PhD Day at ATB

ATB Leibniz-Institut für Agrartechnik und Bioökonomie

PhD-Day at ATB Potsdam, Tuesday, 05 December 2023, Hybrid-Conference; Room Z003 and Zoom

Time	Topic	Speaker	Supervisor ATB	Supervisor University
9:00	Welcome	Prof. Dr. Barbara Sturm Dr. Ulrike Praeger PhD representatives ATB		
9:15	Postharvest refrigeration improvement by heat exchange measurement in fresh produce storage	Tuany Gabriela Hoffmann	Dr. Pramod Mahajan	Prof. Dr. Barbara Sturm, HU Berlin
9:40	Drying kinetics and chemo-metric changes during drying of purple carrots and golden kiwis	Muhammad Tayyab	Dr. Sharvari Raut	Prof. Dr. Barbara Sturm, HU Berlin
10:05	How to model variability in food drying processes?	Jörg Schemminger	Dr. Sharvari Raut	Prof. Dr. Barbara Sturm, HU Berlin
10:30	Coffee break			
11:00	Utility of VisNIR spectroscopy to predict lime requirement of quaternary soils	Michael Horf	Dr. Sebastian Vogel	Prof. Dr. Cornelia Weltzien, TU Berlin
11:25	Effect of high hydrostatic pressure treatment on oxidation and microbial status of Tenebrio molitor paste	Giacomo Rossi	Dr. habil Oliver Schlüter	Prof. Dr. Andreas Vilcinskas, Justus-Liebig-University Gießen
11:50	Group photo / Lunch break			
13:00	Alumni report on their career after doctorate/postdoc phase at ATB	Dr. Simona Menardo	Office for Occupational Safety, Consumer Protection and Public Health – Brandenburg Officer 'Environmental Health Protection'	
13:25	Pitch presentation Why a data catalog?	Ronald Namwanza	Computer Scientist / Programmer Dep. CI RDM and Central IT, ATB	
13:35	Tutorial: Quantus x Climate Applying explainable AI evaluation in climate science	Philine Lou Bommer Anna Hedström	Prof. Dr. Marina Höhne	Prof. Dr. Marina Höhne, Uni Potsdam
14:20	Recording methods of respiratory parameters in cattle	Lena Dißmann	Dr. Gundula Hoffmann	Prof. Dr. Thomas Amon, FU Berlin
14:45	Determining air exchange rates in naturally ventilated barns using image processing and neural networks	Ali Alaei	Dr. Sabrina Hempel	Prof. Dr. Cornelia Weltzien, TU Berlin
15:10	Coffee break			
15:30	Assessment of treatments to reduce the amount of antibiotic-resistant bacteria in chicken manure	Aleksandra Atanasova	Dr. Tina Kabelitz	Prof. Dr. Thomas Amon, FU Berlin
15:55	Counteracting droughts with humic acid application in soil to maintain the soil microbial community	Daniel Höfle	Dr. Ahmed Abdelfattah	Prof. Dr. Gabriele Berg, Prof. Dr. Elke Dittmann, Uni Potsdam
16:20	Economic and greenhouse emissions performance of energetic conversion scenarios of autumn tree leaves from the city of Berlin	Andres Vargas	Dr. Ulrich Kreidenweis	Prof. Dr. Annette Prochnow, HU Berlin
17:00	Get together			

Abstracts

Postharvest refrigeration improvement by heat exchange measurement in fresh produce storage

Tuany Gabriela Hoffmann

Refrigerated storage plays a pivotal role in preserving the quality and safety of highly perishable fresh produce postharvest. For this reason, this study explores the crucial aspect of heat transfer in refrigeration and its impact on food preservation. Addressing non-uniform temperature distribution in cold storage facilities, various cooling rates were investigated under a simulated environment. Moreover, the research introduces a cost-effective approach using Peltier elements for measuring heat exchange, offering promising applications in agricultural technology and storage equipment design.

Drying kinetics and chemo-metric changes during drying of purple carrots and golden kiwis

Muhammad Tayyab

The persistent challenge of ensuring consistently high-quality processed fruits and vegetables is due to limitations in processing and preservation techniques. Despite being one of the most popular processing and preservation techniques, hot air drying is still a mystery (black) box due to unexplored hidden complex relation between process and product quality parameters. High quality dried product based dynamic drying process is complex and difficult to regulate. To resolve this issue, current research focuses on variations in qualitative aspects during drying of purple carrots and golden kiwis. These variations are determined and analyzed using non-invasive (Hyperspectral imaging (HSI)) and invasive techniques.

How to model variability in food drying processes?

Jörg Schemminger

It is an accepted fact that the necessary improvements in fruit and vegetable drying can be achieved through physics-based simulations. This is particularly effective when the measured data allows direct comparison with real world results: a digital twin. However, the inherent heterogeneity of the raw materials still poses a challenge, as each particle in the dryer is different from the others. In this work, we demonstrate how a combination of physics-based and Monte Carlo simulations in addressing this variability by considering different process, product, and design parameters.

Utility of VisNIR spectroscopy to predict lime requirement of quaternary soils

Michael Horf

Detailed knowledge of a soil's lime requirement (LR) is a prerequisite for a demand-based lime fertilization to adjust the required pH optimally and thus to sustainably increase crop yields. The LR can be directly determined by the base neutralizing capacity (BNC). Instead of using laboratory methods to measure BNC, it was extensively examined how far the diffuse reflectance spectroscopy in the visual and near-infrared region (VisNIR) could be a precise, fast, and low cost alternative. Therefore, VisNIR spectra of 170 sieved and dried soils from North-east-Germany were recorded and analysed with several different chemometric methods.

Effect of high hydrostatic pressure treatment on oxidation and microbial status of Tenebrio molitor paste

Giacomo Rossi

High hydrostatic pressure (HHP) is a non-thermal processing technology increasingly explored by the industry. Although it does not involve high temperatures, respecting the main quality parameters of the food, effects of HHP on lipid and protein oxidation must be considered when treating new, alternative food materials. In this talk, effect of HHP on edible insect derived products is evaluated. Three independent experiments will be described, showing that HHP can be effectively applied on insect products, resulting in a significant microbial reduction without showing negative effect on lipid and protein stability.

Tutorial: Quantus x Climate: Applying explainable AI evaluation in climate science

Philine Lou Bommer, Anna Hedström

Explainable artificial intelligence (XAI) methods shed light on the predictions of deep neural networks (DNNs). In the climate context, XAI has been applied to improve and validate deep learning (DL) methods while providing researchers with new insight into physical processes. However, the evaluation and selection of XAI methods are challenging due to lacking ground truth explanations. Consequential unverified choices of XAI methods can lead to misleading information about the network decision and can convey trust in the prediction of a network potentially considering data artifacts. In this demo, we show the application of the XAI evaluation package Quantus on climate data.

climatechange.ai

Recording methods of respiratory parameters in cattle

Lena Dißmann

The recording of the respiration rate (RR) and the tidal volume (Vt) in cattle is of great relevance to detect a stress situation (e.g. heat stress, anxiety) as well as pathological processes at an early stage. Therefore, the objective of this dissertation was to evaluate common recording methods of the RR in order to find the most accurate one and to record the Vt with a RR sensor which would simplify the measurement procedure. The aim of future studies is to automatically record the RR and Vt by using imaging techniques and artificial intelligence.

Determining air exchange rates in naturally ventilated barns using image processing and neural networks

Ali Alaei

Despite these advances, predicting air flow rates in naturally ventilated barns remains a challenging task. This study aims to investigate the effectiveness of combining CFD models, AI techniques, and image processing to predict air flow rates in naturally ventilated livestock barns. By utilizing a combination of these techniques, I aim to develop a more accurate and efficient method for predicting air flow rates in barns, which can ultimately lead to improved ventilation and better health and productivity for livestock.

Assessment of treatments to reduce the amount of antibiotic-resistant bacteria in chicken manure

Aleksandra Atanasova

Spreading of antibiotic resistance is one important threat for human health. Microorganisms with resistance deteriorate the effectiveness of antibiotics. There are three main ways to spread of antimicrobial resistance. One of those is spreading from livestock. Chicken manure is used as agricultural fertilizer. However, it can contain high amounts of antimicrobial resistant bacteria those can be transferred to environment. Therefore, it is the aim of the study to find manure treatment conditions under which most of those bacteria will be eliminated. In this study, we consider the two processes used in fertilizer production: composting and anaerobic digestion.

Counteracting droughts with humic acid application in soil to maintain the soil microbial community

Daniel Höfle

Climate change is a global issue and comes with rising temperatures, altered rainfall patterns and therefore, droughts. This is especially exasperated by areas such as Brandenburg, which are characterized by sandy soil. Humic substances are known to increase soil fertility and water holding capacity and can be used to alleviate drought effects. In this research, we investigated the effect of artificially produced humic substances via hydrothermal humification on the soil microbiome. The artificial humic acid was incorporated into soils collected from Marquardt, Potsdam at a concentration of 0.01%. Soils were subjected to drought treatments and the microbiome was monitored using both isolation on artificial growth media and amplicon sequencing.

Economic and greenhouse emissions performance of energetic conversion scenarios of autumn tree leaves from the city of Berlin

Andres Vargas

Autumn tree leaves are residues generated annually and composted as their final treatment, emitting positive net greenhouse gas (GHG) emissions. Alternatives scenarios were proposed to harness the potential of leaves for energy production: anaerobic fermentation, gasification and co-firing. Using a combination of partial life cycle assessment and net present value (NPV) methods, the GHG emissions and economic performances of these scenarios were evaluated. The results showed that gasification scenarios presented the highest profitability, whereas co-firing scenarios obtained the lowest net GHG emissions. The economic performance was sensitive with respect to the assumptions on the use of available infrastructure, the transport distance of the leaves to the facilities, and the setting of tariffs for power generation.