops such as barley, maize and tomato is strongly limited by soil nutrients availability, especially nitrogen (N), phosphorus (P) and iron (Fe). Literature reports numerous studies focusing on their effect at physiological level, demonstrating how these nutrient deficiencies impair the whole plant carbon cycle, therefore modifying the plants' Stable Carbon Isotope Ratio ($\delta^{13}\text{C}$). Despite this knowledge, limited research investigated the relationship between nutrient shortages and plants' $\delta^{13}\text{C}$. Moreover, these few articles focused mainly on N deficient plants. To fill this gap of knowledge the influence of P, Fe and combined P/Fe deficiencies on the plants' $\delta^{13}\text{C}$ was investigated, trying also to understand the mechanisms behind potential shifts. The $\delta^{13}\text{C}$ was measured in barley, maize and tomato plants during a two week time course thanks to an Ion Ratio Mass Spectrometer (IRMS). Simultaneously, plants stomatal conductance, thought to be the main driving factor of potential $\delta^{13}\text{C}$ shifts according to Farquhar's Model, was measured with an Infra-Red Gas Analyser (IRGA). In all plant species, the $\delta^{13}\text{C}$ decreased in the first days of the time course, with a tendency to reach a constant level towards the end of this two weeks' period. Besides this common behavior, treatments effect on $\delta^{13}\text{C}$ was strictly species- and tissue-specific with only very limited variation attributable to photosynthesis type (either C3 or C4) and/or to Fe acquisition strategy (either Strategy I or II). Combined deficiency perception was strictly species-specific as well but not tissue-specific: - P/-Fe condition behaved similarly to -P in tomato but looked like -Fe in maize. Furthermore, stomatal conductance showed a good correlation with $\delta^{13}\text{C}$ shifts in tomato plants but none with the other two crop species, demonstrating and confirming the limitations of Farquhar's model.

Main Author: Alexa-Maria Wangler (Speaker)

University: University of Natural Resources and Life Sciences Vienna

Co-Authors:

- Sophie L. Otterbach
- Sandra M. Schmöckel

Expression analysis of saponin biosynthesis genes in different tissues and developmental stages in *Chenopodium quinoa*

Keywords: Quinoa, Saponins, qPCR

Abstract text:

Quinoa (*Chenopodium quinoa*, Willd.) has been one of the most important crops in South America for thousands of years and it has gained increasing prestige in the last few decades throughout the world due to its high nutritional content. Nevertheless, quinoa seeds contain also bitter-tasting saponins that must be removed by washing or peeling before consumption. However, washing the seeds requires a large amount of water, and/or specially designed machines are needed for peeling. For this reason, quinoa accessions with a saponin content below 0.11% in the pericarp are an important focus of breeding programs.

These accessions with no or low saponins content are referred to as 'sweet'. Jarvis et al. (2017) established a reference genome and identified a gene encoding for the transcription factor TRITERPENE SAPONIN BIOSYNTHESIS ACTIVATING REGULATOR LIKE 1 (TSARL1), which is likely to regulate several saponin biosynthesis genes. Interestingly, TSARL1 is alternatively spliced in sweet accessions, which presumably leads to truncation of the TSARL1 transcription factor, which in turn might lead to the observed downregulation of saponins biosynthesis. The objective of my study is to investigate the expression of genes that are candidates for saponin biosynthesis using quantitative real-time PCR (qPCR) in bitter and sweet quinoa accessions. I test the expression in three different development stages, and tissues, such as leaves, panicles and roots. Based on preliminary analyses, genes annotated as β -amyrin synthase and one cytochrome P450s (CYP716A78) were determined to be suitable candidate genes for the analysis. They have an expression maximum in the panicle where TSARL1 is expressed. This is consistent with TSARL1 regulating saponin biosynthesis in bitter accessions.

Main Author: Tyminski Marcin (Speaker)

University: Warsaw University of Life Sciences

Co-Authors:

- Katarzyna Ciacka
- Urszula Krasuska

Reactive oxygen species (ROS) involvement in seed ageing

Keywords: apple, seeds, ageing, ROS

Abstract text:

Seeds are a carrier of genetic material and therefore the information about the appearance and condition of plants. They play a crucial role in the reproduction of plants, organism dispersal in the environment as well as in agriculture. To prevent biodiversity loss, seeds are stored in seed banks under appropriate conditions for each species. Unfortunately, even the optimal conditions do not prevent seeds from ageing and viability loss. During seed aging, a number of metabolic processes take place. All of them are related to the accumulation of reactive oxygen species (ROS). Increased concentration of ROS, followed by the inability of the cellular antioxidant system to balance redox homeostasis, lead to cellular oxidative stress.

Such conditions promote cellular damages and viability loss. The purpose of this work was to observed physiological and biochemical changes occurring in embryos of apple seeds (*Malus domestica* Borkh.) during progressive ageing. Apple seeds are the orthodox type, hence ageing processes occur relatively slow. Therefore seeds were subjected to accelerated ageing treatment, in elevated temperature, for 7, 14, and 21 days. Changes in seed embryos during aging were observed through germination tests. Overproduction of ROS was investigated through NBT staining and Rboh transcripts level measurement. Total antioxidant activity was also analyzed followed by the determination of oxidated (carbonylated) proteins level. As the ageing progresses, the vigour of the seeds has been reduced and improper germination and morphological anomalies in growing seedlings have been observed. Embryonic axes have been identified as the main place of superoxide production. Moreover, damages to the membranes caused by lipid oxidation were confirmed and measured by the determination of electrolyte leakage. The work was financed by the project 2016/23/B/NZ9/03462 of the National Science Center, Poland.

Main Author: Mikowska Karolina (Speaker)

University: Warsaw University of Life Sciences

Effect of particulate matters on *Tetranychus urticae* feeding on *Tilia cordata*

Keywords: invertebrate, PM, SD

Abstract text:

Particulate matter (PM) is currently the most common, important and dangerous air pollution. The negative effect of PM on plants and human health is already well known, on the other hand very little is known about the effects of PM on invertebrates, particularly feeding on leaves of plants, that efficiently accumulate PM. In this work the effect of PM (street dust) on the *Tetranychus urticae* adapted to feeding on *Tilia cordata* was studied. *Tilia cordata* is a tree commonly cultivated in the cities and considered as effective in purifying the ambient air from PM. The leaves of *Tilia cordata* have been covered in laboratory conditions with three levels of PM, while leaves free from PM constituted as control. It was found that PM had an effect on the overall development of the *Tetranychus urticae* individuals. PM had also an impact on female fertility and the female fertility during oviposition period, on the other hand PM had no impact on duration of oviposition period. The development of juvenile stages and the lifespan of males and females were not affected by the PM accumulation on leaves. The results obtained in this study suggest that PM deposited on the leaves of urban trees affects invertebrates living on these plants. It seems that in the future, detailed studies on the interactions between the urban tree and their inhabitants will be needed.

Main Author: Sarah de Roode (Speaker)

University: Wageningen University and Research Centre

Nuclear competition in the Basidiomycete fungus *Schizophyllum commune*

Keywords: Sexual selection, *Schizophyllum commune*

Abstract text:

Sexual selection is a much researched field in animals and plants, but less so in fungi. To better understand fungal life cycles it is necessary to understand the extent of sexual selection. With their short generation time and large population size, fungi could be ideal model systems to experimentally study sexual selection. The key system that could give an indication for sexual selection is di-mon mating, also called the Buller phenomenon. In Buller matings, two nuclei in a mated individual compete to fertilize a newly encountered individual. In this study, the Basidiomycete fungus *Schizophyllum commune* was chosen to observe competition between nuclei of a fertilizing wildtype mated individual. This was done by creating dikaryons where one nucleus expressed dominant nourseothricin resistance. These were then mated in replica with a monokaryon without resistance. In the resulting mated individuals it was assessed whether the marked or the wild-type nucleus had fertilized. This was done by assessing growth on nourseothricin medium and by microscopic examination. In almost all replicas of each di-mon mating, the same nucleus prevailed. This means that variance in mating fitness exists between the two nuclei of a dikaryon in di-mon matings. This exciting knowledge could benefit research on sexual selection. Knowing that the distribution of nuclei during di-mon mating is not random will also lead to a better understanding of the life cycle of Basidiomycete fungi.

Main Author: Daria Wilim (Speaker)

University: Warsaw University of Life Sciences

Co-Authors:

- Katarzyna Bagińska
- Julia Kaźmierska

Identification of the ARSB gene mutation in different dogs breeds - analysis in silico

Keywords: mucopolysaccharidosis VI, ARSB, MPS VI

Abstract text:

Mucopolysaccharidosis type VI (MPS VI), also known as Maroteaux-Lamy disease, is a multisystem and progressive disease of autosomal recessive inheritance. It is caused by severe arylsulfatase B deficiency due to mutations in the ARSB gene. MPS VI has been described in humans and companion animal species. In animals, the main symptoms of the disease involve the cardiovascular and skeletal systems. Dogs of breeds such as the Miniature Pinscher, Miniature Schnauzer, Toy Poodle, Welsh Corgi and The Great Dane are at risk of MPS. The aim of this study was to find functional links between the ARSB protein and other proteins, to design molecular assays to identify carriers of mutant alleles of the gene under study. The STRING v.11.0. program (<https://string-db.org/>) was used for in silico analysis of the predicted ARSB protein function links, Primer 3 program was used to design specific starters, the BLAST program was used to compare wild-type and mutant alleles, and the NEBcutter V2.0. program (<http://nc2.neb.com/NEBcutter2/>) was used to visualize mutations. Mutations in their determinant genes result in different types of mucopolysaccharidosis. The association between ARSB and GUSB protein was 0.958, and between ARSB and IDUA was 0.945. A score close to 1 indicates a high association between them. The literature survey identified three mutations within the ARSB gene such as c.G>A in Miniature Pinscher, Miniature Schnauzer (Raj et al., 2020), c.103_124del in Toy Poodle (Jolly et al., 2012) and c.295C>T in The Great Dane (Wang et al., 2017). A primer sequence for amplification of the studied sequence and a restriction enzyme (NgoMIV) that cuts only the wild-type sequence and cuts the sequence with the c.103_124del mutation were proposed. Visualization in a 2% agarose gel in the presence of the Lambda-HindIII Digest marker will easily identify carriers of the mutant allele.

Main Author: Griep Jet (Speaker)

University: Wageningen University and Research Centre

The Chronicles of Narna: characterization of a newly discovered mosquito-associated narnavirus in the invasive Asian bush mosquito, *Aedes japonicus*

Keywords: *Aedes japonicus* narnavirus 1, vector

Abstract text:

The Asian bush mosquito *Aedes japonicus* originates in Northeast Asia, but is currently rapidly invading North America and Europe. *Aedes japonicus* can transmit multiple medically relevant arthropod-borne (arbo)viruses such as Zika virus and West Nile virus. Besides arboviruses, which can infect both vertebrates and mosquitoes, insect-specific viruses have also been found in mosquitoes. These viruses could potentially limit arbovirus spread by mosquitoes, and would therefore be interesting to exploit in arbovirus control methods. Recently, a novel virus, *Aedes japonicus* narnavirus 1 (AejapNV1; family Narnaviridae, genus Narnavirus), was detected in *Ae. japonicus*. The characteristics of AejapNV1 and its potential effects on co-infecting arboviruses are currently unknown. This research aimed to further characterize AejapNV1 by investigating AejapNV1 prevalence in *Ae. japonicus* mosquitoes and the possible transmission mechanism of this virus. Methods: *Ae. japonicus* eggs, larvae, and adult females were collected in Lelystad, the Netherlands. Adult females were collected with human landing catches. The adult males, adult females, and larvae were screened by reverse transcriptase PCR with primers specific for AejapNV1. Results: All of the adult males (N=19), adult females (N=24), and larvae (N=10) screened for AejapNV1 tested virus-positive. Conclusion: This research found that AejapNV1 is highly prevalent in the *Ae. japonicus* population in Lelystad, the Netherlands. AejapNV1 might be vertically transmitted since AejapNV1 was found in larvae. These findings suggest that AejapNV1 constitutes an important part of the biology of *Ae. japonicus* mosquitoes. Future research is needed to assess the potential utility of AejapNV1 in the fight against pathogenic arboviruses.

Main Author: Heidinga Noortje (Speaker)

University: Wageningen University and Research Centre

The role of systems consolidation in the differential effects of stress hormones on memory accuracy

Keywords: Stress, memory accuracy, systems consolidation

Abstract text:

The stress hormones noradrenaline and corticosterone have been shown to exert an opposing effect on the accuracy of episodic-like memory in rats. The presence of noradrenaline during a learning experience was shown to maintain memory accuracy, whereas the presence of corticosterone was observed to reduce accuracy and promote generalization of memory. In our study, we hypothesized that noradrenaline and corticosterone exert their opposing effect on the accuracy of episodic-like memory by differentially influencing a process called systems consolidation, which is the time-dependent reorganization of the memory trace from the hippocampus to the medial prefrontal cortex. We therefore aimed to establish the techniques necessary i) for assessing memory accuracy, and ii) for investigating the reorganization of the memory trace in mice. To this end, during my thesis project, I contributed to the optimization of two methods, namely the inhibitory avoidance discrimination task and the fibre photometry technique. Firstly, the inhibitory avoidance discrimination task allows for assessing memory accuracy versus generalization, but this behavioural task had not been optimized in mice prior to this study. During optimization experiments of this task we observed a high variability in memory accuracy between individuals and responses that suggested high stress levels. Such responses were not observed in earlier rat studies that used this behavioural task and indicated that the inhibitory avoidance discrimination task is not a suitable method for assessing memory accuracy in mice. Secondly, the fibre photometry technique allows for investigating systems consolidation by measuring the reactivation dynamics of learning-associated (or engram) neurons during memory retrieval in the hippocampus and the medial prefrontal cortex. We have found promising experimental conditions for recording reactivation dynamics of engram neurons in the CA1 region of the hippocampus. In the medial prefrontal cortex, our experimental conditions resulted in low recording signals and therefore require further optimization.

Main Author: Kawalski Kacper (Speaker)

University: Warsaw University of Life Sciences

Co-Authors:

- Jakub Martynow
- Patryk Bujarski
- Adrian Szczepański
- Pola Pruchniak

Investigation of the effects of xenobiotic nanoparticles and silver ions on germinal cell development in *Danio rerio*

Keywords: nanoxenobiotics, *Danio*, fertility, germinal cells

Abstract text:

Nanoproducts are a new xenobiotic which concentration in aquatic ecosystems is gradually increasing. Nowadays, the impact of silver nanoparticles on water animal's community is not fully understood. Therefore, the purpose of our analyses is to investigate the effects of nanoparticles and silver ions on germinal cells and fertility in zebrafish (*Danio rerio*). Mature zebrafish individuals of both sexes at 6 months of age were exposed to aqueous solutions of silver nanoparticles at concentrations of: 0.01; 0.05; 0.1; 0.5; 1.0 and silver ions at a concentration of 0.01 for 7 days. Fish in the control group were maintained in water without the tested xenobiotics. After 7 days of exposure, controlled reproduction of fish was carried out. Then after spawning, the fish were sedated and subjected to standard histological processing. Ovarian and testicular morphology were analysed. The study showed that high mortality was observed in groups with higher xenobiotic concentrations. Fish fecundity during spawning varied and was independent of nanoparticle concentration. Histological analyses showed that silver nanoparticles inhibited oocyte meiotic divisions in a non-linear manner. In the group of fish exposed to AgNP concentrations of 0.5; 1.0, the lowest proportion of stage 1 oocytes (20-140µm diameter) was observed.

Macroscopic changes were observed in the percentage of spermatids in fish also exposed to concentrations of 0.5 and 1.0 compared to fish in the control group. Silver nanoparticles at concentrations higher than according to expected mathematical models in the environment negatively affect the meiosis process in zebrafish gonads. The results indicate that chronic exposure to nanoxenobiotics may lead to reproductive disruption in naturally occurring populations and disruption of demographic structure in populations. This research has the potential to contribute significantly to the understanding of the environmental risks associated with the use of nanoproducts in era of intensely developing nanotechnology techniques.

Main Author: Mona Fritscher (Speaker)

University: University of Hohenheim

Genetic characterization of the gene takeout as potential link between sex determination and behavior in the honey bee *Apis mellifera*

Keywords: *Apis mellifera*, diploid drones, takeout-gene

Abstract text:

In the western honeybee *Apis mellifera* the expression of the candidate gene takeout differs between hemizygous drones, homozygous drones and heterozygous female worker bees throughout larval development. The sex determination of *A. mellifera* goes ahead with a unique phenomenon. Like in other haplodiploids, sterile diploid homozygous males can develop from fertilized eggs. However, in *A. mellifera* diploid males do not exist in nature because they are consumed by nurse bees during early larval development. The underlying molecular genetics that trigger the cannibalism of diploid drone larvae are still unknown. It is assumed that cuticular hydrocarbons (CHCs) play a role in discriminating diploid drone larvae from the other larvae. The pheromone-sensitive candidate gene takeout is part of the sex determination pathway in *Drosophila melanogaster* and is presumed to be also involved in the sex differentiation of *A. mellifera*. I performed quantitative RT-PCR to assay takeout expression of genetically decisively classified larvae throughout different larval stages of both haploid and diploid drones as well as diploid female workers to contribute to the clarification of a still unknown phenomenon. Interestingly, I found that the gene takeout gets expressed differently in all three forms of *A. mellifera* in various instants of time during early larval development. These findings will be integrated and discussed into the present knowledge of the relevant regulatory pathways.

Main Author: Bertills Mathilda (Speaker)

University: Swedish University of Agricultural Sciences

Who Calls the African Wild Dog? – De novo SNP discovery and genotyping in the *Lycaon pictus*

Keywords: African wild dog, SNP, Conservation

Abstract text:

Large carnivores, especially the African wild dog *Lycaon pictus*, are vulnerable to human-mediated changes and climate effects. As they are apex predators, they also affect lower trophic levels. Due to anthropogenic land-use changes affecting habitat, prey, and population densities, large carnivore populations are declining. Thus, accurate population demographic estimates are required for conservation efforts to sustain carnivore populations. Genetic data are of high importance when analysing population demographics as they allow the study of oftentimes cryptic effects (loss of genetic diversity, inbreeding depression, and genetic drift). As next-generation sequencing techniques advance, genetic markers as single nucleotide polymorphism (SNP) can provide key ecological information. This information can be used to implement conservation efforts to impede the negative effects on populations. The aim of this study was to develop a highly informative SNP panel through de novo SNP discovery and genotyping in the non-modeled African wild dog, *Lycaon pictus*. A total of 74 autosomal high-qualitative SNP markers were validated and 83 individuals were identified. The validated SNP markers in this study can be included in a final panel of 96 SNPs of high quality with autosomal SNP markers, mitochondria markers, and Y-chromosome markers. A final panel can provide a foundation for further research on relatedness, parental linkage, dispersal patterns, population size estimates, and the discovery of cryptic effects.

SUBTHEME: ORGANISM

Organism- is an individual; a human being, an animal, a plant, or maybe a robot? The organism is built up of smaller parts and operates on its own or within a community. This subtheme includes biology, medicine and health, chemistry, economy, engineering, food science, biotechnology, how the environment impacts the individual being.

Main Author: Ganga Raju Naveen Kumar (Speaker)

University: University of Hohenheim

Co-Authors:

- Sophie L. Otterbach
- Sandra M. Schmöckel

Investigating physiological effects of abiotic stresses in 'sweet' and 'bitter' quinoa (*Chenopodium quinoa* Willd.) accessions

Keywords: Quinoa, Saponins, Abiotic Stresses

Abstract text:

Quinoa is an Andean food crop currently gaining popularity worldwide because of its nutritional importance and ability to adapt well in marginal lands and in wide agro-climatic conditions. One main constraint of quinoa production is post harvest removal of saponins from seeds because of their bitter and anti-nutritional properties. A major breeding target is quinoa with no or low saponin content (called sweet). Many factors are thought to affect saponin levels, including the availability of water, nutrients, light irradiation, during the developmental stage of plants. We investigate the physiological responses in sweet and bitter quinoas upon abiotic stresses. Sixty quinoa accessions including two different ecotypes are used in a field experiment, among them 29 accessions are of sweet type and 31 are of bitter type. Data on physiological parameters such as stomatal conductance, tissue greenness, leaf gas exchange, photosynthetic capacity are recorded periodically during crop growth stages along with the relevant meteorological data to monitor for naturally occurring stress events, such as heat and drought stress. We may also be able to identify those quinoa accessions which perform well in abiotic stress conditions and have a low saponin content at the same time, which may be suitable for use in future breeding programs.

Main Author: Chuang Edward (Speaker)

University: University of Hohenheim

The Phylogenomics of *Chenopodium quinoa* and related species

Keywords: Quinoa, Phylogenomics, Allotetraploid, SNP

Abstract text:

Quinoa (*Chenopodium quinoa*) is an allotetraploid crop with subgenomes denoted as A and B. In 2017, a reference genome of quinoa was published along with a phylogenetic tree of 19 accessions representing the American tetraploid *Chenopodium*. That phylogenetic tree supports the hypothesis of polyphyletic domestication of the crop. However, there is still some room for improvement in that phylogenetic tree that could be further investigated. In this study, publicly available data were utilized to investigate deeper into the phylogeny of quinoa. Firstly, phylogenetic trees of all tetraploids are produced based on the SNP data with RAxML and BEAST. Based on some further analyses, the original sample (SRA ID: SRR4300210) used in 2017 is suspected of being contaminated by one of the other ancestral tetraploids. Secondly, sliding window phylogenetic analysis was performed to investigate the gene flow or introgression between the domesticated tetraploids and their wild relatives. The result indicates that introgression happened more often in the A subgenome than in the B subgenome. Thirdly, the phylogenetic trees treating the tetraploids as separate diploid subgenomes were produced. The result of the diploid phylogeny is a little bit different from the tetraploid phylogeny. One of the *C. hircinum* accession, BYU 566, was positioned differently in the different phylogenies. Finally, the divergence time and the hybridization time were estimated by a phylogenetic approach using BEAST. Based on the estimated date of sugar beet (*Beta vulgaris* L.) - spinach (*Spinacia oleracea* L.) divergence, it is estimated that the two subgenomes differentiated around 9.708 million years ago and hybridized around 1.3171 million years ago to form the allotetraploids. To sum up, the information obtained from this study provides insight into the evolutionary history of quinoa. Our result is more supportive of the hypothesis of monophyletic domestication.

Main Author: Chączyńska Magdalena (Speaker)

University: Warsaw University of Life Sciences

Application of ultrasound and pulsed electric field in the osmotic dehydration process of fruits and vegetables

Keywords: osmotic dehydration, ultrasound, PEF

Abstract text:

Osmotic dehydration (OD) is an important process in food technology that extends the shelf life of food products. OD is applied as pre-treatment before drying or as a single process. It is widely used especially in the fruit and vegetable industry due to the seasonality. The osmotic dehydration method has a lot of advantages (e.g. energy efficiency, quality features, stability of the product during storage, avoiding addition of chemical substances, packaging and distribution cost reduction) but the process is time-consuming. For this reason, innovative technologies, such as ultrasound (US) or pulsed electric field (PEF), aimed at improving the effectiveness of OD are recently researched and developed. US and PEF combined with osmotic dehydration accelerate the mass transfer during osmotic dehydration as well as during drying due to the changes in structure in cell membranes. Moreover, ultrasound positively affects physical and chemical properties, as well as bioactive compounds and microbial aspects, when proper parameters will be chosen. Additionally, US and PEF can cause a reduction of loss of flavour, colour, and valuable nutrients. The aim of the study is to determine the impact of US and PEF on the OD process. The mechanisms of the osmotic dehydration process and pre-treatments (US and PEF) will be presented and the influence of US and PEF pre-treatments on the efficacy of the OD process as well as the quality of the obtained food products will be described.

Main Author: Matys Aleksandra (Speaker)

University: Warsaw University of Life Sciences

Co-Authors:

- Małgorzata Nowacka
- Katarzyna Rybak
- Dorota Witrowa-Rajchert
- Artur Wiktor

Influence of ultrasound on color and antioxidant activity of mushrooms dried by various methods

Keywords: food, drying, pre-treatment, sonication

Abstract text:

Vegetables and fruits, majority of which are sold seasonally, contain a large amount of water. Therefore, producers are seeking drying methods that would extend the shelf life of such food. From their perspective, apart from obtaining longer-lasting products, the economic side is also important - they aim to reduce production costs. Consumers, on the other hand, are guided by the visual and nutritional characteristics of food. A solution that addresses these issues may be ultrasound, which, by causing the phenomenon of cavitation, may shorten the drying time and, as a result, improve the quality of the obtained dried materials. The aim of this study was to analyze the effect of ultrasound used as a pre-treatment before three types of drying (convective, microwave and infrared) on the color and antioxidant activity of mushrooms. The experiment was designed using the response surface methodology (RSM), with two variable factors at three levels. Factor A was the time of sonication (10-30 min), whereas factor B was the parameters characteristic for a selected drying method: air temperature for convective drying (55-85°C), microwave power for microwave drying (100-300 W) and distance from the source of infrared emitter (10-30 cm) in infrared drying. The sonication applied before drying reduced the brightness of the obtained dried mushrooms and increased ΔE . Microwave-dried mushrooms turned out to be the darkest ones, and showed the greatest total color difference (ΔE) compared to the fresh material. The highest values of the L^* parameter were recorded in the convective drying method. It was observed that the application of ultrasound led to obtaining materials with a higher share of red and yellow colors, which may indicate a more intense browning reaction during drying preceded by ultrasound pre-treatment. Moreover, in most cases, ultrasound reduced the antioxidant activity of the obtained dried mushrooms.

Main Author: Alicja Barańska (Speaker)

University: Warsaw University of Life Sciences

Co-Authors:

- Celińska Katarzyna

Optimization of strawberry juice concentrate spray drying at high and low temperature

Keywords: strawberry, powder, spray drying

Abstract text:

The aim of work was to preserve the strawberry juice concentrate by spray drying to produce free-flowing powder. Innovative low temperature spray drying at inlet air temperature 80-120°C was compared to conventional high temperature spray drying at inlet air temperature 160-200°C. Low drying temperature was possible due to the application of dehumidified air (maximum humidity 0.5 g/m³) as a drying medium. Maltodextrin was used as a drying carrier necessary to make possible powder production. The effects of inlet air temperature and the concentrate content in the feed solution (and the resulting powder) were analyzed as influencing the independent variables: drying yield, water content and activity in powders, the overall color difference and the content of anthocyanins. The new low-temperature method allowed to obtain strawberry powder of decreased carrier content. The content of strawberry concentrate in powder after innovative spray drying was as high as 80% of solids, while after conventional spray drying the maximum 60% was possible. Powders after drying at lower temperature had higher water content, but the water activity was still low (below 0.2), providing storage stability. The overall color difference between feed solution and reconstituted powder was lower after drying at lower temperature, indicating lower rate of browning reactions. Moreover, the anthocyanins content in powders was higher when low temperature was applied. Thus, in general it can be concluded that the new innovative method of spray drying allowed to obtain strawberry powders of enhanced nutritional value.

Main Author: Schwalm Henning (Speaker)

University: University of Natural Resources and Life Sciences, Vienna

The role of root and rhizosphere traits in phosphorus efficiency of upland rice

Keywords: Rice, Phosphorous Efficiency, Root, Rhizosphere

Abstract text:

Phosphorus (P), an essential plant nutrient, is mainly obtained from non-renewable resources which has led to a perturbation of P cycle with subsequent environmental risks like eutrophication. In the future, P scarcity could limit plant production and aggravate food security challenges. High P efficiency (PE) of rice (*Oryza sativa* L.), which is a staple food for more than half of the world's population, could be crucial to reduce P fertilizer demand while maintaining sufficient crop yields, especially in low- input upland rice systems. Previous studies have shown that upland rice genotypes differ in PE independent of specific morphological parameters such as characteristics of root hairs and root system size. Furthermore, it has been suggested that cell wall related-properties and mobilization from inorganic sources by pectins are involved in rice P remobilization efficiency. This work aims to investigate root and rhizosphere traits potentially responsible for a high PE in rice. We hypothesize that high PE under low P availability is driven by (i) different quality and quantity of root exudates and/or by (ii) differences in root cell wall properties. Therefore, we will grow four rice genotypes with contrasting PE and root hair properties (DJ123 - high PE, high root hair length and density (RLD); Nerica4 - low PE, low RLD; Santhi Sufaid - high PE, low RLD; Sadri Tor Misri - low PE, high RLD) in semi-hydroponic systems under low P and high P conditions. Root exudates and root cell wall material will be collected at two time-points in order to test whether spatio-temporal dynamics of rhizosphere traits can be related to different P efficiencies among rice cultivars. Our findings will contribute to a better understanding of the underlying mechanisms of high PE in rice and help improve crop selection in sustainable agriculture.

Main Author: Pązik Sabina (Speaker)

University: Warsaw University of Life Sciences

Analysis of the possibility of using hemp oil cake

Keywords: hemp seeds, oil cake, baking

Abstract text:

Currently, hemp oil is a very popular product. Pursuant to Polish law and EU law, industrial hemp belongs to plants of the hemp species, in which the content of the Δ^9 -tetrahydrocannabinol compound is below 0.2% by dry weight. Therefore, hemp seeds are completely healthy and not addictive, so you can add them to food. Unfortunately, due to the Polish law, it is impossible so far. Hemp oil cake obtained from hemp seeds in the oil pressing process is characterized by a high protein content. About 65% of hemp proteins are globulins and 35% albumin, which are valuable ingredients for the human body. Fat is also an important ingredient obtained in hemp oil cake. Among polyenic acids, essential fatty acids dominate: linoleic acid belonging to the n-6 family and fatty acids belonging to the n-3 family - alpha-linolenic acid. The aim of the study is to use the by-products of hemp oil pressing to increase the nutritional value of bakery products such as bread. The hemp seed oil cake obtained after the pressing process was used for the project. An attempt was made to add husked and unshelled seeds in the amount of 5%, 10%, 15% to wheat bread. Before adding the oil cake to the bread, it was tested for fat and protein content. In the obtained products, the organoleptic characteristics of the bread, the firmness of the bread crumb and the texturometric characteristics - double compression were assessed and analyzed. In addition, an assessment of consumer acceptance was also carried out.

Main Author: Cowland Morten (Speaker)

University: University of Copenhagen, Faculty of Science

Micronutrients in hydroponics - utilisation of micronutrients in hydroponically grown tomato with organic fertiliser versus inorganic fertiliser

Keywords: micronutrients, hydroponics, organic inoculum biochar

Abstract text:

A growing world population and ongoing urbanisation leads to more people living in the cities. This contributes to urban farming, including hydroponics, being in a rising trend. With hydroponics you can decrease nutrient leaching as well as save water and area. It can also provide fresher vegetables and herbs with more flavour than otherwise for the city dwellers. Some of the downsides to hydroponics is its great energy consumption if artificially lightened and that the most successful systems use inorganic fertiliser, which has a great impact on the environment and climate in the mining phase. The purpose of this project was to investigate the use of organic fertiliser instead of inorganic with a focus on micronutrient availability. *Solanum lycopersicum* subsp. *gemini* (tomato) was grown under five different treatments: inorganic fertiliser; organic fertiliser where the nitrogen amount equals the inorganic; double dose of organic fertiliser; single dose of organic fertiliser with aquarium water as inoculum; phosphorus deficient organic fertiliser with the same nitrogen amount as the inorganic, but with biochar added, so the amount of phosphorus was the same as for the single dose of the organic fertiliser. In the experiment, the plants grown with organic fertiliser had lower shoot biomass than the inorganic treatment. Analytical concentrations showed micronutrient deficiency for the organic treatments, but the decline in biomass could not be fully explained by that. With the addition of inoculum, the uptake of Zn, Cu, and Mo increased, but analytical concentrations still showed deficiency for Mn and Zn and maybe also Fe, B and Cu. With the addition of biochar, the uptake of Fe, Mn, and Zn increased, while analytical concentrations showed deficiency for B and Cu. The possible deficiencies in the organic treatments were most likely because of inaccessibility for Fe, B, Mn, and Zn but not for Cu.

Main Author: Schepers Lara (Speaker)

University: Wageningen University and Research Centre

Is there an optimal form of exercise to improve health? Exploring the role of PGC-1 α in the effects of exercise on inflammation

Keywords: exercise, inflammation, PGC-1 α , NF κ B

Abstract text:

The burden of noncommunicable diseases (NCDs) is rising worldwide. Several studies have shown that a chronic 'low-grade' systemic inflammation plays an important causal role in the development of these diseases. Physical activity is known to suppress this inflammatory process by inducing the expression of the peroxisome proliferator-activated receptor- γ coactivator (PGC-1 α). This provides an important evidence-base for the beneficial effects of physical activity on prevention and management of NCDs. However, it is far less clear to what extent specific forms (aerobic/strength/concurrent), intensities and durations may provide benefits over others. This narrative review examined the PGC-1 α -mediated effects of regular physical activity on systemic levels of the inflammatory markers TNF α , IL-6, IL-1, IL-1ra and CRP. Moreover, the impacts of different forms of physical activity on the inflammatory markers are compared. In response to exercise-induced PGC-1 α , the myokine profile released into the circulation by the skeletal muscle is mitigated towards a more anti-inflammatory pattern.

Consequently, an altered cytokine release by adipose tissue, skeletal muscle, vascular endothelium and gut microbiome reduces levels of low-grade systemic inflammation. Besides for the myokines IL-6 and irisin, insight in exercise-induced myokines is scarce. An important area for future study is to determine the complete PGC-1 α -mediated myokine profile, to get a more complete overview of the anti-inflammatory effects of physical activity. Focus in this research should be on the myokine release regulated by NF κ B, since the NF κ B pathway plays a crucial role in the regulation of inflammatory processes. Although some studies show a preference for concurrent exercise to reduce systemic levels of inflammatory markers, these do not yet provide convincing directions for a most effective form. Thus, further research and extensive meta-analyses are required to conclude which exercise type, intensity, duration and frequency has the greatest impact on low-grade systemic inflammation.

Main Author: Utri Zofia (Speaker)

University: Warsaw University of Life Sciences

Co-Authors:

- Głąbska Dominika

Does increasing salmon intake help maintain vitamin D status in young Polish women in the autumn season

Keywords: women, fish, intervention, vitamin D

Abstract text:

Background: Fish products are the main dietary source of vitamin D, but due to a low fish intake in the majority of European countries, an inadequate vitamin D intake is common, especially in the vulnerable group of young women for whom it is essential for the osteoporosis prevention. Aim of the study: Assess the efficacy of a salmon intake intervention on maintaining vitamin D status in young Polish women during the autumn season, in which in Poland there is not enough sunshine exposure to generate skin synthesis. Material and methods: The dietary intervention comprised eight weeks of daily consumption of 50 g of Atlantic salmon and was conducted in a group of 47 women aged 20–30 years. Within the study, their changes of total serum 25-hydroxyvitamin D (25(OH)D) levels were analyzed and the effectiveness of the intervention depending on age, body mass index (BMI), and baseline 25(OH)D were assessed. Results: After 4 weeks of the intervention the median 25(OH)D decreased from 57.1 nmol/L to 39.9 nmol/L ($p < 0.0001$). Nevertheless, after 4 more weeks of the intervention it increased to 54.1 nmol/L ($p = 0.0005$), contributing to results not differing from the baseline ($p = 0.7964$). At the same time, the share of respondents characterized by an inadequate vitamin D status increased until the 4th week, but afterward decreased until the 8th week ($p = 0.0002$). Neither the age, nor the BMI influenced 25(OH)D during the study, whereas the baseline 25(OH)D was correlated with the BMI ($p = 0.0419$; $R = -0.2980$). The baseline 25(OH)D was associated with its levels during the intervention, as well as with 25(OH)D change from the baseline values ($p < 0.0001$). Conclusions: In spite of the initial decline of the 25(OH)D observed, afterward the salmon intake intervention contributed to its increase.

Main Author: Bergmann Marie

University: University of Copenhagen, Faculty of Science

Co-Authors:

- Klausen Mia Bundgaard
- Meteran Howraman Andersen
- Jens Rikardt
- Holm Lotte
- Jensen Jens-Ulrik Stæhr

Loss of Appetite in Patients with Chronic Obstructive Pulmonary Disease: A Descriptive and Qualitative Study with a Mixed Method Approach

Keywords: COPD, clinical nutrition, appetite, disease

Abstract text:

Rationale: Loss of appetite in patients with Chronic Obstructive Pulmonary Disease (COPD) can lead to malnutrition and unintentional weight loss, which is associated with an increased risk of morbidity and mortality. Aims: 1) To identify COPD-related factors associated with loss of appetite and 2) to explore COPD patients' experience of appetite and eating problems through individual qualitative interviews. Methods: Council on Nutrition Appetite Questionnaire (CNAQ) is validated to examine loss of appetite in older adults and in patients with chronic disease. A CNAQ-score ≤ 28 is defined as loss of appetite. A questionnaire was posted in a COPD-specific online forum including questions on demographics, BMI, smoking, civil status, number of homemade meals, FEV1% predicted, history of exacerbations, COPD Assessment Test (CAT) and CNAQ. 10 patients were randomly recruited for semi-structured phone interviews to explore the patient's own experience regarding appetite and eating. Results: 87 patients (65 females) responded to the questionnaire; mean age 64.6 ± 7.5 , median BMI 26.3 (range 16.4- 45.4), 17% current smokers and 69% former smokers. The mean CAT-score was 20.5 ± 6.5 and the mean CNAQ-score was 26.5 ± 4.9 . 53 patients had loss of appetite. A higher CAT-score (23 vs. 17.5, $p < 0.001$), lower FEV1% predicted (30.5 vs. 42.0, $p = 0.03$), living alone (68% vs. 32%, $p = 0.02$) and getting all meals delivered (19% vs. 0%, $p < 0.01$) were associated with a loss of appetite. Social contact, severity of disease, physical activity, daily routine, support, and knowledge about nutrition were identified as influencing the patients' appetite and eating patterns during interviews. Conclusion: Severity of disease (high CAT-score and low FEV1 %), living alone and a need for meal delivery were associated with a loss of appetite. Lack of physical activity, social contact, daily routine, support and knowledge about nutrition lead to appetite and eating problems in COPD patients.

Main Author: Posluszny Martyna (Speaker)

University: Warsaw University of Life Sciences

Verification of the Utility of Chicken Isolated Intestine Specimens for Gastrointestinal Motility Studies

Keywords: chicken, isolated intestine, smooth muscle,

Abstract text:

Numerous infectious and non-infectious diseases in chickens disturb gastrointestinal (GI) motility. GI symptoms has been very little studied in birds so repeatable and reliable model for in vitro experiments would be very useful and ethically acceptable. Materials and method: Chicken intestines were collected from routinely slaughtered birds (*Gallus gallus domesticus*) what provide that tissue was healthy and 3R rule (Replacement, Reduction and Refinement) was kept - the animals were not killed for the experiment. Samples were taken both proximally and distally to Meckel's diverticulum.. The segments of chicken intestine (minimum from five different animals) were transported to the university laboratory immersed in ice-cold (0 – 4°C) William's E medium. Modified Krebs-Henseleit solution was used as an incubation medium. Each strip were suspended separately in individual chambers. They were proximally connected to an isometric force transducer and distally attached to an inflexible hook. During the experiments the reactivity was measured as changes in tension. The motor activity of the samples was recorded by Chart v7.0 program. All data went through critical statistical analysis. The experiments included the evaluation of smooth muscle response to a contractile (acetylcholine) and myorelaxant (isoproterenol) substance, as well as the stability of motoric activity over long-term incubation. Results: Acetylcholine and isoproterenol caused significant, dose- dependent reaction on isolated chicken jejunum smooth muscle preparations. The effective dose varied depending on the jejunum segment. Both proximal and distal parts were proven to sustain their viability and stability over 5 hours long incubation period. Conclusion: Isolated chicken intestine specimens are useful tools for preclinical in vitro motility studies.

Main Author: Gbenjo Oluwadamilola (Speaker)

University: Warsaw University of Life Sciences

Co-Authors:

- Babatunde Olayemi

Distribution and population density of nematodes species associated with leafy vegetables grown in selected extension villages in Odeda Local Government, Ogun state

Keywords: Nematodes, Leafy Vegetables, Population, Distribution

Abstract text:

A survey was conducted to determine the types, distribution and population of plant parasitic nematodes associated with the soils and roots of leafy vegetable in Federal University of Agriculture, Abeokuta (FUNAAB) extension villages in Odeda local government, Ogun state using random sampling for soil and root. Extraction of plant parasitic nematode from the soil was done using Modified Baerman technique; Extraction tray method (Whitehead and Hemming, 1965) while extraction of eggs was done using Sodium hypochlorite method (Hussey and Barker, 1973). The extraction was carried out in Crop Protection Laboratory, College of Plant Science and Crop Production, Federal University of Agriculture, Abeokuta (FUNAAB). Frequency and density of each species were highly variable from village to village and within the fields. Seven genera of plant parasitic nematodes were encountered in the three villages (Agbetu, Eweje and Idera). Plant-parasitic nematodes recorded were *Meloidogyne* spp., *Hemicycliophora* spp., *Tylenchulus* spp., *Longidorus* spp., *Pratylenchus* spp., *Radopholus* spp., *Paralongidorus* spp. *Meloidogyne* spp., *Hemicycliophora* spp. and *Tylenchulus* spp., were the most widely distributed in the three villages with relative frequency of 41.4%, 31.9% and 8.5% respectively in soil samples. *Meloidogyne* spp was recorded to be the most predominant with a mean population of 118.00 (Garden egg), 73.67 (Celosia), 69.69 (Amaranth), 555.67 (Jute mallow) and 50.00 (Fluted pumpkin). Chlorosis, necrosis, galled root, stubby root and stunted growth were the observed symptoms associated with the leafy vegetables.

Main Author: Loy Adrian (Speaker)

University: University of Natural Resources and Life Sciences Vienna

Co-Authors:

- Reimoser Sonja
- Rummel Hanna

Can you run from UV radiation? Personal UV radiation exposure while jogging

Keywords: UV, radiation, jogging

Abstract text:

Personal ultraviolet radiation (UVR) exposure is related to various atmospheric parameters as well as orientation of the exposed skin, which in turn mainly depends on personal behavior. The quantification of human UVR exposure is therefore a complex issue. Thus the UVR exposure during different activities has to be studied individually. There are recent studies which researched personal UV radiation exposure during various occupational and leisure activities. However research regarding the UV exposure while jogging has yet to be made. This paper aims to fill this knowledge-gap by answering the following research question: How high is the erythemally weighted irradiance on potentially exposed body parts while jogging in Vienna during summer? The method used to answer this question can be divided into two sections. A literature research was made to build the theoretical base. The main part of the research paper is the collection of primary data of personal UVR exposure. For this, twelve miniature electronic personal irradiance meters called "SunSaver" were placed on the research-relevant body parts of a volunteer while performing the research activity in each of the cardinal directions (N-S,S-N, W-E, E-W) for 30 seconds. The measurement frequency of the dosimeters was programmed to 1 point of data per second. The collected data shows the highest erythemally weighted irradiance is measured on the shoulders and forearms, while only low-to medium irradiance is measured on the upper arms, thighs and calves.

Main Author: Łożyńska Katarzyna (Speaker)

University: Warsaw University of Life Sciences

Diet and the severity of acne in adolescents

Keywords: acne, diet, adolescents, dietetics, skin

Abstract text:

The aim of the study was the analysis of the relationship between diet and the severity of acne vulgaris and the quality of life due to acne among adolescents. Secondary schools from Poland were randomly selected and principals were invited to participate in the study by their schools. The study included an online questionnaire including the CADI Questionnaire (Cardiff Acne Disability Index) and the Food Frequency Questionnaire, which was completed by young people at the turn of May and June 2021. 36 people were included in the statistical analysis, including 24 girls and 12 boys aged 14-19, who correctly completed the questionnaires and gave their informed consent to participate in the study and also provided the consent of their parents/ legal guardians. The relationships between the measurable features were examined using the Spearman's rank correlation coefficient (nonparametric distribution). A statistically significant positive correlations were found between the consumption of refined grains and the declared degree of acne severity ($R=0.3847$; $p=0.0205$) and between the consumption of salty snacks and the declared avoidance of social relations due to acne ($R=0.3648$; $p=0.0264$), while negative correlations were found between vegetable consumption and negative emotions related to acne ($R=-0.3421$; $p=0.0412$), between consumption of milk products and avoiding social relations due to acne ($R=-0.3626$; $p=0.0274$), between consumption of milk products and negative emotions related to acne ($R=-0.3395$; $p=0.0398$), between consumption of milk products and the severity of acne ($R=-0.4654$; $p=0.0037$), between consumption of milk products and the sum of points obtained in the CADI Questionnaire ($R=-0.3656$; $p=0.0260$). In this study, higher consumption of vegetables and dairy products were associated with lower acne severity, while higher consumption of refined grains and salty snacks were correlated with higher acne severity.

Main Author: Blaauw Samirah (Speaker)

University: Wageningen University and Research Centre

Does alcoholism have an intergenerational effect? Investigating the genetic background of alcoholism in *C. elegans*

Keywords: Ethanol exposure, *C. elegans*, genetics

Abstract text:

Over three million people die annually as a result of excessive and repetitive drinking of alcohol. Alcoholism has an environmental and genetic component, as well as an interactional gene-environment aspect that is influenced by genetic background. However, this genetic component is still largely uncharacterised. *C. elegans* and humans share molecular EtOH processing pathways and similar EtOH phenotypes; therefore, *C. elegans* is a suitable model for alcoholism on a behavioural and genetic level. The effects of EtOH exposure were investigated, as well as differences in genetic background between two highly divergent wildtype *C. elegans* strains (N2 and CB4856). We studied EtOH preference in both exposed and non-exposed parental (F0) generation and their offspring (F1) by looking at chemotaxis and differential gene expression patterns in the F1 generation. When assayed directly after exposure, the chemotaxis showed a repellent effect of EtOH on the CB4856 F0 generation and an attractant effect on the N2 F0 generation. When assayed 20 hrs after exposure and including the F1 generation, the chemotaxis assay showed opposite results, with an attractant effect of EtOH on the CB4856 strain and a repellent effect on the N2 strain. Gene expression analysis of the F1 of both naïve and EtOH exposed parental *C. elegans* showed 13 thirteen differentially expressed genes (DEGs) between the two strains. These genes clustered in two distinct gene ontology groups. One group involved the neurocognitive adaptations and chemosensory/nociception mechanisms regarding EtOH exposure, expressed in motor and dopaminergic neurons, chemosensory/nociception mechanisms. The other group regarded the absorption, processing and metabolism of EtOH, expressed in the pharynx, hypodermis, cuticle and digestive tract. In conclusion, the results imply that EtOH preference is influenced by genotype, abstinence time, and a generational effect. There is also a clear generational genetic component based on the DEGs found during the gene expression analysis.

Main Author: Michalik Monika (Speaker)

University: Warsaw University of Life Sciences

Molecular identification of sex in monomorphic breeds and species of birds

Keywords: sex, birds, CHD1 gene

Abstract text:

Many bird species do not exhibit sexual dimorphism, which makes sex identification very difficult. Therefore, molecular techniques based on Polymerase Chain Reaction (PCR) began to be used for gender identification. One of them is the method using specific primers, allowing the amplification of the CHD1 gene. The aim of this study was to propose molecular tests enabling unambiguous identification of sex at the molecular level in selected species of bird. In this study, biological material collected from Hooded crow (*Corvus corone*), Common magpie (*Pica pica*) and Euroasian jay (*Garrulus glandaris*) (from the bird sanctuary in the Municipal Zoological Garden in Warsaw) were used. Birds examined by a veterinarian were considered healthy and their death was caused by a very poor physical condition. The genetic material was isolated from the bird tissues using a commercial kit GeneMatrix Tissue & Bacterial DNA Purification Kit (EURx). The difference in intron length of the CHD1 gene between the Z and W chromosomes helped to determine the sex. The column method was applied to isolate the genomic DNA from the birds' hearts and the CHD1 gene was then amplified by PCR using the P2/P8 primers. The products were checked by electrophoresis on a 2% agarose gel in the presence of ethidium bromide. Clearly visible differences in the length of CHD1-Z and CHD1-W were obtained. One band was observed in males and two bands in females. The obtained results are the first scientific report on the molecular test successfully enabling the identification of sex in the two of three studied species using selected primers.

Main Author: Filipek Aleksandra (Speaker)

University: Warsaw University of Life Sciences

Co-Authors:

- Kołpak Magda
- Górecka Weronika
- Osypiuk Julia

Identification of MDR1 gene mutation in domestic dog (*Canis lupus familiaris*) – in silico study

Keywords: MDR1, domestic dog, P-glycoprotein, mutation

Abstract text:

Gene MDR1 codes transport protein known as P-glycoprotein, which can be found in cell membranes of blood vessel walls and is responsible for proper transportation and binding of xenobiotics, such as toxins and drugs, present in blood. The MDR1 mutation involves a deletion of 4 base pairs from 230 to 233 nucleotides in exon 4. This mutation causes malfunction of P- glycoprotein and makes affected animals more sensitive to the negative neurotoxic effects of certain drugs. In animals with MDR1 mutation blood-brain barrier doesn't work properly and xenobiotics from bloodstream can easily enter the brain. The aim of the study was a proposal for a molecular test identifying the MDR1 gene mutation in domestic dog. The wild type sequence DQ068953, obtained from GenBank database, was used to determine the „mutant” type sequence. Based on data from the newest publications and studies it was possible to establish the molecular basis of this mutation. The NebCutter v2.0 was used to find the restriction enzymes that cleave DNA into fragments at the site of mutation. Subsequently, we designed primers for PCR, using programme Primer3 (v.0.4.0), to create more specific test for mutation identification. Based on the results of the in silico analysis performed we proposed restriction enzyme AluI to cut the 300 bp product of the PCR and electrophoretic separation on 2% agarose gel. After electrophoresis we received 2 or 3 bands in agarose gel depending on product sequence. In healthy animals the number of bands was 3, whereas in animals with mutation the result was 2. Edge confidence MDR1 protein with other proteins was determined using String v.11.0 program. The results of our analysis indicate that the procedure can be used to identify animals with mutation. Proposed procedure can be carried out in any laboratory with basic equipment.

Main Author: Tejera Sindi (Speaker)

University: University of Copenhagen, Faculty of Science

Co-Authors:

- Lecocq Antoine
- Amora Deisy
- Vitt Meyling Nicolai

Development of a bioassay to assess biopesticide effects of *Bacillus thuringiensis* strains using the meal worm beetle *Tenebrio molitor* as a model insect

Keywords: *B.thuringiensis*, Biopesticide, Bioassay

Abstract text:

Bioinsecticides based on microorganisms are valuable alternatives for agricultural insect pest control, to promote the development of a more sustainable food chain. The bacterium *Bacillus thuringiensis* (Bt) is the most broadly used microbial insecticide, thanks to its genetic diversity. However, experimental evaluation of Bt strains against different insect targets are very time and space consuming. Thus, an efficient screening method to elucidate the potential effect of a Bt strain is essential for selecting the most suitable strain for commercial use. A novel Bt with a putative repellent effect, and one Bt strain with a known insecticidal effect were used to develop the screening assays. The evaluated parameters were: (1) mortality, (2) moulting, (3) food consumption, (4) biomass gain, (5) aversion, and (6) time to pupation, in larvae of the mealworm, *Tenebrio molitor*, as well as (7) the presence of Vip and Cry genes. Different pilot experimental setups were performed to assess the previously described parameters, and later three standardized experimental setups were selected and replicated. The experiments included at least two concentrations of both Bt strains. The novel Bt strain did not appear to have any straightforward insecticidal effect and we could not confirm the presence of Vip or Cry genes. However, an increase in larval biomass gain, food consumption and faster pupation rates compared to both control and known Bt strain treatments were observed. Finally, we discuss our results in the context of the current limitations of laboratory bioassays. Indeed, it has been suggested that this novel Bt strain could have a repellent effect through the production of volatile metabolites. However, such effect could be dependent on the bacteria's endophytic relationship with a crop, providing protection otherwise undetectable in a lab setting with bacteria suspended in a buffer.

Main Author: Wierzchowska Katarzyna (Speaker)

University: Warsaw University of Life Sciences

Co-Authors:

- Fabiszewska Agata
- Zieniuk Bartłomiej
- Nowak Dorota

Yarrowia lipolytica yeast - a multifunctional tool in microbial oil collection

Keywords: Yarrowia lipolytica, microbial lipids, waste

Abstract text:

Oleaginous microorganisms show the ability to accumulate lipids in their cells in the amounts exceeding 20% cell dry mass. The lipids stored inside the microbial cell are called single cell oils (SCO). The valuable properties of microbial oils due to content of polyunsaturated fatty acids give hope for their industrial use as beneficial nutrients. One of the most intensively studied species of oleaginous yeast is *Yarrowia lipolytica*. The yeast is characterized by the ability to utilize a variety of carbon sources, both simple sugars and more complex compounds e.g. triacylglycerols. In order to increase the cost-effectiveness of the microbial oil production, it is necessary to take into account factors that affect its efficiency. Critical cultivation factors include the composition of the medium used, such as carbon and nitrogen sources. Considering increasing human population, the environmental impact should be considered during planning the microbial culture for oil extraction. Waste materials can be utilized as low-cost source of carbon for biotechnologically useful microorganisms. The aim of the study was to evaluate the influence of the method of carbon source preparation by its hydrolysis, the intensity of oxygenation of the culture and the level of inorganic nitrogen source limitation on the yield and properties of microbial oil synthesized in *Y. lipolytica* KKP 379 yeast cells in media containing oily waste from fish frying process. The regulation of oxygenation during yeast batch cultures (by maintenance the level of medium oxygenation at the level not lower than 20% of its initial content) allowed to obtain the highest content of lipids in yeast cells (0.431 g oil/g d.m.). A twice increase in the concentration of the nitrogen source in the culture medium resulted in a lower lipid biosynthesis yield by about 30%. Regardless of cultivation parameters, the yeast strain preferentially accumulated oleic acid and linoleic acid.

Main Author: Kmetkova Diana (Speaker)

University: University of Copenhagen, Faculty of Science

The impact of income on the share of animal-based protein in the diet

Keywords: sustainable diet, animal protein, EKC

Abstract text:

Dietary choices are one of the main causes of mortality and environmental degradation. Plant-based diets, in comparison to diets rich in animal products, are considered to be more sustainable because they use fewer natural resources and come with less environmental burdens. However, the rapid increase in global population and wealth has led to increased demand for foods of animal origin. Getting enough protein might be one of the reasons people consume animal products but its increased consumption could negatively impact our health and environment. It is therefore important to analyse what affects the amount of animal products consumed. Hence, the aim of this thesis is to assess the economic and other socio-demographic factors that influence the share of animal-based protein in the diet. Specifically, the impact of income on the share of animal-based protein out of total dietary protein is evaluated to verify whether it resembles the relationship as it can be seen in the Environmental Kuznets Curve. In order to answer the research question, a comprehensive analysis of the past trends and the current state of sustainable diets as well as the inspection of the externalities related to increased consumption of animal products were made. After that, an econometric analysis of panel data was conducted in R using data from FAOSTAT, UN and OECD databases. Several model specifications were tested on three different subsets of entities (global, representative and EU) using Fixed Effects. The findings across all three of the subsets suggest that GDP as well as its square term are significant, meaning that the relationship resembles an inverted U-shaped curve. The turning point for the global analysis was estimated to be 42,597\$, implying that countries with GDP per capita greater than 42,597\$ would experience on average a decrease in the share of animal protein as their GDP increases.

Main Author: Sobień Magdalena (Speaker)

University: Warsaw University of Life Sciences

Histological analysis of the habenula in paradise fish (*Macropodus opercularis*)

Keywords: fish histology, brain, habenula

Abstract text:

In recent years, a lot of research has been conducted to understand the factors that influence animal behaviour. In all vertebrates, the central nervous system (CNS) is involved in the processing and generating of information. The identification and description of its particular parts allow for the understanding of the morphological and functional basis of animal behaviour. One of the structures involved in emotional control and behavioural coordination is the habenula - a small, paired fragment of the CNS that is highly conservative in all vertebrates and is located between the forebrain and hindbrain. This region has recently been shown to be responsible for the processing of pain, fear and circadian rhythm not only in mammals but also in fish. Furthermore, in many species, genes encoding proteins that participate in the control of reproduction have been identified. The suborder in which unusual behaviours during the reproductive strategies and parental behaviour are observed is the Anabantoidei fish. Among many species of the Anabantoidei fish, the paradise fish (*Macropodus opercularis*) deserves special attention. So far, it has been the subject of behavioural studies, in which the habenula and CNS have not been identified. To understand the molecular basis of reproductive behaviour, one should begin with analyzing the structure responsible for processing this type of information. For this purpose, the brains of juvenile paradise fish were collected before the maturation and then subjected to histomorphological analyzes. The conducted analyzes showed that the structure of habenula is similar to Teleostei fishes consisting of two parts, probably corresponding not only to fish habenula tract but to mammals too.

Main Author: Muhammad Firdaus (Speaker)

University: Wageningen University and Research Centre

Co-Authors:

- G.D.P. Konnert
- W.J.J. Gerrits
- S.W.S. Gussekloo
- J.W. Schrama

Water temperature alters white muscle fibre recruitment and growth in juvenile Nile tilapia

Keywords: Tilapia, temperature, muscle, hyperplasia, hypertrophy

Abstract text:

Fish myotomal muscle accounts for up to 60% of total fish biomass. Consequently, the overall growth potential of fish is determined by muscle growth. Muscle growth occurs via two distinct mechanisms: recruitment of new muscle fibres (hyperplasia) and enlargement of existing fibres (hypertrophy). The dynamics of the two mechanisms can be affected by many factors. Water temperature might be the most influential since it strongly affects fish metabolism. In Nile tilapia, knowledge about temperature effect on muscle growth is limited. The present study investigated the effect of two water temperatures (24 and 32°C) on Nile tilapia muscle growth. In addition, fish were fed restrictively (-Res) or to apparent satiation (-Sat) to correct for temperature effect on the feed intake. The experiment consisted of a 37 days growth trial with three treatments (24-Res, 32-Res, and 32-Sat) and four replications. The 32-Sat group had significantly higher feed intake, resulting in significantly higher body weight and growth than the two restricted treatments that received equal feed intake. Following histological size analysis of the muscle fibre composition, fish subjected to 24°C water temperature had significantly smaller fibres and higher fibre density ($P < 0.05$), along with a numerically higher number of fibres than treatments at 32°C. Moreover, the proportion of small muscle fibres ($< 30 \mu\text{m}$) was higher at 24°C, while the proportion of large muscle fibres ($> 40 \mu\text{m}$) was higher in both 32°C treatments ($P < 0.05$). Although treatment 24-Res and 32-Res had comparable growth and protein deposition, muscle growth in both treatments occurred via different mechanisms. A stronger hyperplasia mechanism was observed in treatment 24-Res, while the 32-Res group had dominant hypertrophic growth. In the 32-Sat group, both muscle growth mechanisms coincided. This result demonstrated that temperature and feeding level were potent muscle growth regulators in juvenile Nile tilapia.

Main Author: Pruchniak Pola (Speaker)

University: Warsaw University of Life Sciences

Co-Authors:

- Bujarski Patryk
- Martynow Jakub
- Szczepański Adrian
- Kawalski Kacper

Do silver nanoparticles have effect on sex development in fish

Keywords: xenobiotics, guppy, gonads, sexual dimorphism

Abstract text:

Metal nanoparticles are a new xenobiotic whose concentration in open waters is gradually increasing. To date, the impact of silver nanoparticles on aquatic ecosystems is not fully understood. Therefore the aim of this study was to evaluate the effect of silver nanoparticles on phenotypic traits related to sexual dimorphism and morphology of guppy gonads. Fish at day of birth were divided into five groups. In four experimental groups, fish were exposed to xenobiotics: silver nanoparticles at a concentration of 0.01; 0.05; 0.1 ;1.0 mg/L and silver ions at a concentration of 0.01 mg/L. Fish in the control group were breeding in water without the any xenobiotics. After 60 days, guppies were anaesthetised, collected and fixed according to a standard histological procedure. Histological slides were made and histomorphometric measurements were taken. Results showed changes in ratio of sex in the guppy population and delayed formation of sexual dimorphism among fish. These changes were dependent on exposure to the tested xenobiotics. Compared to the control group, a statistically significant lower survival rate was observed in groups of fish exposed to silver ions and silver nanoparticles at a concentration of 1.0 mg/L. As the concentration of silver nanoparticles increased to a concentration of 0.1 mg/L, an increase in the proportion of individuals with phenotypically indeterminate sex was observed. In addition, a decrease in the percentage of matured males was observed in the experimental groups. At higher concentrations, the proportion was constant. Microscopic analysis did not reveal any histopathological changes. The analyses performed suggest that the analysed xenobiotics do not cause pathological changes, however, they have a delayed effect on the development of secondary sexual dimorphism traits and delay the attainment of sexual maturity. These changes may have consequences for the age structure of fish populations longterm exposed to nanoxenobiotics in aquatic ecosystems.

Main Author: Biemans Ynte (Speaker)

University: Wageningen University and Research Centre

Multimodal prehabilitation to improve functional capacity and postoperative outcomes in sarcopenic colorectal cancer patients

Keywords: Sarcopenia, Cancer, Surgery, Nutrition, Exercise

Abstract text:

Background: Sarcopenia, the age-related progressive muscle disorder characterized by loss of muscle mass, strength and function, is frequently present in colorectal cancer (CRC) patients undergoing surgical resection. Studies demonstrated the link between sarcopenia and several poor postoperative outcomes, including increased complications, recurrence rates, length of stay and lower chemotherapy tolerance and survival. Nutritional and exercise interventions in the preoperative phase may improve physical condition and treatment efficacy in sarcopenic CRC patients. Aim: To evaluate the efficacy and feasibility of preoperative nutritional and exercise interventions in sarcopenic colorectal cancer patients. Methods: A literature review was performed using Medline, Pubmed, Scopus and Google Scholar, which retrieved studies on prehabilitation in CRC patients undergoing surgery. Results: This review found evidence for the anabolic effects of (whey) protein, leucine and vitamin D. Especially in combination with exercise, these nutritional factors may enhance muscle mass, muscle strength and functional capacity in sarcopenic CRC patients. In addition, immunonutrition was shown to accelerate recovery of intestinal function after CRC surgery and to reduce postoperative complications and length of hospital stay. Improvements in physical condition and treatment efficacy of CRC patients can be achieved by a 4-week prehabilitation program. Conclusion: A 4-week preoperative trimodal approach consisting of nutritional support (whey protein, leucine, vitamin D and immunonutrition), personalized exercise programs and psychological support may improve muscle health and postoperative well-being in sarcopenic CRC patients. Large prospective trials are needed to investigate the feasibility and long-term effectivity of prehabilitation in clinical practice.

Main Author: Franceković Paula (Speaker)

University: University of Copenhagen, Faculty of Science

Waking up a scientific sleeper – our vascular gatekeeper

Keywords: nutrition, glycocalyx, chronic disease prevention

Abstract text:

The vascular system is covered with an endothelial glycocalyx (eGC), a layer of glycans and glycoconjugates that protects the endothelial cells much like the walls protect the castle from intruders. Glycans are complex carbohydrates essential for the existence of all living organisms but are vastly less researched than nucleic acids, proteins and lipids. In homeostatic conditions, the eGC serves as an endothelial cell gatekeeper, controlling the permeability and adhesion properties of endothelial cells, as well as vasodilatation of the blood vessels. It has also been suggested that it acts as a sodium buffer.

Pathogenic destruction of the eGC is related to vascular comorbidities of chronic diseases such as atherosclerosis, obesity, type 2 diabetes and metabolic syndrome. Prevention of eGC destruction in chronic conditions might be a new niche for scientists, especially nutrition scientists, as well as medical workers in practice. However, the relationship between diet and lifestyle and restoration of eGC is an unexplored territory. I wish to provide an overview of eGC and describe perspectives of nutritional therapy for the prevention of eGC's pathogenic destruction. Vitamin D supplementation, Mediterranean diet and time management of eating might be promising treatments for preserving eGC health. In secondary prevention, folate supplementation might be beneficial.

Main Author: Goedhart Nienke (Speaker)

University: Wageningen University and Research Centre

The YoYo effect: investigating the adipocyte's metabolic and inflammatory response to weight cycling

Keywords: weight-cycling, inflammation, metabolism, adipocyte, obesity

Abstract text:

The most effective approach to reduce obesity-associated complications, including cardiovascular disease and type 2 diabetes, is to lose body fat. A crucial factor in the development of obesity-associated complications is the presence of inflammation in the fat tissue. Every year 42% of the obese population tries to lose weight. Alarming, most individuals regain bodyweight after initial weight loss, commonly known as weight cycling or 'the YoYo effect'. Fluctuations in body weight are accompanied by repetitive changes in fat cell size and thus lipid droplet content. Fat cells shape their function based on size, thereby influencing crucial metabolic activities such as energy storage but also the secretion of hormones and inflammatory factors.

Previous research suggests weight cycling might incrementally compromise the metabolic health of the fat tissue. However, the underlying mechanisms remain to be elucidated. Therefore, in this study, we aimed to unravel the fat cells' metabolic and inflammatory response to weight cycling-induced changes in size. To achieve this, we established an in vitro weight cycling model, manipulating glucose availability with a double cycle of glucose restriction and refeeding. The first weight cycle appeared to enhance the conversion of glucose to lipids by showing increased fatty acid synthase expression. In the second cycle, however, glucose handling, indicated by hexokinase 2 expression, did not increase which could be a sign of insulin resistance. Notably, inflammatory levels were maintained throughout the second cycle, suggesting weight cycling to induce persistent inflammation of the fat tissue. These findings support the presence of "obesity memory", possibly causing weight cycling to worsen obesity-associated complications compared to previous episodes of obesity. With this study, we present novel mechanistic insights into the potential consequences of weight cycling and provide a starting point for follow-up research on related mechanisms and whole-body metabolic consequences.

Main Author: Szczepański Adrian (Speaker)

University: Warsaw University of Life Sciences

Effect of selected plant extracts rich in saponins on the motoric activity of bovine gastrointestinal tract

Keywords: saponins, duodenum, abomasum, smooth muscle

Abstract text:

The aim of this study was to determine the effect of saponin-rich extracts from *Yucca schidigera* and *Trigonella foenum-graceum* on the motoric activity of bovine gastrointestinal tract. Intensive livestock production requires the use of numerous nutritional additives. In the case of cattle, a large group of plant feed additives are plant extracts that have the ability to modulate fermentation processes in the rumen. Taking into account the specific anatomical structure and physiology of the digestive tract of cattle, special care should be taken to ensure that feed additives do not interfere with gastric and intestinal motility. The analyzes were performed on bovine isolated duodenal and abomasal smooth muscle specimens under isometric condition. The dissected sections were placed in incubation chambers filled with modified Krebs-Henseleit buffer at 37°C continuously carbonated with carbogen. Muscle contraction was visualized using Chart software (v.7.0, ADInstruments, Sydney, Australia). Statistical analysis was performed using Excel (Microsoft Office 2007) and Statistica (v.10.0). The results showed significant prokinetic effect of both tested extracts. Administration of the extracts (0.001 - 1 mg/ml) caused intensification of acetylcholine-induced contractile reactions of the abomasum and duodenum, which suggests that the use of the tested extracts should not increase the risk of disorders, such as abomasums volvulus or displacement.

Main Author: Sotomayor Sainz Alejandra (Speaker)

University: Wageningen University and Research Centre

Maladaptive cognitive biases associated with obesity: Presence in a large and diverse population

Keywords: Obesity, Cognitive bias, Public Health

Abstract text:

Obesity is one of the most pressing global public health concerns of the 21st century. A cognitive bias in human spatial memory has been suggested to drive the unhealthy eating behaviour that causes the disease. When searching for food, human memory was demonstrated to automatically prioritize finding high-calorie foods, likely reflecting the dietary strategies of our hunter-gatherer ancestors in food insecure environments during the Palaeolithic. High-calorie foods such as snacks and fast food are therefore cognitively high-priority items in human memory while navigating food environments and foraging. This vestigial cognitive bias was proposed to have become maladaptive in modern obesogenic food environments by promoting stronger habits of purchasing high-calorie foods and subsequently higher BMIs. To fully understand the relevance of this phenomenon for future public health interventions, we must therefore explore whether the cognitive bias towards high-calorie foods is present at large in the population. An online spatial memory task which revolved around locating pictures of high- and low-calorie foods in a map was completed by 405 Dutch participants from different demographic groups. Participants consistently exhibited a better accuracy when locating high-calorie foods compared to their low-calorie food counterparts.

These results were expressed equally among sociodemographic groups, and were irrespective of the taste of the food, the participant's hedonic evaluations and familiarity with the foods, or their hunger state while performing the experiment. Our findings further reinforce the notion that modern humans are universally affected by a cognitive mechanism shaped by Palaeolithic dietary priorities that has become maladaptive in modern obesogenic environments by facilitating eating behaviours associated with obesity. The fact that the cognitive bias for high-calorie foods could be replicated in a large and diverse sample population suggests that it is a significant phenomenon that could be taken into consideration during future public health interventions aiming to curb obesity.

Main Author: Marta Dadun (Speaker)

University: Warsaw University of Life Sciences

Co-Authors:

- Ewelina Pierzecka

Cardiological complications related to BOAS syndrome in French Bulldogs

Keywords: brachycephalic, French bulldogs, cardiology

Abstract text:

The aim of this presentation is to emphasise the problem of growing population of brachycephalic dogs such as French Bulldogs and its consequences in their health conditions especially those related to both cardiovascular and pulmonary systems. Although in some countries, because of healthy reasons, breeding of brachycephalic dogs has been banned, in Poland there is still a growing demand on French Bulldogs. Thus, there appears a problem of inbreeding and putting phenotype features before health conditions. All those actions lead to BOAS (Brachycephalic Obstructive Airway Syndrome) which characterises in stenotic nares, enlarged tongue, elongated soft palate, everted laryngeal saccules. Those conditions are non- physiological in dogs and can result in significant upper airway obstructions like inspiratory dyspnea, soft tissue edema, turbulent airflow, inspiratory noise, and even death. They lead to permanent hypoxia, which results in an increase of blood pressure in pulmonary circulation- pulmonary hypertension. In consequence we observe cor pulmonale with overload of the right ventriculium and its pathological hypertrophy which has a lot of side effects. The BOAS problem in French Bulldogs seems to be a vicious circle, some steps ought to be taken to either improve the cardiological and general health conditions or ban the breeding of French Bulldogs in Poland.

SUBTHEME: COMMUNITY

Community- is the interaction between organisms, meaning anything from the interaction between a parasite and its host to human societies to robot-human interaction. This subtheme includes engineering, social sciences, economy, entrepreneurship, natural resource management, food and consumption, urban and rural development, agriculture and land use, forestry, food security, medicine and health.

Main Author: Huber Sabine (Speaker)

University: University of Natural Resources and Life Sciences, Vienna

The impact of a combination of management practices on soil organic matter accumulation and soil fungal communities in a Hungarian maize cropping system

Keywords: agriculture, SOM, C sequestration, microorganisms

Abstract text:

Approaches to improve soil organic matter (SOM) accumulation increasingly gain importance in sustainable agriculture to both enhance soil fertility and improve carbon (C) sequestration to offset greenhouse gas emissions. This master thesis aims to test the impact of combined management practices, including reduced tillage and application of manure that was treated with commercial microbial additives, on SOM accumulation and soil fungal communities in a maize cropping system. First, we investigated soils from two arable fields (conventional management, humus build-up) in Pusztaszabolcs, Hungary. Samples were taken down to 160 cm depth and analyzed for physicochemical and microbiological properties. Second, the microbial composition of the additives was tested via cultivation and high-throughput sequencing. Thirdly, short-term effects of the microbial products on SOM accumulation claimed by the manufacturer were examined in a 10-week lab pot experiment with different substrate mixtures (sand, compost, microbial additive) and documented by a time-lapse video. The change of management practices in the humus build-up field led to a substantial increase in soil organic C and total N-stocks, fungal biomass, and improved water storage. Surprisingly, altered physicochemical characteristics between the two fields did not change fungal community composition. Soil depth seemed to have a much greater impact than management since we found a shift in fungal community at roughly 120 cm depth. Microbes contained in the microbial additives comprised of species commonly found in soils, which is why their rediscovery in the arable field was not possible with the applied methodology. We argue that the microbial additives work as a compost starter accelerating maturation of manure treated with these products. Improved nutrient supply may have indirectly increased root exudation, and associated promotion of microbial metabolism might be the reason for enhanced SOM accumulation, especially in the subsoil.

Main Author: Fischbach Martine Ernestine (Speaker)

University: University of Hohenheim

Biological control of the early blight disease caused by the fungus *Alternaria solani* in tomato

Keywords: Biocontrol, *Solanum lycopersicum*, endophytes, screening

Abstract text:

Early blight (EB), mainly caused by the fungus *Alternaria solani* Sorauer, is among the most prevalent and devastating diseases limiting the production of tomato (*Solanum lycopersicon* L.) worldwide. A common strategy to fight against EB is the use of synthetic fungicides. However, fungicide resistance in pathogen populations, environmental risks and consumer demands increase the need for alternatives, such as biological control (BC). In this study, fungal endophytes (FEs) isolated from healthy tomato leaves (ecological approach), the fungus *Clonostachys rosea* IK726 known for its potential to reduce diseases in different crop plants and Prestop, a commercial BC product, were tested in planta for their ability to reduce the EB disease severity (DS) expressed as percentage of leaf area covered with EB symptoms. Several experiments with whole tomato plants grown in a growth chamber were conducted. Among the tested FEs, isolate *Cladosporium cladosporioides* FE3A applied as spore suspension on tomato leaves prior to the pathogen inoculation was most effective. It was able to highly significantly reduce the DS on treated leaves seven days after the pathogen inoculation (p -value = 0.0087). The difference between the mean DS of control plants only inoculated with *A. solani* and of plants treated with FE3A equaled 40.2% (95% CI = [15.5, 65.0]) corresponding to an average percent decrease in DS of 60.9%. A foliar application of *C. rosea* IK726 spores four days before the pathogen also led to a significantly lower DS seven days after the pathogen inoculation (p -value = 0.02) with an average percent decrease of 52.6%. A preventative application of Prestop did not significantly affect the DS on tomato leaves. The findings from this study highlight the potential of two fungi in reducing the EB disease severity in tomato and of finding new BC agents against plant diseases using an ecological approach in screenings.

Main Author: López Carretero Pablo (Speaker)

University: University of Copenhagen, Faculty of Science

Hairy Mary: Mobility of two aphid predators as affected by plant surface and aphid attraction in medicinal cannabis

Keywords: interaction, insect-trichome,-medicinal cannabis

Abstract text:

Production of medicinal cannabis (*Cannabis sativa*) is a blooming sector and biological control programs are crucial for its success, as pesticides are not allowed in medicinal crops. Performance of natural enemies on plant surface regarding its different types of trichomes was assessed. Aphids are a main pest to this crop. *Phorodon cannabis* (Passerini) and *Aphis gossypii* (Glover) are two aphid pests widely spread among medicinal cannabis farms. In the study two candidate aphid predators were assessed: *Chrysoperla carnea* (Stephens) and *Aphidoletes aphidimyza* (Rondani). Mobility on the surface of different plant parts was the most important factor considered. *C. sativa* has six described trichome types, comprising non-glandular trichomes and glandular trichomes. Predator-prey interaction as affected by plant was assessed as well and the results in *C. sativa* leaves were compared with the behaviour in bell pepper plants (*Capsicum annuum*) which have smooth leaves. Highest density of glandular trichomes was in the reproductive plant parts. Non-glandular trichomes did not reduce the mobility of aphid predators. However, sticky conditions produced by the secretions of capitate-stalked glandular trichomes, and capitate-sessile glandular trichomes in low proportion, triggered a reduction of the mobility of both natural enemies in reproductive parts of *C. sativa*. While *A. aphidimyza* performed well as a predator in vegetative parts, *C. carnea* also performed well in flowering medicinal cannabis plants. However, mobility and predator success were reduced as *C. sativa* flowers matured and the density of capitate-stalked glandular trichomes increased. Finally, the method of release of predators onto plants can affect their success, and oviposition performance of *A. aphidimyza* on the plant as well as capacity of young *C. carnea* larvae to climb the stem were studied. Overall, the implications of the gathered results for biological control programs are discussed, included relevant further experiments and optimization of scenarios needed to be implemented.

Main Author: Gopinathan Gopika (Speaker)

University: University of Natural Resources and Life Sciences, Vienna

Evaluation of durum wheat cultivars, breeding lines and landraces for Fusarium head blight resistance and its association with anther extrusion

Keywords: Durum wheat, Fusarium, Anther extrusion

Abstract text:

Sustainable crop production requires growing of disease resistant cultivars, which can withstand attacking pathogen. Breeding for disease resistance is not trivial as resistance donors must be identified and used as crossing parents for breeding regionally adapted varieties. Durum wheat is tetraploid and is the second most cultivated wheat worldwide with an annual production of 36 million tons. Fusarium head blight (FHB) is a fungal disease that results in losses of yield and even more importantly losses of quality through contamination of the crop with mycotoxins such as deoxynivalenol (DON) that is a threat for food safety.

Durum wheat is highly susceptible to FHB and resistance breeding is difficult due to lack of proven resistance sources in its primary gene pool. This study ascertains to discover genetic variation for FHB resistance in a panel of 'exotic' and 'native' durum wheat accessions. A total of 1260 field plots have been planted at the experimental farm of BOKU in Tulln. Plots have been spray-inoculated with a *Fusarium culmorum* conidia suspension and kept moist with mist-irrigation. FHB severity is assessed by visually rating the symptoms such as bleaching of spikelets in a time frame of 10-26 days post anthesis. Distinct characteristics of anther retention (anthers held within the spikelet) and trapped anthers (partially extruded anthers trapped between lemma and palea) is determined 4-8 days post flowering. Generally, plant height, anther extrusion and FHB resistance are highly correlated. Hence, it is assumed that anther extrusion can be used for indirect phenotypic selection. My results will be essential to prove this hypothesis. The field evaluation is ongoing. At the SSC my results on variation for Fusarium resistance, its association with plant height and anther retention will be presented. The relevance of my results for future breeding of high quality and healthy durum wheat cultivars will be discussed.

Main Author: Mäder Philipp (Speaker)

University: University of Hohenheim

Small-scale investigation of the microbial community and enzyme activity in a DO13C flowcell experiment on undisturbed top- and subsoils

Keywords: Microbial community, PLFA, Enzyme activity

Abstract text:

With increasing soil depth, the biotic and abiotic habitat conditions change, affecting the microbial community in its abundance and activity. While these dynamics have been well studied in topsoils, studies concerning the subsoil only started to reveal processes and interactions in deeper soil layers. These studies focused on the general differences between the two compartments on larger scales, whereas small-scaled investigations are rare. Therefore, this study aimed to investigate the microbial community and the enzymatic activity of the β -glucosidase in two undisturbed topsoil and their corresponding subsoil columns on a centimetre scale. The soil zymography method was used to determine the enzymatic activity as well as to determine their hotspots. The microbial community was characterised using the PLFA analysis and group-specific incorporation of DO13C-derived C was investigated with the ^{13}C -PLFA analysis. The first hypothesis of a depth dependant gradient in the microbial abundance from the top- to the subsoil could be proven as well as a depth dependant gradient of the microbial abundance within the top- and subsoil, respectively. Differences in the group specific ^{13}C incorporation proved the second hypothesis and were linked to group specific substrate preferences following differences in the substrate quality. A decreasing activity of the β -glucosidase with increasing depth confirmed the third hypothesis. The distribution of hotspots in the enzymatic activity reflected the microbial activity in the topsoil, while the abundance of enzyme producers might have had a greater impact on the distribution of hotspots in subsoils. The results suggest strong interactions between the different parameters where the microbial community is affected by the SOC and the added substrate leading to an increased enzyme activity and consequently a higher incorporation of DO13C-derived C. The small-scale investigation highlighted the heterogeneity of the soil and visualized differences not only decimetres apart, but on the centimetre-scale.

Main Author: Girard Anne-Laure (Speaker)

University: University of Natural Resources and Life Sciences, Vienna

Phenotypic and genotypic analyses of a European winter wheat panel for resistance against Fusarium head blight

Keywords: Fusarium, European wheat, disease resistance

Abstract text:

Fusarium Head Blight (FHB) is one of the major diseases threatening wheat production in the world. Fusarium, not only induces decrease in yield but it also produces mycotoxins which are toxic for human and animal. To stick to the growth of the population wheat production need to be secured and increased. Using resistant cultivars -in an integrated strategy- is the most efficient and sustainable way to achieve it. For the moment, the most common approach to deal with FHB is based on fungicide and crop management, those technics are not enough to avoid epidemics. FHB is closely linked to environmental conditions and agricultural practices (conservation tillage). Moreover, the resistance of Fusarium is of a quantitative nature, which means that the accumulation of several loci with a small effect will lead to a durable and efficient resistance. Several phenotypic traits and Quantitative Trait Loci (QTL) have been recognized, mainly in exotic lines, as being associated with a higher resistance to FHB. In my master thesis I utilize a panel of 230 regionally well adapted European winter wheat breeding lines or cultivars to investigate the correlations between plant height, anther extrusion and flowering date with resistance to FHB. I am scoring these traits in a replicated and artificially inoculated field experiment comprising 460 field plots at the experimental farm of BOKU in Tulln, Austria. The data will be combined to the genotypic information (25 thousand single nucleotide polymorphism markers) to identify QTL associated with resistance of FHB and with morphological and developmental traits. Thus, we will know which traits and QTL are present in locally adapted cultivars which have good agronomic performances. My results will yield important insights for designing future resistance breeding programs. My experiments are in progress and all results will be ready for presentation during the ELLS SSC.

Main Author - Harshnakumari Kalsinhbhai Bhabhor (Speaker)

University: Czech University of Life Sciences, Prague

Factors Influencing Consumer Behaviour Towards Indian Restaurants Among Indian Community and Non-Indian People (the case of Prague)

Keywords: Consumer Behaviour, Indian restaurants, Ethnic restaurants, Indian Community

Abstract:

The aim of the thesis is to determine the most important factors that affect consumers' choices of Indian restaurants serving India food in Prague. Indian community in Prague and those who are not members of this community (non-Indian people in Prague) will be investigated. The thesis does not only determine the factors but also investigates how these factors influence the consumers. The thesis firstly conceptualises the discourse existing in academic literature concerning factors affecting consumers behaviour towards ethnic restaurants and outlines what factors (and how) are conceptualized when studying the behaviour of the consumers in restaurants (preferably with the focus on Indian restaurants). The research is underpinned by the triangulation of two kinds of methods. Firstly, content analysis analyses the menus of Indian restaurants in Prague accessible through their web pages to create a typology of Indian restaurants in Prague (mostly the type of cuisine, level of prices and localization in Prague), secondly the survey among two samples (Indian community and non-Indian community in Prague) aiming and detecting the weak and strong factors or positive and negative factors influencing their consumer behaviour towards Indian restaurants in Prague.

Main Author: Sandra Sikkema (Speaker)

University: Wageningen University and Research Centre

In Dust We Trust, shaping drifting dune dynamics in the North Holland Dune Reserve

Keywords: Nature-based solutions, water management, governance

Abstract text:

The focus of this MSc thesis is to analyse how the Dutch coastal dune ecosystem of the North Holland Dune Reserve (NHD) can become more dynamic and ecologically diverse while maintaining its key landscape functions. The NHD serves as a water safety measure against the sea, drinking water infiltration area, habitat for a large species richness, and a recreational area. Both the regional water authority and the managing body for drinking water and nature management work on a vision for dynamic dunes. Yet, the exact criteria of where drifting sand, inborn to a dynamic dune system, is allowed are still unclear. This study has summed the criteria for drifting dunes in the NHD, from the interests of drinking water and local ecology. For nature, the main interest is to enhance the natural landscape forming processes inherent to the essence of dunes. Those processes can be achieved by making excavated notches in the fore-dune or removing vegetation, so that bare sand areas interacting with wind can create more drifting sand within the dunes. For drinking water, safeguarding the continued supply of drinking water, and no drifting sand in the infiltration ponds is key. Moreover, the height and weight of the sand on the water pipes and wells is important to consider before realizing notches in the fore-dune that could bring in large amounts of sand. Furthermore, considering the factors of water safety, geomorphology and sand nourishments, new strategies for a dynamic dune landscape in the NHD were proposed. Factors as pre-sorting on increasing climate change, sea-level-rise, drier or wetter weather patterns, and the restructuring or movement of assets, are included. Concluding, an overview of strategy pathways on different time scales is proposed to function as a roadmap of how to create a more dynamic dune landscape in the NHD. Justification: I investigate how the responsible managing institutions interact with each other to make a natural dune reserve more dynamic and ecologically diverse.

Main Authors: Gospel Ayodele Iyioku (Speaker)

University: Czech University of Life Sciences, Prague

Effect of Farmer Input Support Program on the Economic Performance of Smallholder Maize Farmers: A Case Study of Agricultural Cooperatives in Zambia

Keywords: Agricultural Cooperatives, Productivity per Fertilizer Usage, Yield, Propensity Score Matching, Sensitivity Analysis

Abstract:

Input Subsidy Programs have been receiving a great deal of recognition among farming households. These programs are means of making inputs easily available to farmers, increase their production and yield. Literature suggests that Farmer Input Support Program (FISP) might be inadequate to improve the economic well-being of smallholder farmers as the poverty rate in rural areas in Zambia (currently at 82%) has been increasing over the years. Agricultural cooperatives serve as channels for the Government of Zambia to reach and assist smallholder farmers. Even though the FISP is essentially targeted at smallholder farmers, it is claimed that only the more surplus scale farmers benefit from it. The study's main aim was to analyse the inclusion of members in farmers groups and the effect of FISP through cooperatives on their economic performance. Smallholder maize farmers and the current FISP was studied in the Western and Southern provinces of Zambia. Specifically, the study centred on assessing how cooperatives internally managed input subsidies, analysis of the determinants that influence access to FISP through the cooperative and analysis of the effect of FISP on the economic performance among beneficiaries and non-beneficiaries. A total of 370 maize farmers (218 – beneficiaries; 152 – non-beneficiaries) were selected from Monze, Pemba, Choma, Kalomo, Limulunga and Mongu districts from the two provinces. The result of the Probit regression model showed that household and farm characteristics (farm size; cooperative experience), linkages within the cooperative (share investment; active participation) and social characteristics (reciprocity of relationship) had a significant positive influence on access to input subsidy in the cooperative. The propensity scores matching algorithms for analysing the effect of input subsidy indicated that beneficiaries of input subsidy among smallholder farmers in both provinces reach significantly higher economic benefits in terms of fertilizer productivity and yield than non-beneficiaries.

Main Author: Marie Jessica Gabriel (Speaker)

University: University of Copenhagen, Faculty of Science

Causes of deforestation in the Philippines: A four decade (1980-2020) study

Keywords: deforestation, forest cover, Philippines

Abstract text:

Deforestation is one of the biggest environmental problems in the world. It affects biodiversity, ecosystem services, livelihoods, climate, and food security. It is an old ecological problem, but there is no agreement on the rate and causes of deforestation. In the Philippines, there are numerous but conflicting forest cover estimates. Also, there is no agreement on the causes of deforestation and information on contemporary causes are limited. This research aims to shed light on what is the rate and causes of deforestation in the Philippines by conducting a literature review from 1980 to 2020. This study shows that estimating deforestation rates is difficult because of the differences in methodology, data used, and forest definition in quantifying the forest cover of the Philippines. However, the sources have shown that forest cover decreased from the 1980s to the 2000s and increased from 2010 to 2020. Meanwhile, proximate causes of deforestation are primarily agricultural expansion, commercial logging, and illegal logging. On the other hand, underlying causes are mainly demographic and poverty factors; market demand and economic development factors; and governance, policy, and institutional factors. The results also revealed that the different causes are linked to each other. Temporal analysis of the causes of deforestation has shown that wood extraction decreased its importance from 1980 to 2020. Meanwhile, infrastructure extension has increasing significance from 1980 to 2020. Agricultural expansion remains to be a significant driver of deforestation throughout the study period. This study has shown that deforestation is a complex environmental problem involving multiple factors. Thus, it proposes for a solution that addresses both the proximate and underlying factors and a continuous monitoring of forest cover with standardised forest definition to enable comparison between periods.

Main Author: Busari Olayode Ibrahim (Speaker)

University: Czech University of Life Sciences, Prague

Co-Authors:

- Victor Adedeji Abiodun

Impacts of “THE EKO ATLANTIC CITY PROJECT” on the environment

Keywords: Urbanization, Coastal Erosion, Eko-Atlantic City

Abstract text:

Rapid industrialization in Lagos city has been one of the reasons for the migration of people into the city. This influx has drastically increased the city's population, thereby causing various environmental stresses and insufficient infrastructures (housing facilities in particular). Housing facilities have become so expensive that slums are now homes to some residents of the city. The vulnerability of Lagos as a coastal area also exposes the city to hazards such as storm surge, coastal erosion and flooding. The latest attempt to find a solution to the housing issue and simultaneously manage coastal erosion in the city is the reclamation of the area lost to erosion and construction of an ultramodern city on the reclaimed land. This is known as the Eko Atlantic City Project. This study evaluated the advantages of this project and the implications resulting from it on the environment based on a comprehensive review of project documents and peer-reviewed literature released by project managers, investors, and some critics of the projects. From this study, we observed that although the Eko Atlantic City project will satisfy needs for financial, commercial, and residential purposes, however, these should not be realized to the detriment of the environment. There is a need to implement a sustainable management strategy that involves adaptation to ocean water and contributes to environmental greening, which is important to decrease pollution, improves the stability of microclimate, and provide a healthy living.

Main Author: Samuel Kriegl (Speaker)

University: University of Natural Resources and Life Sciences, Vienna

Co-Authors:

- Andreas Zeitelhofer
- Luca Großegger
- Vivien May
- Eva Müller

Current challenges for the water management of Austrian golf courses

Keywords: water management on golf courses

Abstract text:

With more than 100,000 members, golf is the fifth largest sport in Austria. Spread over the whole country, there are 159 golf courses in Austria with a land consumption of about 70 hectares (ÖGV sa). A golf course has a great influence on its environment, but is also strongly influenced by it. This means that climate change has also a big impact on golf courses. While long periods of heat and drought in summer lead to burnt grass areas and a general lack of water, heavy rainfall in spring and autumn causes waterlogging and sometimes even floods. Water management is therefore becoming more and more important. The aim of this work is to find out how the water management on Austrian golf courses has changed over the last decades. The research question is: What challenges have arisen due to climatic changes with regard to the irrigation of golf courses in Austria in recent decades? In order to answer this question, the theoretical basics are explained at the beginning. Topics include basic concepts in the field of golf, golf course management and the current climatic situation in Austria. In order to find out how climatic changes affect the water management, a survey was conducted on this topic. A comprehensive questionnaire was prepared and sent to all golf clubs in Austria. Combined with the findings from an expert interview with the Austrian Greenkeeper Association the information are analysed and presented in the results section. These results show that the climate change has already a quite big impact on the water management of Austrian golf courses and that irrigation problems will probably increase in the future. In the discussion the information of the previous chapters are combined, and the different challenges to water management on Austrian golf courses will be discussed.

Main Author: Cichońska Patrycja (Speaker)

University: Warsaw University of Life Sciences

The opinion of Polish women on selected aspects of plant-based beverages

Keywords: food, beverages, preferences, consumers

Abstract text:

The plant-based beverage market is one of the fastest growing food segments; therefore, there is a need to expand the assortment of these products to meet the growing needs of consumers. This study aimed to present the opinion of Polish women on plant-based beverages, frequency of their consumption, and the possibility of extending their assortment in the market with multi-ingredient products and to examine the influence of sociodemographic factors on the answers given by the respondents. The study was conducted in 2020 among Polish women by using a survey questionnaire. The statistical method used was an univariate analysis of variance ANOVA ($p < 0.05$). It was found that sociodemographic factors influence the respondents' answers to selected questions. The study showed that the plant-based beverages most frequently chosen by the respondents are those most available in the market. The place of residence of the respondents influenced their satisfaction with the available assortment of plant-based beverages. The respondents' interest in increasing the assortment of two- or multi-ingredient plant-based beverages was limited, which may be due to the average preference of Polish consumers for innovation. The growing awareness of consumers and the increased popularity of diets excluding animal products contribute to the dynamic development of the market of plant-based products. When designing new types of plant-based beverages, consumer preferences should be considered, which will allow to understand many basic and practical aspects of the human perception of food. The present study confirms that it is important to assess the impact of individual discriminants and their combinations on purchasing decisions and food choices of consumers.

Main Author: Beach Caroline (Speaker)

University: Czech University of Life Sciences, Prague

Co-Authors:

- Jana Mazancova
- Jiri Hejkrlik

Are Cooperatives an Effective Organizational Structure for Encouraging and Supporting Women's Empowerment? Evidence from Agricultural Cooperatives in the Country of Georgia

Keywords: Economic Mobility, Gender Equality, Caucasus

Abstract text:

Agricultural cooperatives are considered suitable tools for mobilization of rural communities, particularly female farmers, in improving their livelihood towards SDGs. They have been widely supported by international donors, governments, and NGOs in the transformation of developing economies. However, several challenges need to be tackled while measuring outcomes other than the economic benefits of mainly newly established collective actions. Our paper emphasizes the contextual methodological approach of women's empowerment (WE) measurement to be incorporated in regular monitoring of the cooperative performance and consequent impact at the level of the coop members. In addition, based on the case study, it shows the possible pathways to measure WE despite the lacking WE segment in monitoring design. The case study covers 65 female respondents: 29 from agri-coops and 36 from the control group were interviewed with a structured questionnaire in Georgia in 2018. The data are approached through an aggregated three-dimensional model of WE. Georgia provides researchers with an opportunity to test the effectiveness of cooperatives as a source of women's empowerment due to its long heritage in agriculture, patriarchal culture, and recent changes in government. Cooperatives of Sub-Saharan Africa and India are of particular interest to many researchers and shed light on the topic of women's empowerment. Similar trends between gender relations and access to resources are found in Georgia, and the lack of current literature in the Caucasus region warrants further study.

Main Author: Cahyani Shassy (Speaker)

University: Wageningen University and Research Centre

How to construct and implement a nature-inclusive concept using a participatory approach and spatial data Case study: Quicksan software application for sustainable tourism development in small island developing states, Bonaire

Keywords: participatory, spatial planning, nature-based

Abstract text:

Global societies face various challenges from economics, natural resource depletion, food, water, and energy security. These challenges are intertwined with uncertain global processes, such as climate change, sea-level rise, and natural disasters. In the mainstream approach, each challenge is addressed with single expertise, such as ecologists for biodiversity depletion and economists for inflation. Nowadays, societies address these challenges using an innovative approach that elaborates nature and society to restore the environment into the original state, namely nature-based solutions. Such a concept needs an interdisciplinary and participatory approach to gather, build, and implement solutions. Often interdisciplinary collaboration is challenging for a technical solution because of different understanding and expertise to interpret issues. This research proposes a new approach with nature-inclusive design, based on early stakeholders' interview and participatory approach, spatial data availability, knowledge matrix, using spatial modeling software to analyse the data, namely Quicksan. Quicksan supports a combination of participatory approach and spatial data analysis. The software challenges the technical solution for a nature-based approach while considering different perspectives from stakeholders and experts. Literature reviews, expert discussions, data collection were implemented for data input in Quicksan. An indicator framework is used to understand the system and the integration better. A case study of tourism for small island developing states in Bonaire was investigated. Bonaire faces challenges that include managing mass tourism, population growth, erosion, fresh water in the soil, renewable energy. A nature-inclusive approach was used to create a greener and sustainable future for tourism and the environment.

Main Author: Karwacka Magdalena (Speaker)

University: Warsaw University of Life Sciences

Co-Authors:

- Gumkowska Martyna
- Janowicz Monika

The influence of carriers on the composition and chemical properties of freeze-dried vegetable snacks

Keywords: freeze-dried snacks, vegetable, chemical properties

Abstract text:

Diet is a very current topic and is often discussed both by specialists and in the world of pop culture. The symptoms of overweight and obesity occur in a growing part of the society. Worryingly, these problems are also increasingly common in children. One of the reasons for this phenomenon is easy access to fast food products and high-calorie snacks, which, combined with a low level of physical activity, gives visible results. On a global scale, we are also struggling with the problem of overproduction and waste of food, which is why it is important to design sustainable food that shows pro-health effects. The aim of the research was to compare the composition and selected chemical properties of freeze-dried vegetable snacks made with the addition of various carriers. The research material was obtained by use of green beans, carrots, potatoes as well as sodium alginate and dried apple pomace powder as carriers. The chemical composition of the obtained products was analyzed. The content of water, sugars, protein, fat, dietary fiber, and additionally also the total polyphenolic content and antioxidant activity were determined. The research showed that the products with the addition of apple pomace powder were characterized by a higher content of sugars, protein and fat compared to the variants structured with sodium alginate. The content of dietary fiber was greater than 30% in all analyzed products, and it was also significantly higher after adding apple pomace powder. The use of this additive also increased the total polyphenolic content and antioxidant activity. Based on the obtained results, it can be concluded that both the addition of sodium alginate and apple pomace powder can be used to produce foods with health-promoting properties, but the pomace powder gives better results.

Main Author: Golestani Nazli (Speaker)

University: University of Natural Resources and Life Sciences, Vienna

Digital learning and teaching for plant and tree breeding

Keywords: Plant, Breeding, Teaching materials

Abstract text:

There is no doubt about the impact of plant and tree breeding's art and science on society. Plants and trees provide food, feed, wood, fiber, pharmaceuticals, and shelter for humans. Furthermore, they are used for aesthetic and other functional purposes in the landscape and indoors. Producing enough food to feed the world's ever-increasing population has been a lingering concern of modern societies. Plant and tree breeding sciences extends from basic genetics to modern genomics, from diversity and germplasm enhancement to quantitative and statistical genetics, from pre-breeding to cultivar development including the breeding methods. Hence, on a global scale, two aspects of plant and tree breeding education and training are getting important: 1) Is education attractive enough for students to meet future needs? 2) Do students find sufficient high quality training resources to get educated for working in the different career paths in crop and tree breeding? Therefore, in this project, a systematic survey of available clear and deep web resources providing teaching materials for plant and tree breeding will be done. This includes openly accessible materials, but also anything behind a paywall or requiring sign-in credentials. After finding and assessing the materials, these will be categorized according to teaching method, topic, difficulty, academic level and rated in terms of quality. Last but not least, a web-database will be generated, with the help of an external service provider, that will allow a quality controlled one-stop shop to list, search, and access online teaching and learning materials for students and professionals. The easy digital access to learning material and a secure learning web-database environment helps and attracts students and plant and/or tree breeders to feel secure and an increase in number of students could be predictable.

Main Author: Małachowska Maria (Speaker)

University: Warsaw University of Life Sciences

Effects of Harvista™ and SmartFresh™ ProTabs on physiological state and quality of apples of Red Cap® cultivar stored in ULO conditions

Keywords: Harvista™, SmartFresh™, quality, firmness

Abstract text:

1-methylcyclopropene applied preharvest and postharvest effectively inhibits ethylene receptors, resulting in longer fruit storage without loss of fruit quality. The aim of this study was to determine the effect of pre- and postharvest application of 1- MCP on fruit drop and quality of fruits stored under Ultra Low Oxygen (ULO) conditions. Two formulations were used in the experiment: Harvista™ (150 g/ha; applied 7 days before the optimum harvesting window (OHW)) and SmartFresh™ (applied 7 days after fruit harvest). 24 groups were obtained. Fruits for storage were harvested on two harvest dates (22 September - optimum and 6 October - delayed). The apples were then stored under ULO (1.2% CO₂ : 1.2% O₂) conditions for 3, 5 and 6 months. Immediately after harvest, as well as after storage and after 7 days at 20°C, the following parameters were analyzed: internal ethylene content (IEC), firmness, titratable acidity (TA), total soluble solids (TSS) content and was performed consumer analysis. For the preharvest period, significant differences ($p < 0.05$) between the control and studied groups were observed for: IEC (lower results, for apples treated with 1-MCP), firmness (higher results, for apples treated with 1-MCP).

Postharvest application of 1-MCP inhibits ethylene secretion intensity during wholesale and retail (lower results for apples treated with SmartFresh™), both for fruit harvest in the (OHW) and delayed. For fruit evaluated after storage as well as after simulated marketing, significant differences ($p < 0.05$) between groups were noted for the control and study groups (higher results for apples treated with SmartFresh™). After 6 months of storage, consumers rated apples from combinations with both preharvest and postharvest applications of 1-MCP better than control fruit. It was concluded that preharvest application of 1- MCP doesn't maintain high fruit quality of Red Cap® cultivar during storage, additional application of 1-MCP after harvest would be desirable.

Main Author: Brignoli Paolo Libenzio (Speaker)

University: Wageningen University and Research Centre

Co-Authors:

- Alessandro Varacca
- Koos Gardebroek
- Paolo Sckokai

Machine Learning to predict grains future prices - Forecasting agricultural commodity prices using an LSTM Neural Network and traditional econometrics

Keywords: Machine-Learning, Econometrics, Forecasting, Agricultural Commodities

Abstract text:

Forecasting future prices for agricultural commodities is of extreme interest for the actors belonging to the supply chain, as operational decisions and contracts are made before the price is known. There are two possible approach to the forecasting modelling problem: adopting models that try to represent the underlying data generation process; or adopting models that try to mimic the underlying data generation process. To the first category belong the traditional models, theory-driven; while to the second category belong Machine Learning models, data-driven. In recent years, Machine Learning techniques have shown to be able to outperform traditional econometrics in prediction task. However, their adoption in agricultural economics is still hesitant, as it remains unclear how this two categories of models relates to each other. In this paper we compare the characteristics as well as the performances of traditional models versus Machine Learning models in forecasting agricultural future prices. On one hand, we found that the Neural Networks that we employ are able to outperform the traditional models on the longer forecast horizon as well as the shorter forecast horizon; on the other hand, we find that the same Neural Network are not able to pick up crucial time-elements such as a trend or seasonality. Moreover, we find that the optimization of the hyperparameters leads to a decrease of the performance of the forecasts when applied on non-stationary dataset. The evidence gathered in this paper supports a wider adoption of Machine Learning models in agricultural economics given their performance and characteristics, rather than a replacement of the traditional model. Since there is still large room for improving both the pre-processing of the datasets as well as the training of the neural networks, the next challenge is to optimize these two procedures to fit the needs and interest of the agricultural economics sector.

Main Author: Koenig Georg-Wilhelm (Speaker)

University: University of Natural Resources and Life Sciences, Vienna

Understanding the quality of exotic coffee: More than just a souvenir? The case of Gran Canaria, Spain

Keywords: quality-attributes, convention-theory, coffee, primary producers

Abstract text:

Sustainable value creation is a challenge that must be tackled by primary producers of coffee worldwide. The value of coffee is not connected to its material quality only, but foremost to symbolic attributes, like a story or a trademark, and in-person- services, that require a direct end-consumer contact. Both are very hard for primary producers to capture. The composition and interpretation of these attributes changes along the value chain. This thesis understands quality conventions as outcomes of social processes/collective choice and social constructions. They can be either implicit (informal rules, values) or explicit (institutions setting written standards). Conventions coordinate the interactions of independent economic actors. The thesis' aim is to grasp how chain actors in Gran Canaria understand quality attributes and the underlying quality conventions followed. The shape of the regional value chain was assessed. Semi-structured interviews with primary producers and other related stakeholders were conducted. Participant observation was pursued. Green coffee samples were roasted and assayed by specialty roasters. The transcribed results were analysed using a framework linking conventions and quality attributes. The regional context was examined using the Institutional Analysis and Development Framework. The label of "exotic coffee" and the immediate access to tourist consumers, who see coffee as a souvenir, lead to low material quality ambitions followed by the primary producers in contrast to the traditional coffee producing countries. Specialty coffee is very rare in the island. The producer-driven value chain is exceptional short. The primary producers manage to capture the entire value themselves. Most coffee is bought by tourists in on-farm shops. However, this might turn out as dangerous dependency in the future. The COVID- 19 pandemic and the increased competition due to the start of coffee cultivation in other Canarian islands might aggravate the situation.

Main Author: Smyk Jakub (Speaker)

University: Warsaw University of Life Sciences

Database of Forestry Students' Scientific Association at Warsaw University of Life Sciences

Keywords: association database, history, MS Access

Abstract text:

The student scientific movement is special educational phenomenon. There are several scientific associations at the Warsaw University of Life Sciences with various fields of activity. Among these, the Forestry Students' Scientific Association (FSSA) is the largest student scientific organization and has the most diverse spectrum of research interests. The complex and multifaceted nature of FSSA makes it possible to show by its own example what improvements should be implemented in the management of a student organization. A problematic issue in the management of FSSA is the recording of events and achievements occurring within its activities. Meticulous recording and storage of the FSSA data in an orderly manner seems to be important both for streamlining factual reporting and providing complete information for historical studies. In view of the above conditions, the aim of the study was to design an electronic database for storing and processing historical data of FSSA. The improvement of FSSA factual reporting by means of a database was realized on a trial basis using the Section of Forest Botany as an example, as this section was the first to have its history comprehensively compiled. The database was designed in MS Access, placed on a university network drive, made available to authorized users and then filled with the Section's history data. An application with user-friendly interface was programmed in VBA language to operate the database. The database contains tables that store data on the overall activities of the Section of Forest Botany. It allows to create lists of scientific papers, research camps, members of the Section as well as to generate reports summarizing the activity of the Section over a given year or the achievements of a selected student. The FSSA database, properly exploited, may significantly improve the reporting and the creation of studies on the FSSA activities.

Main Author: Jastrzębska Klaudia (Speaker)

University: Warsaw University of Life Sciences

Co-Authors:

- Stefaniak Milena
- Natorska Kinga
- Mikołajczyk Aleksandra

Guests in bat-boxes

Keywords: Glis-glis, edible-dormouse, Kozienice-Forest, bat-box

Abstract text:

The edible dormouse (*Glis glis*), a partially protected species in Poland, is the largest representative of the Gliridae family living in this country. This rodent, which lives in tree crowns, is a nocturnal species. It feeds mostly on the fruits and seeds of trees such as oaks and beeches. Its characteristic feature is hibernation from September to May. *Glis glis* usually chooses tree hollows for its hiding places, it can often be found in bird boxes and recently has also been found in bat-boxes. The research, carried out in autumn 2020 by students of the Warsaw University of Life Sciences (SGGW), was aimed at finding out which animal species inhabit 85 crevice bat-boxes. The boxes were hung up earlier in 2020 in the Kozienice Landscape Park by Błażej Wojtowicz, president of the Polish Society for Bat Protection (OTON). Inspection of the boxes was carried out from the ground by means of a headlamp, which allows for a detailed assessment of the box interior. During the study, traces of the edible dormouse were found in the form of leaves accumulated inside 7 boxes, and 7 specimens of this rodent were observed, up to 3 in a single shelter. These were the first findings of this animal in Polish bat-box. One bat of the genus *Pipistrellus* sp. was also detected and it was the only bat observed during the survey. The population of the edible dormouse in the Kozienice Landscape Park is considered to be very numerous. In 2020, this rodent was recorded for the first time in a crevice bat-box, which may have a negative impact on bats by occupying their roosts.

Main Author: Rapczyński Jan (Speaker)

University: Warsaw University of Life Sciences

Co-Authors:

- Chrzanowska Marta

Large insects in nets - ornithological traps as a method in entomofauna research

Keywords: bird ringing, mist net, entomology

Abstract text:

Ornithological bird ringing camps operate over a span of a few months with their main aim being catching birds in nylon mist nets attached between two vertical wooden poles. During the research conducted on Kępa Radwankowska, an island located in the Middle Vistula River Valley, daily counts of large insects (mainly human finger sized or larger) caught in a 16mm mesh nets were recorded. 92 days of research saw 140 individuals of 18 species caught in 24 mist nets totalling 170m in length, with the tanner beetle (*Prionus coriarius*), the poplar hawk moth (*Laothoe populi*) and the eyed hawk moth (*Smerinthus ocellata*) being the most abundant species, for which catch dynamics were plotted. The recorded entomofauna was represented by insects from four systematic orders: Coleoptera (47%), Lepidoptera (46%), Odonata (5%), Mantodea (2%). In terms of relatively rare species, the great silver water beetle (*Hydrophilus piceus*), the southern darter (*Sympetrum meridionale*) and *Protaetia speciosissima* were recorded. The research has shown a great importance of ornithological nets in large insect monitoring as well as the necessity to conduct such research in various parts of the country to map even the common unrecorded species. Moreover, ornithological nets prove to be an important asset in discovering the new sites of rare and protected insect species.

Main Author: Badziukiewicz Jakub (Speaker)

University: Warsaw University of Life Sciences

Habitat preferences of reptiles in Osieck region

Keywords: reptiles, habitat preferences, Osieck

Abstract text:

In the world, there are over 9,000 species of reptiles, in Poland only 9 species, thus it is the least numerous group of the Polish fauna. Reptiles prefer different habitats, often settling near areas inhabited by humans. Due to human interference in the natural environment, excessive expansion and economic development, reptiles constantly lose their habitats. The aim of this work was to evaluate the species composition of reptiles and to determine their habitat preferences in the Osieck region, Mazovia Voivodeship in Poland. The research was conducted from April to October 2020, in accordance with the principles of herpetological inventory. During the research, 5 environmentally diverse areas with features favorable to the existence of reptiles and characteristic of the region were designated. Some of the aforementioned transects were directly located in the Mazowiecki Landscape Park. In this work, the habitats in which reptiles were observed were analyzed and described. The individual features of individual animals, such as species, sex and age, were also noted. Additionally, problems related to threats affecting reptiles in Poland were taken into account. In total, 58 controls were carried out, during which 181 individuals belonging to 5 species of reptiles (*Vipera berus*, *Natrix natrix*, *Lacerta agilis*, *Zootoca vivipara*, *Anguis* sp.) were observed. The habitat preferences of reptiles presented in the results do not differ from the same ones described in the literature. People report that they still live with stereotypical thinking about the dangers of reptiles, which is a very big threat to the domestic herpetofauna. In order to protect the reptiles, the most important thing is to educate the society and raise the environmental awareness of people.

Main Author: Rázková Zuzana (Speaker)

University: Czech University of Life Sciences, Prague

Co-Authors:

- Duque-Dussán Eduardo
- Staš Jan
- Banout Jan

Solar Drying Applications in Conventional Vietnamese Beef Jerky Preparation

Keywords: Beef jerky; Solar drying; Meat drying; Renewable energy; Organoleptic properties

Abstract:

Meat might be the most valuable livestock product, it serves as the primary source of protein in human diet. Rising meat demand in developing countries along with inadequate equipment and process knowledge highlight the importance of feasible alternatives for rural populations for meat preservation.

Open-sun drying is one of the oldest and still very popular method for food preservation in many rural areas in Vietnam. However, it is often associated with several drawbacks for example contamination by microorganisms, pests, fungi, or moulds which are a constant threat to the product itself because of its perishable nature, but also for the human health. Hence, this research focuses on implementing a solar drying unit to process traditional Vietnamese beef and buffalo jerky as an alternative to open-sun drying and laboratory-type dryers (electric ovens).

Beef and buffalo meat samples were prepared under two different pre-treatments, marinated in the Vietnamese traditional marinade and pan-fried in oil before drying. The drying was conducted in the Active Solar Dryer (ASD) and in the Laboratory Dryer (LD). The main goal was to find a correlation between dryer type and drying speed, and to verify if a relationship with the applied pre-treatment exists. It was noted, that both drying efficiencies (ASD and LD) were similar, it was also found that depending on the pre-treatment applied, the marinating influence the process, slowing the drying activity in both drying units, nevertheless it was not statistically significant. The same effect occurred when frying the samples before drying, however, the drying time increment in the LD was statistically significant ($p < 0.05$). There was no significant difference in the organoleptic and physical properties of the beef and buffalo meat.

SUBTHEME: ECOSYSTEM

Ecosystem- are interactions on a large scale, how all things in the world are dependent on each other and how even the smallest change can have the biggest impact. This subtheme includes environmental sciences, innovations and entrepreneurship, biology, geography and social studies, rural and urban development, natural resource management, engineering, forestry and agriculture, food security, medicine and health and epidemiology.

Main Author: Mathaess Paul (Speaker)

University: University of Hohenheim

The relation between infrastructure and extractivism of non-timber forest products in the southwestern Amazon

Keywords: Extractivism, Deforestation, Infrastructure, NTFPs

Abstract text:

The expansion of infrastructure, especially roads, in the Amazon rainforest contributes to deforestation by facilitating detrimental practices such as logging and cattle ranching, leading to high risks of irreversible change and losses of ecosystem services. In contrast, extractivism of non-timber forest products (NTFPs) is an important alternative livelihood for rural households and can contribute to reduce deforestation, enabling the rural population to generate economic income from forests with a long-term perspective. Extractivism requires a certain level of infrastructure for transport, storage, processing, and market access. This study investigated whether and how infrastructure can contribute to forest conservation through targeted support for extractivism, while minimising detrimental side effects. Three study areas were assessed, one in each country of the trinational border area of Brazil, Bolivia and Peru. Brazil nut (*Bertholletia excelsa*) and acai (*Euterpe* spp.) were analysed as two of the main local NTFPs. Trends in road construction, deforestation and NTFP volumes were identified with time series data from the period 2010 – 2020. Remotely sensed data was analysed and interviews with experts and stakeholders in each country were conducted (n=42) to identify the value chains, existing NTFP infrastructure and developments over time. The results of this study show that lacking or precarious infrastructure can be limiting factors for extractivism, but also suggest that an increase in road infrastructure facilitates deforestation and decreasing NTFP volumes, so that an equilibrium should be sought. Few essential road connections of good quality can, besides many other preconditions, be considered as an optimal basis for sustainable extractivism. However, the results suggest that infrastructure alone is unlikely to sustain extractivism as a livelihood in view of more profitable, but more detrimental alternative livelihoods. The importance of appropriate institutional frameworks and economic incentives is highlighted. Further research involving a representative cross-section of the rural population is recommended.

Main Author: Rafał Rączka (Speaker)

University: Warsaw University of Life Sciences

Deep learning for individual tree crown detection from UAV derived imagery in forest ecosystems

Keywords: deep learning, trees, UAV

Abstract text:

Deep learning is part of a machine learning which is a study about improving computer algorithms automatically with more data provided for algorithms to learn on. Deep learning uses artificial neural network along with feature learning which allows system to automatically detect certain features in data. It has been frequently used in analysis of remote sensing data and it has been proven as highly effective in urban, semi-natural and natural environment especially for computer vision tasks and image analysis. In this work we used deep learning for crown detection in forest ecosystems of Central Europe. Crowns were detected on RGB true orthomosaic. Imageries were acquired using fixed-wing unmanned aerial vehicle (UAV) on study area of over 2000 ha located mostly on eastern part of Poland. Study area included areas of diverse tree stand types. Crown detection were performed using prebuilt model retrained with dataset prepared specifically for study area. Prebuilt model was trained on National Ecological Observatory Network data and it was developed by Weinstein et al. (2020). Retraining data included manually delineated crowns on RGB imagery for randomly selected plots in study area. Crown detection were evaluated and compared in different tree stand variants. Variants differ in tree stand age, dominant species, and site conditions. As an additional conclusion, workflow for optimized results of crown detection was proposed.

Main Author: Suzy Rebisz (Speaker)

University: Wageningen University and Research Centre

Co-Authors:

- Thomas Westhoff

Comparing temporal changes in soil organic matter between a temperate zone food forest and a conventional farm in the Netherlands

Keywords: Food forestry, agroforestry, carbon sequestration

Abstract text:

Food forests are a novel agroforestry practice which has gained rapid popularity across the Netherlands. These unique agroecosystems are defined as a perennial polyculture of multi-purpose plants with several layers that resemble a forest ecosystem. In 2009, a 2.4 ha food forest Ketelbroek near Nijmegen was initiated in the temperate climate of Groesbeek, the Netherlands, which contained a broad selection of perennial crops, mimicking a self-sustaining agro-forest ecosystem. This study measured and observed the temporal change in soil organic matter (SOM) and compared SOM levels between the food forest and a nearby arable farm over a 10-year period. In this decade, the Netherlands experienced the warmest 5 years since records began. Despite these changes in the climate, our key findings indicate that between 2009-2019, there was a 108% increase in SOM at food forest Ketelbroek, from 3.4% in 2009 to 7.1% in 2019. This compares with a 22% increase in SOM for the arable farm from 3.0% in 2007 to 3.7% in 2019. Between 2016 and 2019, food forest Ketelbroek sequestered 6.03 t C. ha⁻¹ and sequestered carbon at a rate of 2 t C. ha⁻¹ in the topsoil (0-5 cm); having above average carbon stocks compared to Dutch average cropland and grasslands. Our study indicates that novel agroforestry systems such as temperate food forests can contribute towards mitigating climate change whilst providing food and supporting biodiversity.

Main Author: Hartmann Antonia (Speaker)

University: Swedish University of Agricultural Sciences

Greenhouse gas emissions from compacted peat soil

Keywords: Peat, Greenhousegas emissions, Compaction

Abstract text:

Cultivated peat soils are a main driver for CO₂ and N₂O emissions. Sand-admixtures into peat soils might reduce CO₂ emissions and improve physical properties for plant growth. Furthermore, it enhances soil strength, thus the ability to tolerate soil compaction by heavy machinery. Soil compaction due to vehicular traffic leads to a decrease in aeration and changes in water flow might alter microbial activity and gas flow. The goal of this thesis was to investigate how soil compaction with different pressures affect soil physical properties and greenhouse gas (GHG) emissions of peat soils. Furthermore, differences in GHG emissions between sand-admixtures into peat soil and control was examined in field and lab measurements. Incubator measurements of soil cylinders were conducted three consecutive days before and after compaction. Furthermore, a method was developed to measure in-situ GHG emissions to understand the fluxes during compaction at 100, 200 and 300 kPa, respectively. In order to describe the compression and recompression properties of peat soils, stress relaxation and rebound calculations were conducted. After a short-term CO₂-outgassing due to pore compression, a reduction of CO₂ emissions was observed after the compaction, which was dependent on soil moisture, applied compaction pressure and sand-admixture compared to the control sample. CH₄ fluxes were below the detection limit, while N₂O emissions seem to increase after compaction. Therefore, changes in GHG emissions are highly dependent on intrinsic soil properties as soil water content and external mechanical loading.

Main Author: Leah Kirchhoff (Speaker)

University: Swedish University of Agricultural Sciences

Impact of vegetation mycorrhizal type on fungal community composition in arctic tundra heath

Keywords: Arctic-tundra, ectomycorrhiza, ericoid mycorrhiza, shrubification

Abstract text:

Compared to lower latitude ecosystems, the carbon storage capacity of tundra soils is high. Climate change is expected to cause changes in tundra ecosystems, specifically with regard to vegetation species composition. Plant symbiotic interactions with mycorrhizal fungi are an important factor in soil carbon storage capacity. However, they depend on the plant species that are present. Changes in the vegetation composition might thus affect soil carbon storage through changes in the fungi that are present. The thesis is part of the Abisko Long-Term Tundra Experimental Research (ALTER) project, a long-term field experiment in subarctic Sweden focusing on the effects of vegetation and associated changes on above- and belowground processes in tundra soils. In an alpine forest-tundra ecotone, vegetation composition was manipulated by removing plant species with certain mycorrhizal associations. The experiment will follow the effects of this manipulation on above and belowground biogeochemical and ecological processes over the next 10 years. The thesis explores links between fungal community structures and plant community composition, plant mycorrhizal type and soil chemistry. To that end, metagenomic sequencing and multivariate statistics were used to relate the fungal community composition at the onset of the experiment (i.e. undisturbed baseline) to the fungal community composition one year after the first plant removal as well as to soil abiotic variables and vegetation observations from both years. We found a strong relationship between mycorrhizal type and the fungal community composition in the plant's rhizosphere. Moreover, vegetation community composition was able to explain a considerable amount of variation in fungal community composition, suggesting a link between the two. In addition, the plant removal treatment did affect the fungal community composition in the soil already after only one year.

Main Author: Nagarajan Neerajaa (Speaker)

University: Swedish University of Agricultural Sciences

The role of agricultural drainage in controlling the effectiveness of two-stage ditches in Sweden

Keywords: Two-stage ditch, subsurface drainage, turbidity

Abstract text:

Two stage ditches are an innovative mitigation measure aimed at reducing nutrient losses from agricultural land and improving the fluvial stability of agricultural ditches as compared with traditional trapezoidal ditches. The evaluation of their effectiveness relies on accurate monitoring of the nutrient and sediment inputs that enters along the ditch. This study investigates the nutrient and dissolved organic matter (DOM) contribution from subsurface tile drains along two-stage ditches in 9 catchments of central and southern Sweden. The focus was to measure the loading of nutrients, sediments and dissolved organic matter (DOM) from the drains and assess its impact on the functioning of the two-stage ditches. Water samples from tile drains were taken from January to May 2021 and tested for turbidity, absorbance fluorescence, nitrate, phosphate, and ammonia. Information on soil properties and land use was collected from County Board Administrations and other open sources. The sampling covered both a spatial and temporal variation with study sites that differed in hydrology, soil types and land use. Turbidity peaked immediately following snowmelt and rain and sites with higher clay content positively correlated with turbidity. In general, DOM consisted mostly of humic compounds of terrestrial origin before March. In April and May there was a shift towards compounds of fresher microbial origin. Turbidity correlated with total phosphorous, and the aromaticity correlated with nitrate-nitrogen, suggesting that phosphorous adsorbs to the sediment particles while nitrogen is present mostly in the dissolved form. While the flow of the drains and thus the load of the nutrients (g/day) was very low in comparison to the stream, the phosphorous concentration (mg/l) from the drains in some sites was as high as 500% and turbidity in one site reached 1200%. This suggests that the drains can severely affect the efficacy of two stage ditches, especially during storm events.

Main Author: Deluga Damian (Speaker)

University: Warsaw University of Life Sciences

Phytoremediation of particulate matter by *Taxus baccata* L. and *Pinus sylvestris* L. depending of air pollution level in different cities in Poland

Keywords: PM, Phytoremediation, Shrubs, Trees

Abstract text:

Air pollution caused by urbanization has harmful effects on humans, animals and plants. One of the most dangerous is particulate matter (PM). PM particles are suspended in the air for a extended time (even for weeks) and can have allergic, carcinogenic and mutagenic effects to humans. A way to reduce particulate air pollution is phytoremediation, a technology derived from environmental biotechnology that uses plants as natural air filters. Phytoremediation uses plants that can efficiently accumulate particulate matter and also are as resistant as possible to environmental stress. In this study, we assessed (i) the ability of Scots pine (*Pinus sylvestris* L.) and English yew (*Taxus baccata* L.) to accumulate PM in cities with different level of particulate matter pollution (divided into three size fractions) on surface of needles, (ii) in epicuticular waxes. The plant material was collected in 2018 and measurements were taken in the summer of 2020. There were differences between species growing in different cities in amount of accumulated PM. Both studied species accumulated PM of both categories (surface and in-wax PM) and from all three size fractions on their needles in different amounts. For both examined species, biennial needles accumulated more dust than annual needles. The highest amount of dust on the needles of *P. sylvestris* and *T. baccata* were found on plants growing in the most polluted city of Kraków. Significantly greater amounts of particulate matter were found on the needles of *Pinus sylvestris* than on the needles of *Taxus baccata*. Both species can act as a bioindicator of particulate matter air pollutants.

Main Author: Schwab Helena (Speaker)

University: University of Hohenheim

Co-Authors:

- Bentje Bossert

The meadow is alive - how can biodiversity become accessible to consumers

Keywords: Biodiversity, labelling, sustainability, consumers

Abstract text:

If you go shopping in the supermarket you will find a lot of different labels on the products: from organic farming to sustainable agriculture, to fisheries and much more. But there is no exclusive label for biodiversity. This is surprising, given that agriculture and biodiversity strongly affect each other. One reason for this is, that many consumers have no understanding of what biodiversity actually constitutes, or in what ways agriculture affects biodiversity. Consumers may have little knowledge of the often hundreds of species that are associated to agricultural habitats, and the many important functions that these species fulfill. However, people typically only value and protect what they know and understand. This is the motivation for our project "The meadow is alive"! We executed our project on a conventionally managed meadow that is part of an experimental animal farm of the University of Hohenheim, Germany. Our goal was to capture the biodiversity of the conventionally grazed meadow and make it tangible for the consumer. We captured the biodiversity with different methods and were surprised how many individuals and species of plants, insects, spiders, birds and bats we could find. In the further course we developed tools for showcasing this biodiversity and the important functions that species fulfill (e.g., pollination) to the consumer. These tools include social media presentations of charismatic but also little-known species, a webpage hosting photos, videos and short information on species and key functions, and may eventually include live video feeds of grazing cows. Linking this information to QR-codes on the product (i.e., the sold milk) shall allow consumers to access this information, and thereby build awareness on the importance of biodiversity for agriculture and beyond.

Main Author: Nawrocki Adam (Speaker)

University: Warsaw University of Life Sciences

Co-Authors:

- Piechota Natalia
- Chrzanowska Dominika

Air phytoremediation from particulate matter by flower meadows in an urbanized area

Keywords: herbaceous plants, meadow, PM, phytoremediation

Abstract text:

The positive role of trees and shrubs in purifying the air from particulate matter (PM) has already been confirmed many times. However, still little is known about the accumulation of PM by herbaceous plants (grasses and forbs) in urban meadows. Urban meadows in the cities can be planted where trees or shrubs could not be grown, such as near roads - which are one of the main sources of PM in cities. The aim of this research was to compare PM accumulation by a perennial meadow and a lawn.

The samples were collected at different distances from the road, on two dates (spring and summer). Additionally, the concentration of PM in the air on the meadow and lawn, as well as air and soil humidity and temperature were measured. Measurements of PM concentrations in the air have demonstrated that meadow trap contaminated air from the road, while lawns disperse it. Meadows are more effective in lowering the temperature of the soil and keeping it more moist. Preliminary (this work is currently in progress) analyzes of PM accumulation by the meadow and lawn indicate higher PM accumulation by the meadow. To confirm the efficiency of meadows for PM accumulation, the results will be expressed as PM accumulation per m² of meadow and lawn. The results of the conducted research indicated that urban meadows can play an important role in improving air quality in urbanized areas.

Main Author: Holzknrecht Alena (Speaker)

University: Swedish University of Agricultural Sciences

Co-Authors:

- Lærke Daverkosen

Can Agriculture Help Solve the Climate Crisis? Relating regenerative farming practices to carbon sequestration and soil health on Gotland, Sweden

Keywords: Regenerative, Soil Health, Climate Change

Abstract text:

Regenerative Agriculture provides tools that can enhance not only the environmental, but also social and economic dimension of food production. The concept of regenerative agriculture is gaining attention both in mainstream media and in academic literature in recent years. However, there is no uniform definition of the term so far, and further there is a lack of comprehensive scientific studies on “real-life” farms that are changing their management from conventional to regenerative practices. This thesis investigates the contemporary and historical context of the emerging term regenerative agriculture and is identifying the different movements connected to it. Further, we are comparing different regenerative farms that have been operating for some years with conventional farms so first conclusions can be made about the impact of certain practices. The soil health on 25 different plots is assessed by a variety of indicators, i.a. total and active carbon, wet aggregate stability, nutrient leaching, and microbial biomass carbon. Soil sampling will be continued on the same plots years ahead to thoroughly investigate the impacts over a longer time period. The thesis is part of a larger ongoing project performed at SLU. By analyzing the soil quality from farms with regenerative agricultural practices, we contribute to the scientific understanding of the impact these practices have on soil fertility, carbon sequestration potential and food security in a changing climate. By looking at a wide range of biological, chemical and physical parameters, this thesis also adds to the on-going scientific discussion on the quantification of soil health on agricultural land. Further, by promoting the topic and expanding the scientific conversation about land regeneration, we contribute to providing decision support for (future) farmers.

Main Author: Ranscht Leon Johann Andreas (Speaker)

University: University of Hohenheim

Assessment of CONVISO® SMART under the current approval and field conditions in Mid-Germany

Keywords: sugar beet, herbicide resistance technology,

Abstract text:

Sugar beets suffer large weed pressure due to their slow juvenile development. This field trial series analyse how the Herbicide Resistance (HR) Concept CONVISO® SMART effects phytotoxicity and weed pressure under field conditions and the current approval in Germany. To answer that question, two trials were created in Weissenfels (Saxony-Anhalt, Germany) and Lüttewitz (Saxony, Germany). The HR Technology CONVISO® SMART consists out of sugar beets resistant to acetolactate-synthase- inhibiting herbicides. The matching herbicide CONVISO® ONE contains the sulfonylurea foramsulfuron (FSN; 50g L⁻¹) and thiencazone-methyl (TCM; 30g L⁻¹). The full dosage of 1 L ha⁻¹ application is only allowed in combination with inter-row hoeing and in-row band application. In the trials, a split application was given for the long-lasting effect. Four application strategies with four replications were compared. Next to an untreated control, a customary herbicide strategy, a CONVISO® SMART splitting application and an application sequence of a customary together with a CONVISO® ONE treatment. The phytotoxicity was measured by stem diameter, fresh and dry matter in BBCH 16. The weed pressure was measured by weed coverage and accounted abundances. Due to rainfalls hoed CONVISO® ONE variants suffered from erosion. So far, the differences among the weed pressure of the treated parcels were low. CONVISO® SMART could be another active component to keep sugar beets competitive in the Mid-German crop cycle despite the case of further herbicide losses.

Main Author: Babatunde Olayemi (Speaker)

University: Warsaw University of Life Sciences

Co-Authors:

- David Williams
- Gbenjo Oluwadamilola

Growth, regrowth ability and nutrient content of celosia argentea with cattle dung

Keywords: celosia, regrowth, nutrient content, cattle-dung

Abstract text:

A field experiment was conducted between May and October 2018 at the Federal University of Agriculture Abeokuta, Nigeria, to examine the effects of cattle dung application on the growth, regrowth ability, and nutrient content of *Celosia argentea* (TLV 8 variety). The experiment was laid in a Randomized Complete Block Design. The treatments consisted of six (6) cattle dung rates (0, 2, 4, 6, 8, and 10 tons/ha) replicated four (4) times. Data were collected at harvest (6 weeks of age) for both fresh and ratoon harvest. Parameters examined were plant height, number of leaves per plant, number of branches per plant, leaf area per plant, yield per plot, fresh weights, dry weights, and nutritional composition of celosia leaves. All data collected were subjected to Analysis of Variance, and means were separated using LSD (0.05). There were no significant differences in parameters examined among the fertilizer rates applied at main growth. In contrast, the growth attributes, yield, and nutritional contents of *Celosia* plants treated with cattle dung differed from the unfertilized plants at regrowth. *Celosia* plants treated with 2 tons/ha of cattle dung significantly produced the highest number of leaves. 2 tons/ha of cattle dung significantly produced leaves with significantly wider leaf area and taller plants when compared to control plants and other fertilized plants. *Celosia* plants fertilized with 4 tons/ha of cattle dung had the highest total dry yield. Plants that received 6 tons/ha of cattle dung had the highest crude protein. Hence, it is recommended that *Celosia* plants be fertilized with 2 tons/ha of cattle dung for single harvesting while 6tons/ha of cattle dung for repeated harvesting.

Main Author: Trzaska Katarzyna (Speaker)

University: Warsaw University of Life Sciences

Co-Authors:

- Pikora Małgorzata

Analysis of the functioning of FIFO in stores, taking into account organic food intended for children aged 0-3 years

Keywords: FIFO, food waste, organic food

Abstract text:

The unprecedented scale of overproduction of food in highly developed countries contributes to food losses and even wastage. In order to prevent this, the stores apply a food storage and distribution policy - FIFO (First In First Out), a concept aimed at first selling products that first appeared in the warehouse. Therefore, products with the shortest expiry date should be placed in the front of store shelves, and products with a longer expiry date on the back. In scientific publications on food for children, the authors focus mainly on: nutritional value, assessment of the suitability of selected products, production technology and consumer preferences. The issues related to wasting food and proper warehouse logistics of products for children have not yet become an area of scientific research. The aim of the research was to assess the functioning of the FIFO system in stores in relation to organic food intended for children. In order to assess the functioning of the FIFO system, inspections were carried out in stores offering organic food for children. The inspections were unannounced and the stores were not informed about them. During the inspection, the arrangement of the products on the shelves and the expiry date were checked, and any irregularities were documented in photos. The results of the study show irregularities in the management of operations and store logistics. A malfunctioning FIFO system has been found in many product types. The implementation of appropriate logistics strategies, including FIFO, may contribute to reducing food waste and the correct rotation of products on store shelves. Regular employee training and the control of stock levels and the arrangement of food products on the shelves are critical to food containment strategies.

Main Author: Gärttling Daniel (Speaker)

University: University of Hohenheim

Effects of Black Soldier Fly by-product application on the whole-cycle performance of fungus gnats

Keywords: Insect production; plant protection

Abstract text:

As production of fishmeal, being a feed source for the growing aquaculture sector, is declining due to the consequences of overfishing, rearing of the Black Soldier Fly (BSF; *Hermetia illucens*) for producing substitutes is on the rise. Thus, by-products of BSF rearing (frass, pupal cases, imagines) will make up considerable amounts as the sector grows, and the use as organic fertilizer is a promising option for the valuation of these side streams. Chitin is an essential component of fungi and insects and is contained in the mentioned BSF by-products as well. Soil amendment with chitin has been observed to increase chitinolytic activity of the soil microbial community, which might affect soil-living stages of agricultural pests. In this study, fungus gnats, a horticultural pest feeding on soil-living fungi and plant roots, were exposed to potting soil amended with different BSF by-products (native/autoclaved frass; frass mixed with pupal cases and imagines), and their performance (substrate choice, duration of development, and mortality) was assessed in a series of experiments. To clarify the observed effects, the substrate mixtures were incubated to monitor the time course of chitin content and chitinase activity. As this research is part of an ongoing master thesis, results are preliminary. Soil amendment with BSF by-products reduced the generation time of fungus gnats, which might be a consequence of increased growth of fungi, being their main feed source. Despite their shorter generation time, population size was reduced compared to pure potting soil. As the autoclaved treatment performed worse, effects may not only be directly related to chitin but may also depend on microbial activity. With BSF by-products being effective against fungus gnats, they could be included into horticultural potting substrates. Effects on other soil-living organisms and its further potential in integrated pest management might need to be assessed as well.

Main Author: Zankl Thomas (Speaker)

University: University of Natural Resources and Life Sciences, Vienna

The role of parasitoids and pathogens in the collapse of a gypsy moth (*Lymantria dispar*) population outbreak in Lower Austria

Keywords: *Lymantria dispar*, parasitoids, entomopathogens

Abstract text:

The gypsy moth (*Lymantria dispar*) is one of the most important pest insects in European oak forests. In 2018, a population outbreak of *L. dispar* was observed in Lower Austria, resulting in total defoliation of an oak forest in the summers of 2018 and 2019. In 2020, the population density was still high, but the population was expected to decline. The present work investigated the role of natural enemies in the collapse of the outbreak. In total, 20 egg masses, 680 larvae and 12 pupae of *L. dispar* were collected in the field between May and July 2020 and reared under semi-field conditions until emergence of adult moths or death. Causes of mortality were determined based on emerging parasitoids and phase-contrast microscopy of tissue samples of non-parasitized cadavers. Stage-specific mortality rates were determined for eggs, all larval instars (L1-L6) and pupae. Mortality was caused by seven parasitoid species and three pathogens. Starting from a high gypsy moth population density in spring, natural enemies reduced the population to a negligible level until summer. Parasitoids caused stage-specific mortality rates of 15-61 %, pathogens killed 11-41 % of the larvae. The dominant parasitoid of young and middle-aged larvae was the braconid wasp *Glyptapanteles porthetriae* (L1-L4: 10-36 % parasitization). Mature larvae were mainly killed by the tachinid flies *Blepharipa pratensis* and *Parasetigena silvestris*, which each killed 27 % of the final instar larvae (L5+L6). The Nuclear Polyhedrosis Virus (LdNPV) was the dominant pathogen (7-34 % stage-specific mortality). Parasitoids of *Lymantria dispar* themselves were exposed to high rates of attack by other parasitic wasps (hyperparasitoids). More than 40 % of the field-collected cocoons of *Glyptapanteles porthetriae* were destroyed by a total of five different species of hyperparasitic wasps.

Main Author: Gamonal Nerea (Speaker)

University: University of Copenhagen, Faculty of Science

Co-Authors:

- Lene Sigsgaard
- Physilia Chua

Pollinator or not? Arthropod visitors in Danish apple orchards

Keywords: Apple orchards, wild pollinators, metabarcoding

Abstract text:

Sustainable agricultural practices are one of the pillars to maintain diverse ecosystems. Wild pollinators are essential to maintain healthy, protected, and productive agricultural systems. Apple orchards constitute one of the most worldwide cultivated crops that rely on pollinator presence. In apple orchards honey bees are used for pollination, but the role of wild pollinators is also considered important as they can improve apple orchard yield. We aimed to (1) assess the biodiversity of pollinators present in four Danish apple orchards, (2) analyse the influence that flowering habitats (flower strips, grass strips, and hedgerows) in the orchards have on pollinators activity, and (3) with molecular tools assess the arthropod visitors of apple flowers. To attain these goals, we used different methodologies: molecular techniques (metabarcoding), traditional netting to collect bees, and visual assessment. In addition, a comparison of pollinator presence between the orchards and margins was studied to understand the function of the surrounding landscape. A final list of orchard visitors was created with the results from this study. The use of different methodologies led to four different conclusions: (1) Molecular and non-molecular methodologies lead to complementary fauna assessment, (2) non-bee arthropods constituted a big part of the community of apple flower visitors, (3) the presence of non-apple flower resources and heterogeneous landscape is important to maintain biodiversity, and (4) possible interactions among flower visitors should be taken into consideration for future practices. Although more research is encouraged, this thesis provides a better understanding of which arthropods might contribute to pollination in apple orchards and the influence of floral resources in their activity. Results should be applied to develop new environmentally friendly and efficient management practices aiming to attract wild pollinators to apple orchards.

Main Author: Grunt Sarah-Carina (Speaker)

University: University of Natural Resources and Life Sciences, Vienna

Emission-restriction potential of touristic aviation through carbon offset and carbon tax in Austria

Keywords: emissions, offset, taxation

Abstract text:

Sarah-Carina Grunt University of Natural Resources and Life Sciences, Vienna (BOKU), Vienna, Austria Commercial air traffic accounts for 2-2,5 percent for global carbon emissions and is the fastest growing traffic sector. Half of these emissions are generated by only one percent of the global population. Passenger numbers have continuously been increasing and so have emissions. The aviation industry mainly focuses on technological innovation and alternative fuels. Considering the rising passenger numbers these instruments will not offset emission increase. Present thesis addresses the current perception of two lifestyle-oriented policy instruments which offer an alternative for emission restriction in touristic aviation: CO₂-offset and CO₂-taxation. Firstly, literature research gives information on aviation emissions, Austrians' travel and flight behaviour, airline strategies, CO₂-offset, and CO₂-compensation. Secondly, I conducted a survey among 18- to 30-year-old Austrians questioning their attitude towards CO₂-offset and CO₂-taxation. By connecting literature research and survey results I can deliver insight into young Austrians' preferred lifestyle-oriented policy instrument for emission-restriction in Austria. Most interviewees know the term and concept CO₂-offset and a fifth have already compensated flights. Still, CO₂-compensation is being estimated by the interviewees as less efficient than CO₂-taxation to effectively restrict or reduce carbon emissions. Interviewees answers correspond to experts which name CO₂-taxation in combination with the existing EU Emission Trading System as the most efficient method to restrict aviation emissions. Regarding lifestyle-oriented policy instruments, aviation industry accentuates CO₂-offset and shows reluctance towards CO₂-taxation. However, relevant literature and interviewees perceive CO₂-taxation as the more effective emission restriction instrument. CO₂-offset at its current state lacks transparency and uniformity and is better to use for awareness raising.

Main Author: Vybornova Anastassia (Speaker)

University: University of Copenhagen, Faculty of Science

Towards a sustainability shift of the transportation system: a network algorithm for the identification of gaps in urban bicycle networks based on OSM data

Keywords: sustainable mobility, cycling, network algorithms

Abstract text:

In our era of global change, a systemic transformation towards sustainability is the most pressing challenge of the twenty-first century. Sustainable transport plays a pivotal role for any pathway envisioned towards such a transformation – particularly in an urban context. Cycling as mobility mode is increasingly being promoted as a „green solution“ for utilitarian travel.

However, the current state of research in bicycle infrastructure planning is still highly fragmented. Our work aims at contributing to the consolidation of a data-driven, computational approach to green urban transport planning. With this goal in mind, using the bicycle network of Copenhagen as case study, we try to answer the following question: What is the best location to build new bicycle infrastructure in a city? We present an algorithm that identifies and rates (by relevance) gaps in a bicycle network, based solely on the input of topological features which are readily available as open-source data from OSM (Open StreetMap). For this purpose, we define “gaps” as segments (of flexible maximum length) of existing streets which, if provided with a bicycle facility, improve the overall quality of the network. We assess the quality of the network based on network connectivity measures from graph theory. To showcase the applicability of our approach, we present the gaps identified by the algorithm in the bicycle network of Copenhagen, classified and ranked by relevance (quality impact). We compare our results with the city’s current bicycle network development plan (Cykelsti Prioriteringsplan 2017-2025) to demonstrate the validity of our findings. Our work shows how network analysis based on open-source topological data can serve as powerful and cost-efficient tool for decision-making support in bicycle network planning.

Main Author: Orzińska Joanna (Speaker)

Univeristy: Warsaw University of Life Sciences

Application of the green streets in limited urban space, Warsaw case study

Keywords: green street, green infrastructure

Abstract text:

Green streets are part of modern solutions of adaptation to the climate change in urban areas. There are many various guidelines, that explain how to implement them. The main goal of the design problem was to transform the selected street into a green one according to the principles related to the relevant literature and considering available space. This design had also supposed to fulfill additional ecological function to developed a natural connection that fills the gap in the Warsaw Nature System. The first part of the work concentrated on the principles of creating green streets analyses based on the leading literature including technical guidelines. Additionally the catalogue of green-blue infrastructure elements applied along green streets have been made. Next, the author compared obtained data with the "Principles proposed for green streets of Warsaw" in 2017 prepared by the City Officials, only these guidelines made for Warsaw, takes into account the participation of the inhabitants during the process of designing the green streets. In the third part the complete redesign of the selected street in Warsaw have been proposed. The goal was not only to achieve better social and environmental functions and transform the street into more inhabitants-friendly and better adapted to climate change but also to add ecological function and create natural connection between two vast green open spaces. The research covered deep analyzes of various parameters collected during inventory as: street structure, green cover (vegetation type), type and share of pavement, as well as planning guidelines from local master plans. Next design guidelines were proposed along with the selection of appropriate elements from the green and blue infrastructure catalogue. The new elements of the street include various aspect as water management and quality, greenery and air quality, energy efficiency and reduction of heat production.

Main Author: Spengler Jessica (Speaker)

University: University of Hohenheim

Impact of the evolution of the climate system on phenology as a challenge for agriculture in Baden-Württemberg - Investigation of climate change in connection with large-scale weather-classifications

Keywords: Agriculture, Climate Change, Large-scale-weather-situations, Temperature

Abstract text:

Climate is the primary driver of agricultural systems which are human managed ecosystems. The changing climate over the past decades and in the future forced and will force modifications of agricultural systems. Changes in meteorological variables and the frequencies of large-scale-weather-conditions were investigated in the thesis. The averaged temperatures have increased over the past decades and lead to an increase of the number of summer and hot days. This resulted in a shift of phenological phases towards the beginning of the year, as plants show strong correlations with temperatures. Also drought periods and number of hot days tend to increase, causing enormous stress to plants. This leads to a reduction of the harvest, resulting in economic losses. Additionally, the vegetation period is extended. Late frost is a threat for plants as the vegetation period starts clearly earlier, whereas the latest frost events are only slightly shifted towards the beginning of the year. This leads to a longer period where the plants are in a vulnerable state and the risk of frost damage exists. In addition, extreme events like warm and heat periods have increased in number and length. The precipitation changes are moderate, but a decline is also recognizable. Unfortunately, an increasing of the temperature and a decline in the precipitation is a big thread to farmers. The examination of large-scale-weather-situations shows that especially north-situations have increased in temperature. There are various ways to adapt to the changes. In addition to mitigation of negative effects of climate change, they also bring opportunities like longer growing periods and the possibility to grow new plant varieties. Through new technologies and adaption possibilities it is possible to adapt to the changing climate, but it is of great importance to apply the strategies in a sustainable way to avoid further damage of the environment.

Main Author: Oostvogels Vincent (Speaker)

University: Wageningen University and Research Centre

Bending the curve of biodiversity loss: interdisciplinary research to enhance biodiversity conservation in agroecosystems

Keywords: agriculture, interdisciplinarity, context-specific research

Abstract text:

There is an urgent need to bend the curve of global biodiversity loss, and in doing so there is an important role for agriculture. However, it often remains difficult to integrate effective biodiversity conservation in agricultural production systems. In the process of developing a PhD proposal on this topic, we conducted a literature search to explore the challenges that underpin this difficulty. Three challenges emerged in particular. First, people have many different views on biodiversity conservation. However, this multiplicity of (sometimes contrasting) views is often not made explicit. This hinders a dialogue about the desired direction of biodiversity conservation. Second, the links between agriculture and biodiversity are complex and context-dependent, and the heterogeneity in farming systems adds to this complexity. Nevertheless, conservation recommendations to farmers are often rather generic, which leads to suboptimal outcomes. Third, biodiversity conservation is likely to have implications for other sustainability dimensions of agriculture, such as greenhouse gas emissions, profitability, or labour requirements, resulting in synergies or trade-offs. These implications are generally not quantified, which hinders adoption by farmers, awareness from actors and, ultimately, the development of integral sustainability strategies that consider biodiversity conservation along with other sustainability objectives. Given these challenges, effective integration of biodiversity conservation in farming systems will require interdisciplinary, context-specific, systems approach research. We specifically propose to integrate social and bio-economic research methods, and we are doing so in our PhD project. This project, encompassing four contrasting regions, aims to explore options to enhance biodiversity conservation in dairy farming, while maintaining viable farms and aligning with other sustainability objectives. To that end, we combine a range of methods, including stakeholders interviews, characterization and modelling of farming systems, and participatory approaches. We believe that integrating research disciplines and methods can generate novel insights that help to bend the curve of biodiversity loss.

Main Author: Piechota Natalia (Speaker)

Univeristy: Warsaw University of Life Sciences

Co-Authors:

- Dominika Chrzanowska
- Adam Nawrocki

Traffic-related PM accumulation from vegetation of urban forests

Keywords: air, forest, plants, shrubs, trees

Abstract text:

In the process of air purification, a lot of attention has been devoted to trees and shrubs. Little attention has been paid to herbaceous vegetation from the lower forest layers. Urban forests are often located on the outskirts of cities and surround exit roads where there is heavy traffic, generating particulate matter (PM) pollution. The aim of this study was to investigate the spread of PM from the road traffic in the air and to investigate whether and how individual layers of urban forests accumulate PM. We conducted comparative analyses of PM accumulation on plants in five zones away from the road into the forest in the air and in four vegetation layers: mosses, herbaceous plants, shrubs and trees. The results clearly show that all forest layers accumulate PM. We have shown that PM is very efficiently accumulated by herbaceous plants growing along roadsides, and that PM which was not deposited on herbaceous plants was accumulated by trees and shrubs. Alongside the distance from the road into the forest, the PM content on herbaceous plants decreased and the accumulation on trees and shrubs increased. We estimated that the PM concentration in the air dropped significantly in the front line of the trees, but it was still detectable up to 50 m into the forest. The results presented herein clearly show that meadow vegetation and urban forests play a very important role in air purification.

Main Author: Watschka Manuela Irina (Speaker)

University: Swedish University of Agricultural Sciences

Phosphorus accumulation in a free water surface wetland discharging into the Baltic Sea

Keywords: eutrophication, phosphorus, sediment accumulation, wetland

Abstract text:

Excessive amounts of nutrients like phosphorus and nitrogen lead to severe consequences in aquatic ecosystems. The nutrients promote the growth of algae that can be toxic and consume oxygen during its decomposition, which leads to hypoxic bottom layers that are harmful to fish and aquatic biodiversity. This so-called eutrophication is a long-lasting problem of the Baltic Sea and therefore, its surrounding countries strive to decrease the nutrient input from domestic wastewater and agricultural runoff. This study investigated a free water surface (FWS) wetland in South-East Sweden that was constructed to retain phosphorus from agricultural runoff before the water is discharged directly into the Baltic Sea. The FWS wetland has an area of 1.6 ha, corresponding to 0.1 % of its catchment area. The specific objectives of the study were to estimate the phosphorus accumulation, the risk of internal loading and the value of the sediment as soil amendment. Therefore, at four locations sediment core samples were collected in April 2021, 6.5 years after the wetland had been constructed. The sediment was analysed for (i) total phosphorus and phosphorus fractions, (ii) metal content, (iii) plant available phosphorus, nitrogen and carbon and (iv) particle size distribution. Furthermore, the performance of the FWS wetland was related to wetland and catchment factors. The annual estimated sedimentation rate was about 0.5 cm with slightly higher sediment accumulation at the outlet of the FWS wetland. The annual retention of phosphorus in the FWS wetland was about 13 kg per ha. The metal content was below the maximum permitted values defined in the European Sewage Sludge Directive and the appropriate Swedish legislation. This allows to bring the sediments back to agricultural fields in order to recycle nutrients and contribute to the circular economy objective of the European Union.

Main Author: Luger David (Speaker)

University: University of Natural Resources and Life Sciences, Vienna

Aggregate associated carbon as influenced by soil management intensity

Keywords: Organic carbon, Soil aggregates

Abstract text:

Intensification of agricultural soil management led to progressive deterioration of the soil structure and related loss of soil organic matter. Promoting aggregate stability is thus a measure inherently linked with soil organic carbon accrual. This study investigates the impact of management intensity on aggregate stability and breakdown dynamics upon degree of disruptive energy. To this end, soil aggregate stability (SAS) was tested for a set of 21 different sites with each having three soil management systems with contrasting soil management intensity: Pioneer – Soil conservation methods; Standard: Common crop management techniques; Reference – Natural grass vegetation. Aggregate breakdown behavior was investigated on samples of three sites by applying a range of defined ultrasonic disruptive energy levels ($J\ cm^{-3}$). Discrete sonication energy levels were derived from the evaluation of dissolved organic matter (DOM) release curves of 21 study sites and produced in a pilot test. Aggregate mass distribution was assessed via wet sieving (2000-20 μm). The combination of UV-Vis DOM measurement (Abs-254nm) after each disruptive energy level and elementary analysis of aggregate size classes allowed for detailed analysis of aggregate breakdown at defined energy level. Soil aggregate stability (SAS), organic carbon (OC) and DOM contents were highest for Reference systems followed by Pioneer systems on all sites. Generally, aggregate breakdown correlated with increasing DOC release upon increasing energy input. Aggregate breakdown at Reference systems occurred at higher energy input compared to Pioneer and Standard systems which is in line with higher SAS values. Increasing level of energy input led to more pronounced differentiation in released DOM in the sequence Reference > Pioneer > Standard. This shows that aggregate breakdown is generally associated with the release of DOM. Yet, DOM release upon aggregate destruction seems to be a function of absolute DOM and OC content rather than the degree of aggregate stability.

Main Author: Korp Nora (Speaker)

University: University of Natural Resources and Life Sciences, Vienna

Walnut shells as sustainable fillers in biodegradable plastic composites

Keywords: biodegradable-composite, natural-fillers, walnut-shell, mechanical-properties

Abstract text:

The world is facing an increased problem of plastic and waste pollution. To promote waste reduction and recycling solutions, research into the production of biodegradable plastics as well as into the use of waste materials as fillers is urgently needed. Walnut shells are a by-product of the nut production and are usually incinerated. The walnut shells consist of one single cell type: thick walled, lignified sclerenchyma cells with many lobes. These cells remind by their interlocking on jig-saw puzzles in 3D and achieve an exceptional high surface area. Therefore, we test the potential of this uniform and uniquely shaped waste material to produce a biodegradable polymer-walnut shell composite. Polybutylene adipate terephthalate (PBAT), which is a very flexible and easy to handle biodegradable polymer, was mixed with three different natural fillers, namely milled walnut shell powder (WSP), delignified walnut shell cells (WSC) and as comparison wood flour (WF). We could show that Young's Modulus, a value which indicates tensile stiffness (resistance to elastic deformation), could be increased with all fillers, whilst axial strain and elongation at break was reduced. With WSC-PBAT we reached a Young's modulus five times higher than pure PBAT and with the WSP-PBAT composite we could even increase the Young's modulus seven fold. Although the mechanical strength of the walnut fillers laid under that of WF-PBAT, we could show that walnut shells and their delignified cells can enhance mechanical properties. Especially the outstanding even distribution and size of the WSC could be a favourable property for industrial production. These first results show the potential of walnut shell waste as sustainable fillers for PBAT composites. However, more in-depth research is needed to pave the way for walnut shell waste in biodegradable composites and other material applications to finally reduce plastic and waste pollution.

Main Author: Ježo Aleksandra (Speaker)

University: Warsaw University of Life Sciences

Lignocellulosic residues from vineyards as an alternative material for Wood Plastic Composites production

Keywords: vine prunings, WPC, agriculture residues

Abstract text:

Lignocellulosic material being an agricultural waste are easily available and commonly found in large quantities. Therefore, many research works are carried out on the effective management of agricultural biomass. However research has been focusing mainly on investigating power engineering, particularly energy acquisition. Nevertheless a significant part of lignocellulosic materials classified as agricultural waste can be also successfully used in other application. Maintenance pruning in orchards and vineyards provides a vast amount of lignocellulosic biomass. It's been estimated that five tons of prunings can be obtained from one hectare. Only in the EU in 2015 vines were grown on 3.2 million hectares, and the approximate amount of produced biomass was 16 million tons. An insignificant part of vine pruning waste is used as a source of energy obtained from combustion, while the rest remains unutilized. The possibility of using vine prunings as an alternative feedstock for WPC composites creates new directions for the utilization of this biomass. WPC composites are widely applied in floor panels, terraces, or gardening furniture. The object of the following study was to evaluate the utilization of vine pruning waste as an alternative feedstock in wood plastic composites (WPC) production. In the frame of work were manufactured composites of the high density polyethylene (HDPE) with the varied contributions of vine pruning waste. Preliminary results on the mechanical and physical properties of the composites are encouraging and give grounds for further continuation of the research.

Main Author: Kaufmann Lilian Mira (Speaker)

University: University of Natural Resources and Life Sciences, Vienna

New materials based on waste: bacterial cellulose from kombucha production blended with walnut shells

Keywords: kombucha, bacterial cellulose, composite, walnut

Abstract text:

The ever-growing demand for sustainable and bio-degradable materials bring into play several plant feedstock components. Especially cellulose as one of the most abundant polymers in nature with excellent mechanical properties, has shown high potential in the development of sustainable new materials. Isolating cellulose from plant biomass often needs harsh treatments as cellulose fibrils are intimately associated with hemicelluloses and lignin. In contrast bacterial cellulose can be easily produced via fermentation and meets today's needs for ecological green material manufacturing. Utilizing waste to manufacture functional material is the key scope of this research. Two waste components, bacterial cellulose from kombucha fermentation and walnut shells, are combined to produce sustainable composites. The bacterial cellulose pellicle grows at the air-liquid interface with easy controllable fermentation parameters (i.e. no aseptic working needed, fermentation media is easily cooked, ...) and is finally a waste product of the kombucha industry. Walnut shells are also a waste product and currently discarded or incinerated. In this work, novel bacterial cellulose composite materials were produced with changing concentration of walnut shell cells as filling material. Characterisation of these sustainable composites included mechanical properties, water holding capacity and composite and surface structure and will help to assess the potential for various applications. Biomedical applications such as wound dressings might be interesting due to a high water holding capacity and long water retention times. Additionally, these composites might be used as a vegan leather-substitute or in the field of packaging material.

Main Author: Fränkel Julian (Speaker)

University: University of Natural Resources and Life Sciences, Vienna

Co-Authors:

- Hohegger Laura
- Kiran Sanem
- Fürhacker Maria

Behavior of microplastic particles in soil

Keywords: microplastic, soil, microscoping environment

Abstract text:

Several studies have shown that plastics are a huge part of the environmental pollution mainly due to its long degradation time; especially microplastic (MP) is getting more and more attention all over the media. However, most of the reports refer to the behavior of microplastics in water. The reason for that is mainly the fact that the detection of microplastics in terrestrial systems requires much more effort compared to investigations of aquatic systems. The aim of this study was the investigation of the behavior of microplastic particles of various sizes in 2 types of soils with different characteristics. Undisturbed samples of arable (xg) and sandy soils were used. After determining the soil properties, fluorescent polyethylene particles of x sizes (1 μm – 3000 μm) were placed on the soil column. on the particles were washed into the soil with water. The movement of the particles were measured by fluorescence microscopy after filtration (0.45 μm) in the leachate and in different depth of the soil column. Special attention was paid to the interaction of various properties such as particle size, particle density or pore size of the soil. The results indicate, that the small particles (1 – 5 μm) distributed within the column and in the leachate. Particles (425-1000 μm) did not enter the soil and 50 μm were found only in the upper part of the column. In conclusion the study showed that the behavior of microplastic particles depends on the particle size, the particle density and the type of soil; small MP could reach the groundwater.

Main Author: Gawron Paulina (Speaker)

University: Warsaw University of Life Sciences

The culinary use of vegetable kitchen waste as component of sustainable food production system

Keywords: sustainability, organic food, consumer assessment

Abstract text:

The aim of this study was the development and sensory evaluation of three innovative dishes using organic vegetable kitchen waste included in a vegan menu. The overall aim was to incorporate the principles of sustainable food production systems into culinary practice with an emphasis on the reuse of kitchen leftovers. The first step towards creating a vegan menu from organic vegetable kitchen leftovers was to establish a partnership with a company that would agree to make the earliest discarded parts of vegetables and fruits available for culinary purposes. The next step was to create recipes using the products obtained and to prepare dishes based on them. After an initial sensory evaluation, 3 dishes were selected and subjected to a semi-consumer evaluation to test their desirability. The sensory analysis carried out showed that the dishes prepared from kitchen leftovers received a positive sensory evaluation in the semi-consumer test. The chocolate mousse from aquafaba received the highest overall quality score (7.1), while the other two dishes (chops made of leftovers from broth, salad made of cauliflower stalks) were rated lower and at the same level (6.2). The study showed that it is possible to create attractive dishes prepared from kitchen leftovers. It was also shown that the recipes for these dishes should be promoted among consumers and awareness should be raised of the importance of such a diet for the environment and for achieving global sustainable development goals.

Main Author: Thoma Christopher (Speaker)

University: University of Natural Resources and Life Sciences, Vienna

Effects of drying-rewetting cycles on soil greenhouse gas fluxes in an Austrian forest

Keywords: GHG, climate change, extreme events

Abstract text:

In this Master Thesis, the effect of extreme weather events on the capacity of soils to uptake and release greenhouse gases (GHG) on the mid- and long-term (6-7 years) was studied. An experiment simulating extreme weather events on the Rosalia forest was launched in 2013, and soil-atmosphere GHG fluxes (CO₂, CH₄ and N₂O) have been monitored almost continuously since the onset of the manipulations. The study site is fully equipped for automated chamber measurements of soil- atmosphere GHG fluxes and soil microclimatic parameters (soil moisture and soil temperature) to better understand the GHG exchange processes. Additionally, rain-out shelters and an irrigation system ensure an unproblematic conduction of manipulation events. This long-term manipulation includes an environmental control with natural precipitation and two levels of stress. This Master Thesis analysed the 2019 and 2020 dataset. Results from this time period were compared with available information on the short-term response (2013-2017) of the soil after the beginning of the simulations. In the observation period of this Master Thesis, extended drought events triggered a decline of soil CO₂ and N₂O emissions, while an increase in soil CH₄ uptake was observed. Rewetting caused a significant but short-lived increase in CO₂ soil emissions. The observed reduction of GHG emissions during drought overweighed the GHG pulses after rewetting events. The reason might be that N acted as a limiting factor at our experimental site. It was observed that the manipulations affected the soil GHG fluxes in the mid- and long-term at a lower intensity than in the short-term. The significant differences among the three treatments decreased compared to the previous observation periods. Overall, this Master Thesis contributed to gain a deeper understanding on the mid- and long-term effects of climate change and extreme weather events on the GHG balance of Austrian forest soils.

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