

**Scientific Student Conference 2017**

**Euroleague for Life Sciences**



**GLOBAL CHALLENGES  
THE IMPACT OF LIFE SCIENCES**

**Editors:**

**Grete Bertelsen**

**Ida Arendal Jørgensen**

**17 November – 18 November 2017**

**Copenhagen**

**Denmark**

**Scientific Student Conference 2017**  
**Euroleague for Life Sciences**  
**Global Challenges – the Impact of Life Sciences**  
**17 November – 18 November 2017**  
**University of Copenhagen, Faculty of Science**  
**Copenhagen**  
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Editors: Grete Bertelsen, Ida Arendal Jørgensen

Quotation from or reference to any part of this book should be made with full reference to the above data.

Lay-out: Kenneth Velling Johansen

Cover: Kenneth Velling Johansen

ISBN: 978-87-991224-9-3

Printing: Frederiksberg Bogtrykkeri A/S

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## **Euroleague for Life Sciences (ELLS)**

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

BOKU – University of Natural Resources and Life Sciences, Vienna, Austria

CULS – Czech University of Life Sciences, Prague, Czech Republic

SCIENCE – University of Copenhagen, Faculty of Science, Copenhagen, Denmark

SLU – Swedish University of Agricultural Sciences, Uppsala, Sweden

UHOH – University of Hohenheim, Stuttgart, Germany

WULS-SGGW – Warsaw University of Life Sciences, Warsaw, Poland

WUR – Wageningen University and Research, Wageningen, The Netherlands

CAU – China Agricultural University, Beijing, China

HUJI – Hebrew University Jerusalem, Jerusalem, Israel

LU – Lincoln University, Lincoln, New Zealand

## **Organizing Committee SSC 2017**

Prof. John Renner Hansen

Prof. Grete Bertelsen

Katja Sander Johannsen

Ida Arendal Jørgensen

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ELSA member Frederikke Melina Fava

ELSA member Albert Fuglsang-Madsen

## **Conference Secretariat SSC 2017**

Katja Sander Johannsen

Ida Arendal Jørgensen

Lucy Møller

## Welcome by Chair of the Board, Euroleague for Life Sciences (ELLS)

Welcome to the Scientific Student Conference!

I am honored to welcome you on behalf of the ELLS Board to the 9<sup>th</sup> ELLS Universities Conference.

Each year our ELLS Universities community puts collective effort on finding solutions to world challenges related to Life Sciences. This year we focus on tightening collaboration and knowledge production across the borders. We look for the answers to crucial issues in health of humans, animals, plants, and environment. We are concerned about sustainability and safety of our food supply and on how to enable innovation and entrepreneurship in our fields work better. A conference such as ELLS is a perfect opportunity to share results of research projects, acquire new knowledge and set new directions. We encourage you as students of biosciences to engage with one another and reflect on each subject raised.

Let me also extend my deep and heartfelt gratitude to this year SSC host, University of Copenhagen. They have organized a remarkable event for all of us.

Thank you for joining us at the 9<sup>th</sup> SSC conference.



Best wishes,

Professor Wiesław Bielawski  
ELLS Chair of the Board  
Rector WULS-SGGW – Warsaw University of Life Sciences

## Welcome by Dean of the Faculty of Science, University of Copenhagen

Welcome to Copenhagen, to the Faculty of Science at the University of Copenhagen, and to the ELLS Scientific Student Conference 2017.

It is a pleasure for me to welcome you to the 9<sup>th</sup> annual ELLS Scientific Student Conference, hosted by the Faculty of Science, at the University of Copenhagen.

Agricultural and veterinary sciences, and later on Life Sciences in a broader sense, have been taught on these premises since 1858, and it is a pleasure to be part of the history of this institution and its ongoing development, inevitably linked to the ever-expanding world that it is set in.

This year's conference theme "Global challenges – the Impact of Life Sciences", addresses the way many of the contemporary issues and questions facing us have become borderless, and thus require solutions that cross borders, both geographically and academically.

This is one of the things that make the Euroleague for Life Sciences, and not least, the Scientific Student Conference, so important – it gives students the opportunity to develop an interdisciplinary international network and international experience early in their careers.

This year we welcome approximately 350 students and scientists from the ELLS member universities. We hope you will use this opportunity to be inspired by, and engage actively in, the conference and the presentations, and discover Copenhagen and our campus here at Frederiksberg.



I wish you all a fruitful conference at SCIENCE,

Prof. John Renner Hansen

Dean at the Faculty of Science, University of Copenhagen



## Program

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<b>Friday, 17 November 2017</b>				
<b>9.00 – 11.00</b>	Campus tour or other activity – <a href="#">Around Copenhagen and at the Frederiksberg Campus Area</a>			
<b>10.00 – 12.30</b>	Registration – <a href="#">The Marble Hall</a>			
<b>11.30 – 12.30</b>	Lunch – <a href="#">The Marble Hall</a>			
<b>12.30 – 12.45</b>	Opening and welcome Michał Zasada (Vice Rector for International Cooperation, WULS-SGGW) Anne Swank (ELSA Chair) Grete Bertelsen (Vice Dean of Education at SCIENCE) - <a href="#">Auditorium A2-81.01</a> (Broadcasting also in <a href="#">A2-70.04</a> )			
<b>12.45 – 13.30</b>	1 <sup>st</sup> keynote speech – Connie Hedegaard - <a href="#">Auditorium A2-81.01</a> (Broadcasting also in <a href="#">A2-70.04</a> )			
<b>13.35 – 14.35</b>	Poster session I.I – <a href="#">Copenhagen Plant Science Centre, Foyer</a>		Poster Session I.2 – <a href="#">Copenhagen Plant Science Centre, auditorium</a>	
<b>14.35 – 15.35</b>	Oral session I.I – <a href="#">Auditorium A2-70.01</a>	Oral Session I.2 – <a href="#">Auditorium A2-70.02</a>	Oral Session I.3 – <a href="#">Auditorium A2-70.03</a>	Oral session I.4 – <a href="#">Auditorium A2-70.04</a>
<b>15.35 – 16.00</b>	Coffee Break – <a href="#">The Marble Hall</a>			
<b>16.00 – 17.00</b>	Oral session 2.I – <a href="#">Auditorium A2-70.01</a>	Oral Session 2.2 – <a href="#">Auditorium A2-70.02</a>	Oral Session 2.3 – <a href="#">Auditorium A2-70.03</a>	Oral Session 2.4 – <a href="#">Auditorium A2-70.04</a>

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<b>17.00 – 18.00</b>	Poster session 2.I - Copenhagen Plant Science Centre, Foyer	Poster Session 2.2 - Copenhagen Plant Science Centre, auditorium
<b>18.00 – 19.00</b>	Walk to the dinner venue (arrival in groups to avoid waiting time outside)	
<b>19.30 – 22.00</b>	SSC Dinner – “Søpavillonen” Gyldenløvesgade 24, 1369 Copenhagen K	
<b>22.00 – 01.00</b>	Student Party – Søpavillonen	

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**Saturday, 18 November 2017**

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**8.30 – 9.30**Registration and coffee – [The Marble Hall](#)**9.30 – 10.30**

Oral session 3.I – <a href="#">Auditorium A2-70.01</a>	Oral session 3.2 – <a href="#">Auditorium A2-70.02</a>	Oral Session 3.3 – <a href="#">Auditorium A2-70.03</a>	Oral Session 3.4 – <a href="#">Auditorium A2-70.04</a>
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**10.35 – 11.35**

Poster session 3.I – <a href="#">Copenhagen Plant Science Centre, Foyer</a>	Poster Session 3.2 – <a href="#">Copenhagen Plant Science Centre, auditorium</a>
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**11.40 – 12.40**

Oral session 4.I – <a href="#">Auditorium A2-70.01</a>	Oral Session 4.2 – <a href="#">Auditorium A2-70.02</a>	Oral Session 4.3 – <a href="#">Auditorium A2-70.03</a>	Oral Session 4.4 – <a href="#">Auditorium A2-70.04</a>
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**12.40 – 13.45**Lunch Break – [The Marble Hall](#)**13.45 – 14.30**2<sup>nd</sup> keynote speech – Afton Halloran - [Auditorium A2-81.01](#)**14.30 – 14.45**Presentation from the Research Support group  
- [Auditorium A2-81.01](#)**14.45 – 15.00**Coffee break – [The Marble Hall](#)**15.00 – 16.00****Award Ceremony**

ELLS Prize for Excellent Master Thesis

Acknowledgement of ELLS Joint Master Programme Graduates

Student Presentation Prizes

Acknowledgement of support of chair persons and SPPC  
members

Wrap-up by ELSA chair

Closing of the conference

– [Auditorium A2-81.01](#)

## General information

### Conference venue

The conference takes place in “Marmorhallen” and surrounding auditoriums, and in the Copenhagen Plant Science Centre. The main entrance is located on Thorvaldsensvej 40, 1871 Frederiksberg C.

### Abstracts

This book contains the abstracts of oral presenters and poster presenters invited for the conference, based on their abstract. Each abstract is found under the session in which they will be presenting. Affiliations are provided only for the presenting authors, whose names are underlined. The organising committee does not take any responsibility for scientific or typographical errors.

### Presentation prizes

A scientific Student Presentation Prize Committee evaluates all presentations, and decide on a 1<sup>st</sup> and 2<sup>nd</sup> prize in each of the following categories, to be handed out during the prize ceremony on Saturday November 18:

Oral presentations in the sessions of “Global Health – Humans and Animals”.

Oral presentations in the sessions of “Global Health – Plants and Environment”.

Oral presentations in the sessions of “Food – Quality, Production and Safety”.

Oral presentations in the sessions of “Collaboration – Enabling innovation and entrepreneurship in Life Sciences”.

Poster presentations in the sessions of “Global Health – Plants and Environment” and “Global Health – Plants, Environment and Production”.

Poster presentations in the sessions of “Global Health – Humans and Animals”.

Poster presentations in the sessions of “Food – Quality, production and safety”.

The posters in the category “Collaboration – enabling innovation and entrepreneurship in Life Sciences” have been included in the session on “Global Health – plants and environment” due to a small number.

### Conference dinner on Friday 18.11.:

The conference dinner and party takes place at “Søpavillonen” on Gyldenløvesgade 24, 1369 Copenhagen C.

The dinner starts at 19.30, and we encourage participants to arrive continuously between 18.00-19.15 in order to avoid a line outside the venue. Interested students can depart in groups from the main entrance of the Copenhagen Plant Science Centre from 18.15 onwards.

## Keynote speakers



### Connie Hedegaard

Connie Hedegaard will give the first keynote speech of the Scientific Student Conference on Friday November 17 at 12.45 – 13.30 in Aud. A2-81.01.

Connie Hedegaard has a long resume within policies surrounding climate issues at a national and international level.

As previous Danish Minister for Climate and Energy, Head of the UN Climate Convention in Copenhagen in 2009 and European

Commissioner for Climate in the EU, she has in-depth insight in the aspects of both climate and derived major challenges facing our societies today. She is currently head of the board at the Danish green think tank Concito.

Connie will focus on the importance of quality research and knowledge dissemination for solid and sustainable policy making related to a global future.



### Afton Halloran

Dr. Afton Halloran gives the second keynote speech of the Scientific Student Conference on Saturday November 18 at 13.45 – 14.30 in Aud. A2-81.01.

Afton Halloran recently finished her PhD thesis “Impacts and outcomes of cricket farming systems on rural livelihoods and sustainable diets in Kenya and Thailand”, carried out as part of the research project “GREEiNSECT”.

Her research interests focus on farmers’ organizations, food policy, sustainable diets, rural and urban development and sustainable food systems.

Her resume includes co-authorship of the book “Edible insects – Future prospects for food and feed security” published by FAO and Wageningen University.

Afton is returning to the ELLS Scientific Student Conference, as she presented her research as a MSc. student at the conference in Wageningen in 2011, where she won a prize for best oral presentation.

## **Abstracts for oral sessions**

Due to the large diversity in abstract submissions, a few abstracts are presented in sessions with a different subtheme than the one they were originally labelled with by the author. The original subtheme chosen by the author is included in the abstract for reference.

**Scientific Student Conference 2017**  
**Euroleague for Life Sciences**

**Session 1: 17 November 2017 at 14.35 – 15.35**

**Oral session 1.1. Global Health: Plants**

**Auditorium A2-70.01**

# **Regeneration ecology of *Quercus* species in Gaurishankar Conservation Area, Nepal**

Jokin Idoate Lacasia

*BOKU - University of Natural Resources and Life Sciences, Vienna*

Keywords: Regeneration; *Quercus semecarpifolia*; *Quercus lanata*; Light availability; Seedlings

Subsistence hill agriculture is very common in the mid hill areas of Nepal, which creates a big dependence and pressure on the forests, and on *Quercus semecarpifolia* and *Q. lanata* species in particular. These species have an important provisioning service value due to their capacity of supplying fodder, leaf litter, firewood and timber, but they are being overexploited. The forests they form are facing an imminent threat due their failure to regenerate.

The conditions in which their seedlings survive and grow are currently being studied in Ladhuk, Bulung and Orange Village Development Committees, where the upper temperate mixed broadleaved forest and the temperate mountain oak forest are found, inside Gaurishankar Conservation Area (GCA), in Dolakha District, central Nepal. 42 plots with different levels of disturbance have been located, as well as undisturbed plots for both species, each plot consisting in 4 subplots 1x1m, 2 being fixed and 2 variable according to the presence or absence of the seedlings.

The physical characteristics of the plots (slope, orientation, elevation), microsite cover, competing vegetation, distance to the closest potential mother tree, its height and DBH, as well as of the neighbouring trees, height and root collar diameter of the seedlings and saplings, level of disturbance, soil conditions (thickness of the different layers, colour and pH) and light availability (using hemispherical photographs that will then be analysed using the software Hemiview 2.1) are currently being recorded, with the objective of developing further knowledge about the ecology of the regeneration of these two oak species, assessing their status in the study area, and developing useful guidelines for the management of these forests, as well as for future ecological restoration projects that may attempt to use these species.

**Global health - Humans, animals, plants and environment**



# **The potential of timber based construction in Europe**

Johannes Amlacher, Max Reisinger, Tobias Absmeier

*BOKU - University of Natural Resources and Life Sciences, Vienna*

Keywords: Wood, timber, construction, CO<sub>2</sub>, substitution

Due to the climate change, the interest in building with wood currently got a huge upsurge. Based on literary- and Internet research, and additionally an expert interview, the potential of timber based construction in Europe should be considered regarding a link to climate change and a chance for wood to replace conventional building materials in the future.

This paper/script set itself the goal to discuss the ecopolitical parameter and the technical feasibility of timber based construction, which highlight the benefiting measure on the political tier, plus to eradicate the doubts regarding statics and fire technology. It depicts that the EU also noticed the potential of wood construction, because of its good ability to sequester the climate-damaging CO<sub>2</sub>, and therefore getting closer to the goals of political understandings.

Due to this the effect of CO<sub>2</sub>-substitution is going to be clarified. Furthermore the ecobalance will be discussed which allows to measure the substitution of emissions from emergence to disposal of the materials. Conclusively the amount of already constructional used wood in Europe is illustrated by reference to chosen examples, which include the progress of international wood construction and how experts predict the future of this trend.

The results show, that due to the availability and the climate-friendly aspects of the building material an intensification of wood construction is not only possible, but also necessary in times of climate change.

**Global health - Humans, animals, plants and environment**

# **Effects of fertilization and deep-soil heating on nutrient uptake and allocation in tundra vegetation**

Angeline Bruls

*WUR - Wageningen University and Research Centre*

Keywords: Arctic, plants, climate change, warming, experiment

Climate change, which is stronger at high latitudes, will lead to changes in tundra vegetation through warmer temperatures and consequent thawing of permafrost, which will possibly increase soil nutrient levels.

The aim of this project was to analyze the effects of fertilization and deep-soil heating on nutrient uptake and allocation in tundra vegetation. Data from a field experiment were used to determine nutrient concentrations (mg/g) and amounts of nutrients (g/m<sup>2</sup>) for different plant parts of different plant functional types.

Fertilization resulted in higher amounts of nutrients for most PFTs, except sedge. In general, aboveground plant parts reacted stronger to the fertilization treatment than belowground parts, as was expected. Also, moss nutrient concentrations increased with the fertilization treatment, although moss biomass declined, possibly due to shading by the vascular plants. Sedge and grass were known to have reacted to deep-soil heating in biomass and root distribution. However, only sedge leaves showed an increase in g/m<sup>2</sup> nutrients. Sedge reactions to both fertilization and deep-soil heating could possibly be explained by their root morphology. For deciduous shrub coarse roots a slight response to deep-soil heating was found, which was surprising.

Some results of this study could be made clearer or more distinct if the experiment was conducted for a longer time period. This could also provide some clearance on whether or not soil nutrient levels increase with deep-soil heating. This research provides more insight in the mechanisms of vegetation shifts due to climate change.

**Global health - Humans, animals, plants and environment**

**Scientific Student Conference 2017**

**Euroleague for Life Sciences**

**Session 1: 17 November 2017 at 14.35 – 15.35**

**Oral session 1.2. Collaboration: Enabling innovation and  
Entrepreneurship**

**Auditorium A2-70.02**

# **Public participation, sustainability and environmental awareness. Case study of the effect of wisdom councils on participants in the region Bregenzerwald.**

Katharina Toth

*SCIENCE - University of Copenhagen, Faculty of Science*

Keywords: Public participation, sustainable development, environmental awareness

Several researchers claim that technological improvements and innovations are necessary but not sufficient to achieve sustainable development (SD). Vital are changes in values, norms, moral judgements and social constructions that determine the necessary changes in inherent attitudes and behaviours. This is particularly important for tackling environmental risks and global environmental changes such as climate change. Public participation processes are considered to be an important element and a path for enabling more SD, because they involve the civil society, which is seen as an important actor for more SD.

Hence, this thesis analyses the effects of the public participation method “wisdom council” (WC) on its participants by conducting a participatory observation of a WC in the region Bregenzerwald, as well as semi-structured qualitative interviews with participants of this WC. The objective is to investigate how the WC process affects participants regarding legitimacy, creditability and acceptance of decisions and political institutions. Furthermore, it assesses the effects on participants regarding their own potential future commitment as that of other stakeholders towards these decisions. Additionally, it then examines what consequences these effects could have for supporting more SD. This is done by applying concepts like general education, social learning, empowerment, self-determination and community spirit. Another aim of this thesis, which sets it apart from already conducted studies, is to analyse how attending WCs changes the environmental awareness of participants. The reason why this could be important is because environmentally aware citizens are seen to be more capable of promoting SD.

The findings show that the aforementioned concepts are valuable for examining the effects of WCs on its participants and to better understand if and how these effects can be meaningful for enabling more SD.

**Collaboration - Enabling innovation and entrepreneurship in life sciences**

# **Less time in the greenhouse means better experiments: combining plant physiology and statistical modelling to improve crop measurement efficiency**

Raisa Ramdeen, Miranda Mortlock, Erik Van Oosterom

*UHOH - University of Hohenheim*

Keywords: Plant physiology, modelling, C4 cereals

Large trials for screening leaf area in crop trials currently require the measurement of physical characteristics such as leaf length and width of individual leaves throughout the growing season. This requires a large time input by scientists. The use of automation with sensors can improve efficiency but can only collate those detailed data on relatively small plants. Therefore automation is only useful in the early part of the growing season. In sorghum trials in SE Queensland there is a large amount of detailed information on individual leaf size for many genotypes and under various environmental conditions.

The aim of this work was to investigate the relationships of the leaf length and width with the individual area, in relation to total leaf number and the area per leaf over the growing season. A high quality data set was used to develop a method for estimating total plant leaf area by combining a minimum number of leaf measurements with published relationships on that estimated individual leaf area from the leaf position, total number of leaves, and the tiller number.

The model provided good estimates of plant leaf area, across a range of sorghum genotypes and environmental conditions. The methods can easily be extrapolated to other C4 cereals. The models developed can significantly reduce the number of measurements required for leaf area estimation. This will contribute to the researchers' ability to increase the number of genotypes assessed within a trial and will assist the large throughput of plots for trait monitoring.

**Collaboration - Enabling innovation and entrepreneurship in life sciences**

# **Coping with Water Scarcity: Alternate Wetting and Drying as Mitigation Strategy for Water-shortages in a Rice Irrigation System in the Philippines**

Pia Schneider

*UHOH - University of Hohenheim*

Keywords: Modelling; oryza sativa; water saving irrigation; WEAP

Irrigated rice consumes for a large share of increasingly scarce freshwater resources and several irrigation techniques have been developed to reduce the irrigation requirement. One of these techniques, Alternate-Wetting-and-Drying (AWD), reduces water demand and methane emissions without yield decrease. WEAP (“Water-Evaluation-and-Planning”), a water management tool, has been applied to evaluate potential water savings of irrigated rice under AWD in the Philippines. The tool was validated for a clay and a sandy soil on the experimental station of the International Rice Research Institute (IRRI) and thereafter, applied for the Angat-Maasim-River-Irrigation-System (AMRIS), an important rice-growing area. Source of the irrigation water used in AMRIS is a reservoir, which also supplies Manila with 97% of its freshwater demand. In case of water shortages, Manila’s demands are prioritised and rice production is threatened.

For the experimental station, irrigation requirement under conventional and AWD irrigation was simulated using WEAP and compared to experimental data. Introduction of AWD on clay soils saved 28% ( $\pm 11$ ) in the dry season, whereas sandy soils aimed a water saving potential of 12 % ( $\pm 4$ ) in the dry season. The potential impacts of climate change scenarios and an increasing freshwater demand of Manila on the water balance of AMRIS were simulated. The combination of both scenarios had a significant effect on the water level in the reservoir, with an up to 40 % larger depletion during the year. Inflow and precipitation were not sufficient to replenish the initial storage volume. In the climate change scenario, streamflow was reduced and water shortages occurred. Implementing AWD could enhance the water availability in the system and counteract as a water scarcity mitigation technique. Depending on the extent of the water shortage, different temporal and spatial AWD implementation approaches are proposed.

**Food - Quality, production and safety**

**Scientific Student Conference 2017**  
**Euroleague for Life Sciences**

**Session 1: 17 November 2017 at 14.35 – 15.35**

**Oral session 1.3. Food: Quality, Production and Safety**

**Auditorium A2-70.03**

# **Microencapsulated Iron: Evaluating chemical and physical thermostability**

Miek Schlangen

*WUR - Wageningen University and Research Centre*

Keywords: Carbonyl content, iron, microencapsulation

Meat replacers are characterized as more sustainable in comparison to meat. The popularity, and therewith demand, of meat replacers is expanding quickly. Iron is an essential nutrient to fortify meat replacers as a lack of it can cause serious illnesses. Fortification of iron with spray dried microencapsulates has potential in preventing iron from executing its pro-oxidant activity. Moreover, microencapsulation of iron with pea protein concentrate (PPC) through spray drying has shown to be promising for controlled release in the gastric fluid and for masking the metallic off-taste. However, before incorporation in a product, the effect of process conditions on the particles needs to be researched.

In this work the effect of temperature on chemical and physical stability of microencapsulated iron was investigated. The stability was determined by protein oxidation, morphology and particle size distribution in fresh samples and after being exposed to different temperatures (140 °C, 100 °C or no temperature treatment (25 °C)). The carbonyl content (mmol/kg) of the spray dried particles, a pea protein suspension and the spray drying feed solution was researched.

Carbonyl contents were highest in the spray dried samples compared to the pea protein suspension and the feed solution, suggesting an increase in protein oxidation during the spray drying process. Samples exposed to 140 °C gave rise to higher carbonyl contents than the other investigated temperatures, but no significant differences were found. Samples exposed to higher temperatures also showed more broken particles in the SEM pictures. Analysis of the particle size distribution showed that spray dried particles with iron exposed to 140 °C were prone to formation of aggregates as the particle size was larger compared to other samples.

Concluding, exposure to temperature had no significant effect on the chemical stability of spray dried particles, whereas the physical stability was affected.

**Food - Quality, production and safety**



## **Anthocyanins and their color modulation**

Nicole Nemetz

*UHOH - University of Hohenheim*

Keywords: Anthocyanins, natural food colorant, co-pigmentation

Purple sweet potato (PSP) (*Ipomoea batatas* (L.) Lam.) may represent an alternative resource for purple and red color additives in food systems. Without undesired flavor and a higher stability of the pigments towards external conditions such as low pH values, an extract of anthocyanins of PSP can be implemented into acidic food systems. Anthocyanins of PSP form complexes with natural based polyphenols.

The stability of these anthocyanins was investigated to determine the effect of structural stabilization as well as color enrichment with natural polyphenols at three different pH values (2.6, 3.6, 4.6). In detail, the color changes of PSP anthocyanins as influenced by intermolecular co-pigmentation were studied by adding chlorogenic and rosmarinic acids as well as food-grade phenolic apple and rosemary (ColorEnhance®) extracts at various dosages (0.25 g/L to 5 g/L (and g GAE/L)) to a diluted PSP anthocyanin concentrate.

The bathochromic shift was most remarkable in samples containing rosemary extract (pH 2.6), however, the strongest absorption was observed at pH 4.6 ( $\lambda = 543$  nm). The hyperchromic effect was highest at pH 4.6 with a concentration of 1.25 g GAE/L of apple extract. Moreover, CIE L\*a\*b\* color values indicated that a broad color range (purple-blue to red) is reachable by simply mixing food-grade phenolic extracts with PSP anthocyanins. Thus, the application of phenolic extracts in foods at slightly acidic pH values seems to be promising for future applications with respect to intensify reddish colors.

**Food - Quality, production and safety**

# **Allelopathic properties of tomatidine and other alkaloids from Solanaceae**

Lukas Hallberg

*SLU - Swedish University of Agricultural Sciences*

Keywords: Allelopathy, tomatidine, alkaloids, sterols

Alkaloids are a heterogeneous group of secondary metabolites in plants with toxic attributes. These substances often have toxic effects on different organisms and are found in many species of the nightshade family (Solanaceae). This study shows that the alkaloid tomatidine from tomato (*Solanum lycopersicum*) are allelopathic to arabidopsis (*Arabidopsis thaliana*, cv. Col), cornflower (*Cyanus segetum*) and tobacco (*Nicotiana tabacum*, cv. SRI) but not to tomato itself. The allelopathic effect were shown to be specific for tomatidine, 8 structurally similar alkaloids from nightshades that were tested in this study did not yield the same effect. The plant material was grown in MS-medium containing tomatidine and its root growth were inhibited due to impaired cell elongation. The roots were deformed and shorter in the presence of 1 - 5  $\mu\text{M}$  tomatidine compared to untreated control plants. The addition of sterols or plant hormones to arabidopsis grown in tomatidine did not stimulate the root growth.

Germination of seeds from different agricultural plants were not affected by tomatidine, however, the growth was retarded which resulted in significantly less germinating seeds of flax (*Linum usitatissimum*).

**Food - Quality, production and safety**

**Scientific Student Conference 2017**  
**Euroleague for Life Sciences**

**Session 1: 17 November 2017 at 14.35 – 15.35**

**Oral session 1.4. Global Health: Animals & Environment**

**Auditorium A2-70.04**

# **Effect of various amendments of the fractions of potentially toxic elements in a contaminated environmental sample**

Katerina Vejvodova

*CULS - Czech University of Life Sciences Prague*

Keywords: Clay amendment, soil acidification, contamination, PTE

Clay amendments, kaolinite and vermiculite, were added at a 10% application rate to contaminated garden soil to reduce plant available metal(loid)s as well as other criterions that will reduce the impact of PTE on the environment.

The garden soil samples were taken from Kutná Hora and after determining the soil properties, the samples were split into two groups; normal soil and acidified soil. The original soil was acidified by the addition of HNO<sub>3</sub>, to observe if pH would influence the adsorption of the metal(loid)s.

The normal and acidified soils were prepared into 50 ml beakers in triplicates and a control, and were placed in room temperature with occasional watering.

Samples were analysed three times over an eight-week period to evaluate the effect of the clays on arsenic, cadmium, lead and zinc bioavailability, pseudo total concentrations and different fractions of a BCR sequential extraction.

After eight weeks, the pseudo total values remained either slightly over or under the original values, with no significant changes in absolute values. Soils amended with vermiculite, vermiculite in acidified soil and kaolinite in acidified soil had values increase in week four, only to decrease in week eight. Kaolinite in the original soil managed to decrease plant available zinc by 0.6% over eight weeks. Vermiculite, vermiculite in acidified soil and kaolinite in acidified soil decreased plant available zinc by 0.3-1.1% in week four, but concentrations increased by 0.2% in week eight.

Vermiculite and kaolinite proved to reduce plant available metal(loid)s in the soil, but not to the extent as it was expected. The pH influence from the acidification of the soil was not as significant as it was expected for our experiment. The studied elements had lower concentrations in the acidified soil but conclusively values remained higher than the controls.

**Global health - Humans, animals, plants and environment**

## **Routine blood tests in the monitoring of performance capacity in Arabian race horses**

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*WULS-SGGW - Warsaw University of Life Sciences*

Keywords: Performance capacity, Arabians, race horses, blood

Health and performance ability of the horses are usually assessed on the basis of physical examination, monitoring of heart rate and analysis of selected laboratory parameters. The analysis of haematological and blood biochemical parameters allows assessing the general health and metabolic changes that occur with the training progress. In case of overload, resulting usually from inappropriate training or overtraining, clinical symptoms (visible lameness) are preceded only by slightly worse disposition, which may be unnoticed by a coach though it causes a decrease in horse's sport condition and worse performance. Because of this, monitoring blood parameters, not only clinical symptoms is necessary for proper management of the training process including reducing the risk of lameness.

In this study the haematological and blood biochemical parameters of 37 purebred Arabian racehorses aged 3 – 5 years were studied during routine race training sessions. From each horse, blood samples were collected at rest, immediately after the exercise and after 30 min. restitution.

Changes in blood parameters reflected to the horses' fitness, adaptation to the effort applied during training sessions and provided information related to muscle damage and overtraining. The results however, must be interpreted using references values for the Arabian horses in race training, which are much more precise and differ from wide normal range for equine species in general.

**Global health - Humans, animals, plants and environment**

# **Identification of new emerging pollutants in surface water using suspect screening analysis and prioritization strategies based on regulatory databases**

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Keywords: Emerging pollutants, suspect screening, LC-HRMS, regulatory databases, surface water

Emerging pollutants (EP) have the potential to enter the water system and cause adverse ecological and human health effects while simultaneously not being covered by existing water-quality regulations. However, the existing target analysis methodology only allows the detection of a very small fraction of the substances present in wastewater samples. The new advances in high resolution mass spectrometry (HRMS) and the application of suspect screening, with a suspected screening list based on prior information but with no reference standard, greatly increases the list of substances that can be identified. The present study aims to detect and identify new, potentially hazardous pollutants based on the hypothesis that regulatory databases can assist in the prioritisation of relevant substances.

Data from the Swedish Chemical Agency database was used to prioritise compounds based on the occurrence on the market, the consumer tonnages, and the use pattern, among other factors. Out of the approximately 20 000 chemicals present in the database, 143 potential organic pollutants were prioritised and a screening was performed in surface water from different locations in Sweden using a LC-HRMS-based analytical approach. 21 tentative identifications were successfully performed with most substances being formerly out of the focus for environmental scientists (also not included in regulations nor monitoring programs). 16 of those substances were further confirmed with reference standard (the highest number in a study of this nature) showing the efficiency of both, the prioritisation strategy, and the suspect screening approach. Results indicate that the use of regulatory databases is a promising way to enhance identification rates as well as to identify new, potentially hazardous compounds. This study is of paramount environmental relevance and it will be considered in the design of future monitoring programs to gain deeper insights in the distribution and concentrations of EP.

**Global health - Humans, animals, plants and environment**

**Scientific Student Conference 2017**  
**Euroleague for Life Sciences**

**Session 2: 17 November 2017 at 16.00-17.00**

**Oral session 2.1. Global Health: Humans and Animals**

**Auditorium A2-70.01**

# **Wait and see or take the lead? - Implementation of the UN Sustainable Development Goals in the private sector**

Sandra Falkner

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Keywords: Sustainable Development Goals (SDGs), private sector, implementation process

In September 2015, a new world agenda for sustainable development, the Agenda 2030, was endorsed by the United Nations. Within the framework of 17 Sustainable Development Goals, businesses, governments and civil society actors are equally called upon to move towards a more sustainable and just world. As many governments around the world fail to adopt adequate policy instruments that ensure such a sustainable path forward, businesses are more and more encouraged to take the lead. However, the private sector also needs to acknowledge that this leading role means coming up with more than just business as usual and relying on existing corporate sustainability measures. What is needed is to incorporate sustainability as an integral part of business strategies and operations. Many companies are already committing to the SDGs and have produced first information folders and websites. However, the results and their impacts are still outstanding.

This paper analyses different processes for the implementation of the UN Sustainable Development Goals. Austria Glass Recycling, a privately owned non-profit company responsible for the collection and recycling of used glass packaging throughout Austria is taken as the main example and their process is compared to the processes currently used by other companies. Company sizes range from small and medium to large scale and come from various sectors, all based in Austria. Data collection is performed through semi-structured interviews with 7-9 companies. The results serve further as an orientation paper for other companies that also want to contribute to the Sustainable Development Goals.

**Global health - Humans, animals, plants and environment**



## **Sustainable development usage in the Olympic context**

Corey Cowger

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Keywords: Sustainable Development, Olympic Games, Sustainable Planning Practices,

Since 1987, Sustainable Development has been well-established in the public lexicon. It was not until 1994, however, that the term was introduced as a part of the Olympic Movement. An action, in part, resulting from public backlash to irreparable environmental damage caused by the construction and implementation of the Albertville Olympic festival of 1992. This damage was the end-result of the organizations foray into ever-growing regional development and at the time lacking environmental policies. The 1994 adoption of Sustainable Development as a core tenet of the Olympic movement has resulted in a multitude of sustainability declarations by recent Olympic Games; examples of which can be seen in the Sydney, Athens, Beijing, Vancouver, London, and Rio de Janeiro Festivals. The organizing committees for these Olympic Festivals have relied heavily on the implementation of green technology and environmentally conscious planning in crafting the modern Olympics.

However, are these measures legitimate forward-moving steps in promoting a sustainable development agenda? Or is the International Olympic Committee (IOC) using Sustainable Development to distract from its detractors claims of unchecked growth and gigantism?

**Global health - Humans, animals, plants and environment**

# **Discovery of human IgG antibodies against medically relevant toxins of black mamba (*Dendroaspis polylepis*) venom**

Urska Pus

*SCIENCE - University of Copenhagen, Faculty of Science*

Keywords: Recombinant snakebite antivenom, phage display, black mamba, snakebite, immunology

Venom of the infamous black mamba (*Dendroaspis polylepis*) is the reason behind the majority of snake related deaths in Africa. The venom consists of many different paralysing neurotoxins affecting the function of nicotinic acetylcholine receptors and a multitude of excitatory dendrotoxins targeting potassium channels, which synergistically combine their effects and cause strong neurotoxic symptoms, such as flaccid paralysis and involuntary muscle contractions.

The current medical treatment against envenoming is based on the administration of an animal-derived antiserum, containing antibodies against snake venom toxins. This way of obtaining the antivenom is unfortunately accompanied with high costs and batch-to-batch variation. Moreover, due to the heterologous and immunogenic nature of the antivenom, patients in up to 80% of the cases experience serum sickness and anaphylaxis, which in some cases leads to death.

Snakebite antivenom, produced in mammalian cell cultures, using recombinant technology could improve the current treatment options against snakebite envenoming.

We report the results of the discovery of human antibodies against medically relevant snake toxins from *Dendroaspis polylepis* venom. Using a unique antibody library and employing the phage display technique, a suite of scFv antibodies, expressed in *E. coli* has been discovered. Screening with ELISA was used to identify the most promising clones. Based on their sequences, they were converted into IgG format and expressed in mammalian Expi-293 cells. A mouse model was used for preclinical evaluation of recombinant human IgGs in neutralizing the effects of toxins, present in the venom of *Dendroaspis polylepis*.

**Global health - Humans, animals, plants and environment**

**Scientific Student Conference 2017**  
**Euroleague for Life Sciences**

**Session 2: 17 November 2017 at 16.00-17.00**

**Oral session 2.2. Food: Quality, Production and Safety**

**Auditorium A2-70.02**

# **The influence of drying parameters on a faba bean protein powder**

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Keywords: Faba bean protein, spray drying, temperatures, powder

There is an increasing interest in designing and producing protein isolates from vegetable protein sources for use as food ingredients. It is of great importance to have a good characterization of the physicochemical and functional properties to enhance the applicability of the proteins when used as food ingredients.

The aim of this project was to investigate how powders made from a faba bean protein product by spray-drying were affected by different inlet and outlet temperature settings. Powders made at eight different temperature settings and one freeze-dried powder, for control, were investigated. The quantitative parameters analyzed were the yield in total and of dry matter, and the protein content. The qualitative parameters analyzed were the dry matter content related to storage and shelf life, the solubility in water, the particle size and the color of the powder. The dry matter content was found to be the most important of the analyzed properties in relation to shelf life. There were powders that had both high enough and too low content of dry matter (the minimum limit of dry matter is 92%). The solubility, mean particle size and color were all of acceptable values for all temperature settings. When drying faba beans, the spray-drying method was for most of the analyzed parameters better than the freeze-drying method. The recommended temperature setting from the once investigated was an inlet temperature of 220 °C and an outlet temperature of 95 °C.

**Food - Quality, production and safety**

# **Resistance to Fusarium head blight in wheat: analyzing phenotypic and genetic associations of flowering behavior with Fusarium resistance**

Magdalena Ehn

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Keywords: Resistance breeding; fusarium head blight; anther retention; wheat

Fusarium head blight (FHB) is an important disease in wheat and other cereals. It is mainly caused by *Fusarium graminearum* and *F. culmorum*, two fungal species that infect wheat heads during flowering. FHB leads to yield and quality losses, particularly to contaminations of the harvest with toxic fungal metabolites (mycotoxins) posing a serious threat for food and feed safety. Disease control can best be achieved with integrated measures, among which planting of resistant cultivars plays a key role. Breeding for FHB resistance is tedious and expensive, and could be enhanced through better understanding its genetic architecture. FHB resistance is a quantitative character controlled by many genes. Plant height and anther retention in the florets are speculated as prominent morphological traits that modulate FHB resistance.

I worked on two wheat populations: one spring wheat and one winter wheat. Both were grown in a field experiment inoculated with *F. culmorum*. The spring wheat population comprised 540 field plots and consisted of recombinant lines descending from a cross between a highly susceptible and a resistant cultivar, and additionally mutant lines with small chromosomal deletions descending from a FHB resistant cultivar. The winter wheat population were 1440 plots with modern wheat breeding lines and cultivars. I visually assessed flowering date, anther retention, plant height, percentage of infected spikelets per plot and infection incidence per plot, respectively. All wheat lines in my populations are genotyped with molecular markers.

My work is in progress and I will present results on the genetic and phenotypic associations of flowering behavior and height with disease severity and I will draw conclusions on the applicability of these results for supporting FHB resistance breeding. The long term goal of my work is to contribute to enhanced food and feed safety and security.

**Food - Quality, production and safety**

# The influence of iron on browning of insect protein extracts

Greta Canelli

*WUR - Wageningen University and Research Centre*

Keywords: Insects, iron, complexation, polyphenols

Insects are considered a nutritious alternative protein source. However, upon grinding, *Hermetia illucens* and *Tenebrio molitor* extracts show browning formation, which causes a decrease of consumer acceptability. In previous research, *Hermetia illucens* extract showed darker colour compared to *Tenebrio molitor*, but lower polyphenol oxidase activity. Therefore, it was suggested that polyphenol-metal interaction could have been responsible for colour development.

The aim of this research was to determine the structure and understand the reaction of the molecules responsible for off-colour formation in protein extracts from insects.

A model system involving dihydroxyphenol (L-3,4-dihydroxyphenylalanine) and iron was adopted, to understand interactions in the system. Factors such as pH and ratio of L-DOPA to iron concentration had an effect on colour formation. Equimolar concentration of L-DOPA and iron-ions resulted in reversible coordination iron-complexes mainly at pH 7 and 10. The complexes were identified by ESIToF-MS and consisted of  $\text{Fe}^{3+}$  in the centre, coordinated by either two or three L-DOPA molecules. These complexes showed black colour because the iron acted as a metal to ligand charge transfer, enlarging the actual conjugated system. The iron-complexes formed at pH 7 could further react to covalent crosslinking by oxidative coupling, after 24 hours or when the iron concentration increased. Covalent crosslinking upon auto-oxidation was already formed at pH 10 as soon as L-DOPA was dissolved in solution. At pH 10, the presence of both iron-complexes and melanins resulted in brown colour formation. At acidic pH, limited colour was shown. L-DOPA ( $E^0_{\text{pH}3} = + 0.616 \text{ V}$ ) and  $\text{Fe}^{3+}$  ( $E^0_{\text{pH}3} = + 0.77 \text{ V}$ ) predominately interacted by redox reaction, producing quinones and  $\text{Fe}^{2+}$ . Quinones could further react by circumscribed oxidative coupling. The mechanism behind iron and dihydroxyphenols interaction, responsible for blackening, was greatly understood. This could be extrapolated and further applied to investigate blackening upon grinding insects.

**Food - Quality, production and safety**

**Scientific Student Conference 2017**  
**Euroleague for Life Sciences**

**Session 2: 17 November 2017 at 16.00-17.00**

**Oral session 2.3. Global Health: Plants**

**Auditorium A2-70.03**

# **The Environmental Impact of Rwanda's Most Produced Crops under Status-Quo Agricultural Production: Creating Life Cycle Inventories and Assessments with Locally-Sourced and Ecoinvent Global Data**

Kirsten Moore

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Keywords: Environmental Impact Profiles, Rwanda, Commodity Food Crops, LCIA modelling

Status-quo agricultural production of Rwanda's most produced crops has yet to be inventoried in detail and analyzed for its potential impact on the environment. Current Life Cycle Assessment (LCA) databases do not provide accurate representations of the reality of Rwandan low-input, small scale agriculture. This study, supported by the Rapid Planning and Protein2Food Projects, creates Life Cycle Inventories (LCIs) of Rwandan crops under low-input production and of the same crops under average global production using LCI data from ecoinvent version 3.3.

The crops produced in Rwanda at the greatest quantities between the years 2013-2016 are summarized using statistics from the National Institute of Statistics Rwanda (NISR). The methods of how these crops are produced are then collected through published scientific literature and inventoried as individual LCIs of these crops. These crops are additionally inventoried as LCIs with global data collected from ecoinvent version 3.3 to compare Rwandan agricultural production to the global average. The values collected for production of these crops are analyzed for their quality through comparisons with the ecoinvent global data and with literature from countries with similar production methods. Furthermore, an existing food model within Umberto®, a mass-flow LCA software, calculates the LCIs to determine the environmental impact of status-quo production of these crops in Rwanda.

Agricultural production of a banana, cassava, maize, sorghum, and sweet potato in Rwanda can be characterized as low-technological production, with reduced to no tillage, few mineral fertilizers, composted manure application, lack of harvest machinery, and no mechanical irrigation. FAOStat and ecoinvent failed to provide reliable data for these Rwandan crops. The status-quo methods of production and the correlated environmental impacts for these 5 crops are put into African and global perspectives. Current research of these crops under status-quo production in Rwanda is lacking in quality and quantity.

**Global health - Humans, animals, plants and environment**



# **Threat of Forest Fires on the territory of the Czech Republic**

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Keywords: Forest fires, Risk of fires, Forest protection

Forest fire is a destructive factor, which affects all forest functions. Knowledge of forest fires behaviour, their forecasts and ways of firefighting are necessary for forest protection. Aim of study was create a map of vulnerability by forest fires in the Czech Republic and identify the most threatened regions.

Map vulnerability by forest fires was create by interaction of several factors like forest fires abundancy, human population, the rate of tourism (which is connected with the forest visiting), percentage of coniferous, percentage of pine forests and habitat moisture.

Analysing relationships of fire abundancy with other variables showed that vulnerability by forest fires is mostly affected by human population and rate of tourism and less by portion of coniferous forests. Map of vulnerability by forest fires showed that the most vulnerable regions are central Bohemia, The Giant Mountains, Jizerské hory mountains, Bohemian Forest mountains and vicinity of Plzeň city and surroundings of Karlovy Vary city.

**Global health - Humans, animals, plants and environment**

# **Thermal treatment of weed seeds using exhaust gas during harvest**

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*SCIENCE - University of Copenhagen, Faculty of Science*

Keywords: Heat treatment. Seedbank. Weeds. Exhaust. Combine.

Herbicide resistant weeds is an ever-increasing issue in crop production and effective solutions to manage these are in demand. Few methods are useful at present with the disadvantage that they are labor demanding, expensive and impossible to implement at certain locations because of local legislation or environmental issues.

This study investigated the possibility of utilizing exhaust gas during harvest to heat weed seeds and thereby prevent germination. This will decrease the size of the soil seed bank, thereby reducing total weed infestation.

Combines are non-selective during harvest, which means they cut and thresh every plant that it encounters. During the threshing and cleaning process, weed seeds together with chaff are separated from the cereal, which makes it possible to treat the weed seeds found in the chaff. Seeds of common weeds (*Geranium pusilla*, *Spergula arvensis*, *Lolium perenne*, *Lapsana communis*, *Centaurea cyanus*, *Alopecurus myosuroides*, *Tripleurospermum inodorum*) were treated at 75°, 110° and 140° at 2, 4 and 6 seconds after which they were germinated for 16 days to test efficacy of the method. 75° was found to be insufficient at all three durations, while 140° at 2 seconds repressed germination on all species. Thermal treatments of 110° had varying results, according to duration and species. 75° showed a slight tendency to break dormancy in *Alopecurus myosuroides*, although these results are not significantly different to each other.

Our results show that this new method has the ability to terminate weed seeds, if heated sufficiently. The specific temperature needed for this varies for the species and probably size of seed too.

**Global health - Humans, animals, plants and environment**

**Scientific Student Conference 2017**  
**Euroleague for Life Sciences**

**Session 2: 17 November 2017 at 16.00-17.00**

**Oral session 2.4. Collaboration: Enabling Innovation and  
Entrepreneurship**

**Auditorium A2-70.04**

# **Comparison of chemical composition of native corn stover and corn cobs before and after liquid hot water (LHW) pre-treatment in consideration of bioethanol production**

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Keywords: Corn stover, corn cobs, chemical composition, bioethanol, liquid hot water (LHW) treatment

Nowadays, in times of growing environmental awareness and the spread of government policies restricting usage of traditional fossil fuels, but simultaneously increasing demand for them, it is crucial to find a new effective ways of obtaining energy carriers. Corn stover and corn cobs are innovative, and very attractive materials for environmentally friendly bioethanol production. Those lignocellulosic industrial residues have high content of cellulose and hemicelluloses, which can be easily hydrolyzed into fermentable sugars. However, the matrix of cellulose, hemicelluloses and lignin, of which corn stover and cobs are formed, is resistant to enzymatic degradation. Therefore to maximize the effectiveness of industrial bioethanol production process certain pre-treatment is required. The raw biomass must be pre-treated in a way that enzymatic accessibility would be enlarged, for example with liquid hot water (LHW) method.

As a part of BIOSTRATEG2/298241/10/NCBR/2016 project, the analysis of chemical composition of native corn feedstock was carried out separately for stover and corn cobs before and after LHW pre-treatment which was performed at 160oC and 205oC. For both materials the content of extractives in organic solvents was determined. Kürschner-Hoffer method was performed to cellulose isolation and content determination, while lignin, holocellulose and ash content were examined according to PN-92/P50092 standard. The results indicated that considering bioethanol production, native corn cobs have more favorable chemical composition than corn stover. Furthermore, research outcome implied that liquid hot water (LHW) pretreatment highly changed the characteristics of native biomass in positive manner considering enzymatic accessibility.

**Collaboration - Enabling innovation and entrepreneurship in life sciences**

## **Access to land in Europe: How participation of different stakeholders affects the land tenure security**

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Keywords: Land tenure security, access to land, non-operating landowners, sustainability

Access to land, understood as an ability to obtain and secure agricultural land for sustainable farming, has become a major problem in Europe. The farmers' population is aging, although new entrants struggle to obtain agricultural land as there is not enough of accessible and more importantly - affordable land to buy. Moreover, access to land is not only affected by land tenure insecurity, but also by loss of agricultural land, land concentration, land speculations and insufficient policy.

As a reaction to the mentioned issues and the need to deal with it, an informal network called Access to Land Network has been established in Europe. In our research we selected three initiatives from this network for further in-depth research as examples of new collaborative solutions between different types of stakeholders involved in farmland management - Terre de Liens from France, Regionalwert AG from Germany and Eco Ruralis from Romania. These initiatives are advanced in dealing with land accessibility by applying tools to overcome constraints limiting the access to land in their country. By qualitative questionnaire, we examined the tools and processes which could be possibly applied in the environment of the Czech Republic.

The results show that these initiatives support fair land acquisitions by providing land to small-scale farmers to farm in agroecological way. However, applying a similar strategy in the Czech Republic is, for now, rather difficult. The Czech Republic is a country with the biggest average area of production blocks per holding and more than 80% land is rented by non-operating landowners. These stakeholders in relation to access to land still remain understudied so it is necessary to conduct a further in-depth research to learn about its impact on land accessibility and sustainable farming.

**Collaboration - Enabling innovation and entrepreneurship in life sciences**

# **Computational performance optimization of solar-powered screw press for sesame (*Sesamum indicum* L.) oil extraction**

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Keywords: Energy; Mechanical extraction; Oil quality; Screw press; Solar module

Oilseeds are the third most important food source in the world, after cereals and legumes. Among oilseed plants, sesame (*Sesamum indicum* L.) has become an important agricultural product in Africa for domestic and export markets. Burkina Faso is one of African countries that produce high-value sesame oil, which has been widely commercialized in Europe. Decentralized sesame oil production in rural areas is getting more attention due to its economic benefit. However, high electricity cost has been the major constraint. In order to overcome the constraint, a completely off-grid screw press machine run by photovoltaic (PV) module has been considered as an attractive solution, especially in tropical countries. The aim of this scientific work was to evaluate the feasibility of a solar-powered screw press in Burkina Faso, as a case study.

The whole activities were conducted at the University of Hohenheim, Germany. Different processing parameters of the screw press such as nozzle diameter (14, 15 and 16 mm), screw speed (45 to 80 rpm) and gap (1 to 3 mm) were investigated. Process temperatures were measured and product quality was analyzed. The optimum condition was investigated with regard to throughput, oil recovery and power requirement. The quality of the sesame oil was also compared with commercial sesame oil available in Germany. The solar components such as batteries and charge controllers were determined, and the whole solar extraction system was numerically analyzed for its performance using a PV-simulator. In terms of business opportunities and sustainability, field implementation of the solar system has been suggested.

**Collaboration - Enabling innovation and entrepreneurship in life sciences**

**Scientific Student Conference 2017**  
**Euroleague for Life Sciences**

**Session 3: 18 November 2017 at 9.30-10.30**

**Oral sessions 3.1. Collaboration: Enabling Innovation and  
Entrepreneurship**

**Auditorium A2-70.01**

## **Fungal melanin: A novel approach for metal detoxification**

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Keywords: Fungal melanin, *Armillaria cepistipes*, metal detoxification, electrospun membranes

Metals on one hand serve as essential components of the normal health physiology yet on the other hand, can cause serious toxic manifestations in case of over-exposure. In fact, the later one has always been a major threat to the public health in many industrial and mining gathering areas. Although a range of techniques are now available for heavy metals removal, they become inefficient during the treatment of effluents having metal ions less than 100 mg/L (Volesky, 1990). Treatment of such dilute waste is important since concentrations of metal ions at this level are already potentially toxic and hazardous to human beings.

In this project, we describe the use of melanin pigment synthesized by fungi as a new, sustainable and cost-effective solution to this problem. The objective of this study is to develop melanin-based composites that can remove heavy metals from different aqueous solutions with low heavy metals content, even human fluid. For this purpose, electrostatic spinning method was used to incorporate melanin into some biocompatible polymers, which was then proceeded to metal binding assays. At the current stage, *Armillaria cepistipes* was identified, within the scope of screening with a range of fungi, as the most potent candidate for melanin production in liquid media containing tyrosine with maximum melanin content of 25-28 g/L medium. Those fungal melanin particles were then successfully immobilized in electrospun polymers such as polyurethane and polycaprolactone membranes. Their chelation effect for Lead, Cadmium, Nickel and Chromium was also excellent in water and Phosphate-buffered saline (PBS) with maximum metal removal of up to 97%.

In the future, further studies will be conducted in serum and whole blood to achieve the final goal, but fungal melanin does open a new approach for metal detoxification.

**Collaboration - Enabling innovation and entrepreneurship in life sciences**



# **Utilization of drones for data acquisition for forest stand level inventory**

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Keywords: UAV, forest inventory, remote sensing, SfM

The present development of the unmanned aerial vehicles (UAV) technology and computer vision technology enables to relatively fast obtain and process the data of Remote Sensing (RS) with certain accuracy and precision. Using of modern UAV technology provides a lot of new opportunities for data collection.

This thesis describes the automatic method of 3D point cloud and 3D models generation using Structure from Motion (SfM) and the Multi-View Autostereoscopic (MVA) method in the environment of Agisoft PhotoScan ®, whose further processing, using Sample and Inverse Water Shed (IWS) algorithms, continued in the environment of ArcGIS 10.3 including the final statistical evaluation of accuracy and precision of algorithms used. The aim was to estimate the height and crown projections of individual trees by means of a UAV method. The collection of aerial (UAV low flying platforms) and ground data was realized on three plots that significantly varied not only in species and age but also in spatial arrangement with regard to gaps. The method of ground data collection was used as a control method for the evaluation of UAV data. The correlation between the ground data method and the aerial data method was statistically significant in all plots. Compared to basic methods, UAV is able to collect data from one plot six times faster using the same number of staff and only a half of necessary financial means. The whole thesis is based on present-day knowledge and technologies available before the year 2016.

**Collaboration - Enabling innovation and entrepreneurship in life sciences**

# **Exploring the producers' perspective on local industry development – A case study of the conditions for blackcurrants, strawberries and arctic raspberries in northern Sweden**

Anna Enocksson

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Keywords: Producers; Knowledge and innovation systems; Value chain; Industry development

Sweden is establishing a national food strategy to increase the competitiveness of Swedish agriculture in its food value chains and by increasing the total food production, in relation to consumer demand. As berries are a horticultural product of high consumer demand, and berries are the main horticultural crop in northern Sweden this case study focuses on berry producers in northern Sweden. This explorative case study is based on interviews with blackcurrant, strawberry and arctic berry farmers in the two northernmost counties of Sweden. It aims to explore the position of the producers regarding the berry value chains and the knowledge and innovation systems they are a part of, relating back to the strategic area of knowledge and innovation pinpointed in the national food strategy. To achieve this the interviews focused on mapping the value chains, exploring the barriers producers experienced concerning improving their position, and the potential the producers saw regarding changes in the value chain, support system for producers and product based on their berries.

The main findings include a need for broader platforms able to bring together different value chain actors, as well as a stronger support network to capture and help create new knowledge. There is also a potential for more rural networks, to find new business opportunities by supporting collaborations between for example producers and processors, or producers and tourism agents. The study has also found that there are differences between producers concerning how they view themselves as producers and in what drives them, which influences how likely a producer is to be innovative and open to new ventures that can help to develop the local industry.

**Collaboration - Enabling innovation and entrepreneurship in life sciences**

**Scientific Student Conference 2017**

**Euroleague for Life Sciences**

**Session 3: 18 November 2017 at 9.30-10.30**

**Oral session 3.2. Food: Quality, Production and Safety**

**Auditorium A2-70.02**

# **Can the edible snail *H. aspersa maxima* serve as a sustainable source of protein for human nutrition in the 21st century?**

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Keywords: Helix, aspersa, maxima, food security

Edible land snails played an important role in human nutrition for centuries before vanishing from the society's plate after World War II, becoming a dish in fine dining and recently reoccurring as superfood.

Being easy to farm, highly nutritious and allowing production with a high level of food safety, the edible snail *Helix aspersa maxima* shows great potential as a sustainable source of protein for human nutrition in regards to the UN's Sustainable Development Goal No. 2 "No Hunger".

To assess this potential, a multi-level case study was performed in cooperation with the snail producing farm of Andreas Gugumuck in Vienna, Austria. Following a literature research regarding the historical setting, legal framework and product quality, the feed conversion rate and land use were estimated as indicators for ecological sustainability and were compared to organic pig and poultry production in Austria.

It was found that Mr. Gugumuck's production system requires 17.75m<sup>2</sup> of land (sum of arable land for feed production plus land used to keep the snails) to produce 1 kg of meat. This is low compared to beef production (38,50 m<sup>2</sup>), but higher than organic pork production (13,68 m<sup>2</sup>) or organic broiler production (7,62m<sup>2</sup>).

Land use efficiency is however depending on the production system: Highly extensive ones as Mr. Gugumuck's were found to require more land than intensive snail production, i.e. 10,01 m<sup>2</sup> and 6,76 m<sup>2</sup>, respectively.

We conclude that snail production can present an effective alternative source of protein due its overall high efficient feed conversion rate and due to a reduced land use.

Yet, aspects such as the natural biomagnification and accumulation of heavy metals in the snail's body or the absence of specific legal regulations have to be critically considered and might pose a barrier when establishing snail farms on a global scale.

**Food - Quality, production and safety**

# Investigating the potential of combining a fungal and a bacterial biocontrol agent for the management of plant diseases

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Keywords: Biocontrol, Combination, Soil-borne pathogens, *Pseudomonas fluorescens*, *Clonostachys rosea*

Damping-off, a soil-borne disease caused by *Rhizoctonia solani*, results world-wide in significant annual yield losses. Managing this disease can be challenging, especially when using conventional methods (e.g. crop rotation, pesticides). The application of living organisms, microbial biological control agents (BCAs), could provide a potential alternative strategy for the sustainable management of plant diseases.

BCAs tested to date are often unstable in the field due to varying environmental conditions that affect their performance. As BCAs are typically applied individually, inoculation with a combination of microbes comprising different modes of action could enhance protection of plants against pathogens. This study investigated the potential of combining a fungal (the mycoparasitic *Clonostachys rosea* IK726) and a bacterial (the potato rhizosphere-associated bacterium *Pseudomonas fluorescens* In5) BCA to protect tomato seedlings from *R. solani* infection, using a combination of *in vitro* and *in planta* assays.

*In vitro* testing showed that *C. rosea* is not susceptible to *P. fluorescens* compared to *R. solani*, for which a significant reduction in growth was recorded when co-cultured with *P. fluorescens*. This result indicated that *C. rosea* can tolerate *P. fluorescens*, which is important for co-application. The combined biocontrol activity of the BCAs was further tested against *R. solani* by sowing tomato seeds coated with the BCAs in vermiculite or a soil-vermiculite mix. Seedling germination and damping-off was assessed. Seeds inoculated with the BCA-combination showed enhanced protection against damping-off compared to individual coatings in the soil-vermiculite mix. The combined coating could suppress the pathogen in vermiculite in all tests. From microscopy analysis, slow colonization by a GFP-tagged *C. rosea* and efficient colonization of tomato roots by a mCherry-tagged *P. fluorescens* In5 as well as bacterial colonization of fungal hyphae was observed. In conclusion, the BCAs were found to be compatible and enhance biocontrol efficacy when co-inoculated.

**Food - Quality, production and safety**

# **Genetic diversity of agro-morphogenic traits in soybean (*Glycine max L. merr.*)**

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Keywords: Soybean, Genetic diversity, Crop improvement

An experiment was conducted with 14 genotypes of soybean (*Glycine max L. Merr.*) beside the net house of the Department of Genetics and Plant Breeding, Sher-e-Bangla Agricultural University, Dhaka in Randomized complete block design (RCBD) to study the variability, correlation, path coefficient analysis and the genetic diversity using agro-morphogenic traits during November 2013 to May 2014. Analysis of variance for each trait showed significant differences among the genotypes. GCV and PCV were close to each other for all the characters except leaf area index, indicating the minor environmental influence on the expression of these characters. High heritability associated with a high genetic advance in percent of the mean was observed for leaf area index, number of seeds per plant, 100 seed weight and yield which pointed out that selection of these characters would be effective.

The significant positive correlation with seed yield was found in pod length and 100 seed weight which revealed that selection on the basis of these traits would improve yield ultimately. Path coefficient analysis evidenced that 50% flowering, pod length, days to 1st pod maturity, number of seed per plant and 100 seed weight had the positive direct effect on yield per plant. Therefore, importance has to be given for these characters in the further breeding program to improve soybean yield. Multivariate analysis based on thirteen characters of fourteen soybean genotypes was divided into four clusters. The maximum contribution of traits towards diversity was observed by days to 50% flowering, plant height, number of main branches per plant and leaf area index. As a result, these traits could be emphasized during the selection of parents for hybridization. The highest inter-cluster distance was observed between cluster II and IV and the maximum intra cluster distance was found in cluster III. Considering group distance and other agro-morphogenic performance, genotypes G1 (BADC SV1) from cluster II, G10 (Asset-95) and G7 (BS-29) from cluster VII, G4 (GMOT-43) and G12 (BADC SV2) from cluster IV found a potential for future hybridization program.

**Food - Quality, production and safety**

**Scientific Student Conference 2017**

**Euroleague for Life Sciences**

**Session 3: 18 November 2017 at 9.30-10.30**

**Oral session 3.3. Global Health: Environment**

**Auditorium A2-70.03**

## **Revitalization process in small sized cities on the example of the city of Brok**

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*WULS-SGGW - Warsaw University of Life Sciences*

Keywords: Revitalization, society, space, economic, environment.

The aim of this paper was to present the issue of revitalization process in small sized cities in Poland and to show the outcomes of the national project: “Miasto w Twoich Rękach II – rewitalizacja małych miast” ( “City in Your Hands II – small sized cities revitalization”), carried out by the Spatial Management Students Scientific Association at Warsaw University of Life Sciences.

The paper presents theoretical and practical information connected with the revitalization process in Poland, which points out importance of this process in planning the cities development. It also brings up the legal framework and role of the Commune Revitalization Program, which handles urban issues including social, spatial and economic sphere, thereby influencing a standard of living of the local society.

The project “Miasto w Twoich Rękach II” consists of 3 stages: the first stage was a science camp in the city of Brok, during which students did an extensive inventory of road infrastructure and land development housing using the mobile application Collector for ArcGIS, which facilitates transfer of gathered data to the software. They also interviewed local society and public institutions and examined data from Municipal Council. The outcome of processing this information were spatial, social and economic analyses, that will help to determine problematical area in the planning process. Due to this teamwork the Diagnosis to Commune Revitalization Program for city of Brok was framed. The second stage was Nationwide Science Conference, the theoretical basis and beginning of the third stage – Nationwide Competition for the best Commune Revitalization Program for the city of Brok attended by six teams. Project had benefits for the Municipal Council of Brok and for the students, as the gathered ideas would be used in the future.

**Global health - Humans, animals, plants and environment**



**Long-term population dynamics of high-elevation plant species  
(*Saxifraga bryoides* and *Silene acaulis* ssp. *exscapa*) based on  
photographs of permanent plots of the GLORIA-Mastersite  
Schrankogel (central Alps, Tyrol)**

Claudia Bergero

*BOKU - University of Natural Resources and Life Sciences, Vienna*

Keywords: Population dynamics; alpine; cushion plants; climate change;

The impacts of climate change on cold-adapted ecosystems at high altitudes - in the form of habitat shrinkage and upward shifts of lower-elevation plant species resulting in higher competition pressure to high-elevation species - affect the biodiversity of these vulnerable and valuable ecosystems.

In my thesis, I study the long-term population dynamics of two species of the alpine-nival ecotone, *Saxifraga bryoides* and *Silene acaulis* ssp. *exscapa*, over a period of 20 years on the GLORIA (Global Observation Research Initiative in Alpine Environments, [www.gloria.ac.at](http://www.gloria.ac.at)) mastersite of Mt. Schrankogel, based on GIS-analysis of repeated photographs of monitoring plots. To infer population growth rates and the parameters mortality, fecundity and growth, and their dependence on ecological plot characteristics, integral projection models (IPMs) are used. In this method, the photographs are first georeferenced within a dummy coordinate system and later all clearly distinguishable individuals of *Silene exscapa* and *Saxifraga bryoides* are selected, their fecundity status (fertile/vegetative) recorded, and their size (surface area) measured by drawing a polygon. On the basis of these data, IPMs are modelled and compared with the results of other studies based on field-work from the same site to test the efficiency of the method. Additionally, this study presents a guideline for the use of photographs of long-term monitoring plots in population studies.

**Global health - Humans, animals, plants and environment**

# **Evaluating trace element changes in boreal stream water at locations of groundwater inflow**

Laura Coulson

*SLU - Swedish University of Agricultural Sciences*

Keywords: Trace element, boreal stream, groundwater inflow

Many naturally occurring trace elements are essential for biological processes, but are potentially toxic at high concentrations. Changing rainfall and temperature patterns in boreal regions can alter the mobilization of trace elements from mineral soils into surface water systems. Understanding natural processes is crucial to evaluate how the changing climate will affect different ecosystems. Therefore it is important to evaluate the processes that control the movement of trace metals into surface water. The primary pathway for heat and nutrients from upland areas to streams is subsurface groundwater flow. The land border around lakes and streams, the riparian zone, regulates stream water quality and influences the transfer of elements from terrestrial to aquatic ecosystems. Therefore, understanding the interaction between the riparian zone and stream water at points of groundwater inflow can give insight into the processes that dominate stream chemistry and the transport of trace elements from upland mineral soils into the stream.

This project was conducted in northern Sweden in the Krycklan Catchment Study. Previously, areas of groundwater inflow on this 1.5-kilometer headwater stream were determined using flow accumulation algorithms and a distributed temperature system to identify step changes in water temperature. In this study, surface and groundwater samples from above and below the areas of groundwater inflow were collected before and during the spring snowmelt period. The samples, along with archived samples from summer and autumn, will be analyzed by ICP-MS for Ag, Al, As, B, Ba, Be, Bi, Ca, Cd, Cl, Co, Cr, Cs, Cu, Fe, K, Mg, Mn, Mo, Na, Ni, P, Pb, Sr, Tl, U, V and Zn.

While results are not yet available, this project hopes to identify how stream water chemistry is influenced by riparian groundwater inflows and, if possible, see if known locations of groundwater inflow show step changes in trace element concentrations.

**Global health - Humans, animals, plants and environment**

**Scientific Student Conference 2017**  
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**Session 3: 18 November 2017 at 9.30-10.30**

**Oral session 3.4. Global Health: Humans and Animals**

**Auditorium A2-70.04**

# **Development of therapeutic nanobody complexes using bacterial superglues**

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*WUR - Wageningen University and Research Centre*

Keywords: Emerging infectious disease, nanobodies, bacterial superglues, Schmallenberg virus, nanobody complexes

Emerging infectious diseases, many of which are zoonotic and arthropod-borne, continue to represent a major problem for human and animal health; inevitably associated with huge economic losses. Measures that directly target the pathogen are essential to successfully control disease outbreaks. Similar to conventional antibodies, nanobodies are characterized by highly specific and strong antigen binding interactions. However, their small size accounts for superior solubility, stability and ability to recognize unique conformational epitopes compared to conventional antibodies, making them of interest for a wide range of applications. Recently, the discovery of 'bacterial superglues' expanded the toolbox available to create nanobody complexes. In this study, carried out within the Zoonoses Anticipation and Preparedness Initiative (ZAPI: <http://www.zapi-imi.eu/>), we aimed to develop a platform for rapid generation of nanobody complexes employing bacterial superglue biochemistry. Ultimately, we aim to develop nanobody complexes against viruses of the genus Orthobunyavirus (family Bunyaviridae) that are associated with disease in humans. However, to facilitate our present study, we made use of Schmallenberg virus (SBV), an exclusively veterinary pathogen. A panel of six nanobodies selected by phage display technology, directed against the N-terminal domain (Amino) of the SBV Gc glycoprotein, each with a different CDR 3 region, were expressed in yeast. Competition ELISAs identified that the nanobodies target four different antigenic sites in SBV Gc Amino. Bivalent and bispecific complexes were produced by covalently coupling SpyTagged and SnoopTagged nanobodies to an elastin-like polypeptide scaffold with the corresponding Spy- and SnoopCatchers. Several nanobody complexes showed superior SBV neutralization capacity compared to uncoupled nanobodies in a virus neutralization test. These results show the suitability of the platform as a tool to enable accelerated screening and production of nanobody complexes for the development of novel therapeutic treatments for emerging infectious diseases.

**Global health - Humans, animals, plants and environment**

# **Characterisation of suppressor mutants arising from constitutive phosphorylation of WalR in the WalKR two-component system in *Staphylococcus aureus***

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*SCIENCE - University of Copenhagen, Faculty of Science*

Keywords: VRSA, *Staphylococcus aureus*, Vancomycin Resistance, Antibiotic Resistance, WalKR, Two Component System, Forward Genetics

*Staphylococcus aureus* was earlier this year announced the fifth most globally important pathogen to combat, as ranked by WHO, due to antibiotic-resistance. Antimicrobial-resistance development is a major international issue, of which growing concern prompts more knowledge to be acquired, particularly to develop strategies of fighting it. Understanding how drug-resistance arises has implicated the low G+C gram-positive pathogen's essential two-component system (TCS), WalKR, in development of vancomycin resistance. What exact genes are regulated by this TCS is an active field of research, in which various approaches has been applied. In this study, we utilized a forward genetic selection approach for phenotypical screening to identify new candidate genes of the WalR regulon in *S. aureus*. This pointed to a gene encoding a staphylococcal lipoprotein, sgtB and pbp4 as potential members of the WalR regulon.

**Global health - Humans, animals, plants and environment**

## **How to cheer a deer? Review of environmental enrichment methods in order to find suitable tools for improving deer welfare in captivity.**

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*WULS-SGGW - Warsaw University of Life Sciences*

Keywords: Cervidae, deer, environmental enrichment, ZOO, welfare indicators

Animal welfare is no longer understood only as physical health of animals in captivity. More and more attention is paid to their emotional state. Number of enclosures in ZOO's have been equipped with tools that increase the range of behavioral choices to variety of animal species and draws out their appropriate behaviors and abilities, thus enhancing animal welfare. So far there is hardly any data on behavioral enrichment for cervids. Time they would have to spend in "survival mode" in the wild has been eliminated by living in a human-arranged enclosure and not replaced with other activities. It negatively affects their mental state as well as decreases their attractiveness for visitors which is crucial to meet educational and conservation goals of the ZOO's.

Hereby we present study which has as an aim to verify the effectiveness of the types of enrichment possibilities for members of Cervidae family.

For the use of the study we divided enrichment methods in following categories: Nutritional, which incorporates presenting varied or novel food types or changing the method of food delivery. Physical, to change or add complexity to their environment. Occupational, which promotes investigatory behavior and exploratory play. Sensory-stimulating animals' senses, with subcategories visual, olfactory, auditory, tactile, and taste. In majority of cases the tools include a combination of different categories.

The evaluation of the enrichment methods will include welfare indicators like reduction of the time spent pacing, increase in the diversity of behavior and use of enclosure space. Chosen tools will be tested in deer enclosures followed by detail observation of reaction to the newly seen objects or smells.

As a result, we will present a table with known enrichment tools assigning them to categories and evaluating their effectiveness in increasing the welfare indicators as well as describing individual reactions observed in animals.

**Global health - Humans, animals, plants and environment**

**Scientific Student Conference 2017**  
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**Session 4: 18 November 2017 at 11.40-12.40**

**Oral session 4.1. Collaboration: Enabling Innovation and  
Entrepreneurship**

**Auditorium A2-70.01**

# **Urban Agriculture and Sustainable Livelihood: Assessment of Ostuni Urban Agriculture Initiative's Potential Contribute on Livelihood of Local Community**

Yunjie ZHONG

*UHOH - University of Hohenheim*

Keywords: Urban agriculture, sustainable livelihood, multifunction, local food system, municipal project

Urban Agriculture (UA) can be described as a form of agriculture which activities such as food production, processing, marketing, raw material management, and distribution happen within and around a fluid urban region, including intraurban and periurban areas, often considered as a response to the increasing urban population and food demand. Compared with rural agriculture, non-production-oriented goals and their multilevel benefits makes UA more than simply food provisioning. UA provides an opportunity to boost local economics, minimize the food miles, regenerate the urban ecological metabolism, (re)build inter-linkages in urban level and create their synergies, which are crucial to approach a sustainable livelihood of local community. Moreover, the raising awareness of local food consumption and the increase of city vacant land have revitalized the UA projects in developed countries. Through a qualitative research, this paper aims at providing an understanding to the phenomenon of UA and its potential impacts on local livelihood.

Starting with a literature review through which the conceptualization, features, sustainable pathways for livelihood and challenges of UA, a case study conducted in an Italian UA initiative, 'Intervento di rigenerazione urbana nell'area degli orti extra moenia di Ostuni', will then be introduced to assess the potential contributes and problems for UA on local livelihood through livelihood capital assessment in natural, social, financial, human and physical aspects respectively.

**Collaboration - Enabling innovation and entrepreneurship in life sciences**



# **Rooftop gardens as a pro-environmental solution for the modern city. Conclusions from the project of an educational and recreational rooftop garden on a municipal solid waste treatment plant in Warsaw.**

Marta Kiliś

*WULS-SGGW - Warsaw University of Life Sciences*

Keywords: Rooftop gardens, phytoremediation, spreading environmental awareness, urban space, landscape design

Nowadays we can find the rooftop gardens more and more often in the modern architecture - including public or private buildings. Why we observe the increase of rooftop gardens use among modern design? Why we talk about the multi-functionality of their applications? The reasons for it can be found not only in the human desire to stay near nature even in a cramped urban area. There are many reasons constituting an argument for the use of green roofs in cities like environmental, aesthetic, economic or social ones. Modern development of green roofs throughout the world is mostly dictated by the need to improve deteriorating state of the urban environment.

The main objective of this work was to prepare a design of an intensive green roof at incinerator of Municipal Solid Waste Treatment Plant in Warsaw. This project aims to the quality and comfort of employees staying on the premises of the object as well as to be used for educational purposes by young children during school trips. This concept makes use of the place's character and adapts to the expectation of its future users. Vegetation has the most important role in increasing the standard of the place as also harmonising with the design's educational elements.

The growth of interest in green roofs brought to our attention that, in modern design of residence areas an increasing emphasis is put on the use of environmentally friendly technologies. Green roofs can become a tool to support sustainable development and bring long-term benefits. A coherent system of greenery in cities is crucial from the point of view of functional ecosystem. Although green roofs are artificially created by man, they can be considered as important elements of green infrastructure necessary to achieve the continuity of the landscape in heavily urbanized areas.

**Collaboration - Enabling innovation and entrepreneurship in life sciences**

# **Community gardens - Revolt in urban public space**

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Keywords: Community gardens, Sustainability, Gardening, City, Public space

The diploma thesis discusses a topic of urban community gardens, which is growing trend over recent years. The thesis outlines a brief history and development of urban gardening in the Czech Republic. The literary section proceeds further with concrete examples of existing community gardens, both abroad and in our country. It is trying to sort through a diverse range of urban gardening and community gardens. Thesis shows possible causes of this phenomenon and its objectives, features and benefits. The significance of this thesis is to show a diverse range of topics that appear in community gardens: regional supply, diversity of cultivated varieties, self-sufficiency and sustainability, co-ownership, social interaction, informal education, protection and promotion of the environment. Equally, important consequence of community gardens is the ability to think about the context and the change in attitude towards consumerism. The potential of community gardens in urban public space can contain possible solutions to a wide range of local and global issues and challenges of contemporary society. On top of that, there are developing relationships at all possible levels.

The practical part of this thesis was dedicated to project, which focused on Community garden Vidimova in Prague. This garden is located in the courtyard of a former kindergarten. The building is currently used by the Municipality of Prague district 11. Designed space garden has nearly 3,800 square meters. Development here has the character of a settlement with dense construction mainly residential multi-storey panel buildings. The project proposal was based on analyses of regional relations, natural conditions and the evaluation of the current state of the territory and its community. It is a constantly growing community that now includes over 40 regular members. This garden has a great potential, but above all it is necessary to involve all concerned subjects in decision-making and communication.

**Food - Quality, production and safety**

**Scientific Student Conference 2017**  
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**Session 4: 18 November 2017 at 11.40-12.40**

**Oral session 4.2. Food: Quality, Production and Safety**

**Auditorium A2-70.02**

# **The relationship between agonistic behaviour and feed efficiency of beef steers in Scotland**

Akke ten Berge

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Keywords: Steers, aggression, feed efficiency, welfare

Beef cattle production is the largest agricultural sector in Scotland in terms of economics. Improving feed efficiency is an important way of reducing costs and greenhouse gas emissions of beef production. Residual feed intake (RFI) is a measure for feed efficiency that can be compared between cattle, irrespective of their age, growth and diet. Feeding patterns, activity and stress are associated with RFI. The aim of this research is provide insights into the effect of diet and location on agonistic behaviour and the effect of agonistic behaviour on feed efficiency in beef finishing steers.

On SRUC Easter Howgate, 80 steers were divided between 4 pens and two diets with forage:concentrate ratios of 8:92 and 50:50 (dry-matter basis). Feed was provided ad libitum in automatic bin feeders which registered feeding behaviour. Steers were weighed once a week and backfat thickness was scanned at the end of the 8 week trial. Each pen was observed for 12 hours. Associations between efficiency indicators, diet, agonistic behaviour indicators, age, weight, farm of origin and location of the agonistic interactions in the pen were analysed with Linear Mixed Models, type Restricted Maximum Likelihood using GenStat (Version 15).

Forage-steers behaved more aggressively than concentrate-steers in the feeding area whereas concentrate-steers were more aggressive in the vicinity of the drinker. Steers performed agonistic behaviour without attempting to displace another steer, possibly because of frustration in a barren environment. Steers are not relatively more aggressive in one area than in another, and aggression does not lead to a higher activity, referring to locomotion, in the pen. RFI and the level of agonistic behaviour were influenced by management at the farm of origin. This variation was probably caused by different sires and differences in microbial composition. Agonistic behaviour tended to increase RFI, possibly due to altered behaviour patterns.

**Food - Quality, production and safety**

# **How adsorption time influences coalescence of protein-stabilised emulsions**

Ivanna Colijn

*WUR - Wageningen University and Research Centre*

Keywords: Emulsification, protein-stabilised, coalescence, adsorption time, microfluidics

Many food products are oil-in-water emulsions and they need to be stabilised by emulsifiers, and proteins are commonly used for that purpose. However, when the interface is not rapidly stabilised during emulsification, newly formed droplets coalesce and therefore the extent of coalescence depends on the time allowed for emulsifier adsorption. A microfluidic coalescence channel can be used as an analytical tool to measure the influence of adsorption time on coalescence during emulsification. Microfluidic devices enable droplet formation measurements within the millisecond time range. It is a relatively new method and coalescence quantification in the presence of proteins has not been reported before.

In the current study, the effect of protein concentration and droplet residence time on coalescence was measured in the microfluidic coalescence channel. Different microfluidic designs were used to vary the protein adsorption time prior to droplet collision (from 11 to 173 ms). These measurements were done with different proteins:  $\beta$ -lactoglobulin, whey protein isolate, and oxidised whey protein isolate. Our results quantitatively show that rapid coalescence of emulsion droplets can be reduced by increasing the protein concentration and by increasing the adsorption time. Stable emulsions were produced with microfluidics within the measured time range. Our results show that lower protein concentrations can be used compared to high-energy emulsification methods, as long as the time for protein adsorption was sufficient.

These findings imply that emulsification processes can be drastically optimised. We also found that protein properties are important for coalescence stability. To optimise industrial emulsification processes it is important to measure coalescence stability in high detail and in small time-scales, this is not possible with conventional techniques but this is possible with the microfluidic coalescence channel. This method can therefore be used to study interface stabilisation during emulsification and can be used to develop emulsion formulations *ab initio*.

**Food - Quality, production and safety**

## **Comparison of chemical composition and sensory attributes of beef from different muscles of Czech Fleckvieh heifers and bulls**

Jana Fořtová

*CULS - Czech University of Life Sciences Prague*

Beef, heifers, bulls, muscle, chemical composition, sensory analysis

Fleckvieh is the most important source of beef in the Czech Republic. Therefore, this breed was used in a feeding trial performed with heifers and bulls in the experimental unit of the Institute of Animal Science. The animals (12 heifers and 12 bulls) were kept in identical housing and feeding conditions until slaughter at the similar age of 18 months and the average live weight of 639 kg. After slaughter, meat samples were collected from three muscles: *m. longissimus lumborum* (MLL), *triceps brachii* (MTB) and *rectus abdominis* (MRA). Physical, chemical, technological and sensory analyses were performed and the results were evaluated using appropriate statistical methods. Meat tenderness was measured using Warner-Bratzler shear force. Marked differences among muscles were detected in the content of intramuscular fat which positively influenced mainly juiciness of MRA and several other sensory attributes. The intramuscular fat content in MRA was higher than in MTB by 46 % and 47 % and higher than in MLL by 28 % and 18 % in heifers and bulls, respectively. The highest score for tenderness and chewiness and the lowest shear force values were recorded in MLL. Compared to bulls, heifers had more than two fold higher intramuscular fat contents in all muscles; it was even 2.7 fold more in MRA. This might be associated with significantly higher tenderness and chewiness observed in heifers. Increasing meat tenderness was associated with lower total collagen contents and higher soluble collagen contents. Generally, the meat of heifers received higher scores in all the sensory attributes observed.

**Food - Quality, production and safety**

**Scientific Student Conference 2017**  
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**Session 4: 18 November 2017 at 11.40-13.00**

**Oral session 4.3. Global Health: Plants**

**Auditorium A2-70.03**

# **Effects of grassland extensification on yield, forage quality and floristic diversity**

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Keywords: Grassland, management intensity, low input, productivity, phyto-diversity

Intensification during the last decades endangers species rich meadows and pastures, which are characterising the small scaled agricultural landscape in less favoured regions in Austria. To counteract the loss of biodiversity, farmers joining the Austrian agri-environmental programme must implement an environmentally friendly and biodiversity-promoting management on 5% of their total grassland. Already established field trials at three different sites, each consisting of two blocks (3-cut and 4-cut regime), combined with various fertilization treatments, were used to find out how floristic diversity and forage quality are affected by decreased management intensity.

The original design was split up into subsets: a) unchanged as reference, b) two cuts + unreduced fertilization, c) two cuts + reduced fertilization (90 kg N/ha) and d) two cuts + no fertilization. High fertiliser rates, combined with low cutting frequencies, resulted in accelerated maturity and poor forage quality. The proportion of valuable plants for insects decreased in the 2-cut regime with unreduced fertilization, and increased the most in the unfertilized 2-cut regime plots during the observation period from 2010 to 2013. Reference plots with unchanged cutting frequencies also showed a higher proportion of pollinator plants in the year 2013 indicating good environmental condition of such practice-relevant management systems.

**Global health - Humans, animals, plants and environment**



# **Diversity and nutritional characterization of *Garcinia kola* Heckel (Clusiaceae) in Southwest Cameroon**

Anna Manourova

*CULS - Czech University of Life Sciences Prague*

Keywords: Bitter kola, Central Africa, domestication, indigenous fruit trees, phytochemistry

*Garcinia kola* (Clusiaceae) is a fruit tree species indigenous to West and Central Africa. The tree is frequently called ‘wonder plant’ because all its parts have medicinal use. In Cameroon, seeds of *G. kola* are widely used by locals for treatment of gastric problems. Studies on *G. kola* have mostly focused on its bioactive substances. However, information on intraspecific diversity and the exact nutritional values of the seeds remain unclear.

Therefore, the objective of this study was to assess and describe morphological diversity and nutritional status among different populations of *G. kola* from Southwest region of Cameroon. For examination of the species’ management and utilization, we visited 50 farms and interviewed 48 farmers. Further, morphological characteristics of 759 fruits, 1,821 seeds and 403 leaves coming from 81 individual trees were examined and botanical descriptors were developed based on the species morpho-types. Seeds of each tree were subjected to nutritional analyses for: ash, moisture, crude fat, fibre, protein and NFE (nitrogen-free extractives) content. The nutritional values were determined as follows: ash 0.33 %, moisture: 42.3 %, crude fat: 1.48 %, crude fibre: 2.27 %, crude protein: 6.48 % and NFE: 78.02 %. As we did not find any significant differences in-between our study sites, the results suggested that morphological diversity within a single population is much higher than the diversity among populations from different sample sites. Process of *G. kola* domestication seemed to be at its very beginning, though we have identified efforts in terms of species targeted cultivation and selection. It is expected that this study may provide basics for the first steps of *G. kola* domestication.

In the future, research on species population genetics as well as secondary metabolites content should be conducted to complement our data and fasten the domestication process.

**Global health - Humans, animals, plants and environment**

# **The evaluation of health status of the international provenance research plot Hůrky with Douglas-Fir (*Pseudotsuga menziesii* /Mirb./ Franco) in southern Bohemia**

Michal Samek

*CULS - Czech University of Life Sciences Prague*

Keywords: *Pseudotsuga menziesii*, *Phaeocryptopus gaeumanni*, *Rhabdocline pseudotsugae*, provenance test, Czech Republic

One of the potential problems in the cultivation of the Douglas fir in Europe could be various fungal pathogens, especially *Phaeocryptopus gaeumanni* and *Rhabdocline pseudotsugae*, which attack the assimilation organs and cause their fall and thinning of the crown. The state of health and susceptibility of Douglas-fir were studied at the international research area of IUFRO - Hůrky (Písek, southern Bohemia). Determined parameters were defoliation, diameter at breast height, height and height adjustment of tree. The newly obtained dendrometric parameters were compared with the measurements from 2011. The area was monitored for sporulation by a Burkard-type spore trap. The influence of provenance and dendrometric parameters on tree health status was evaluated using the poisson general regression model. Cluster analysis was used to determine the similarity of provenances. In total, 704 trees from 25 different provenances which originate from North America, including 5 IUFRO standards, were evaluated. The average height of all trees was 30.1 m with DBH 30.5 cm. The average volume of stock was 1.09 m<sup>3</sup>. Significant effect of good growth properties on tree health status has been identified. Some provenance with good dendrometric characteristics showed a higher level of susceptibility to needle cast. The most appropriate provenances came from Washington, they were productive in quality with unchanged thickness growth compared to the last measurement and without significant damage caused by needle cast. Problems could be with coastal provenances and some provenances from British Columbia which showed higher susceptibility to needle cast and impaired health status. The occurrence of Swiss and *Rhabdocline* needle cast was confirmed. The highest sporulation was detected in May and June.

**Global health - Humans, animals, plants and environment**

# **Competitive nitrogen uptake of creeping thistle (*Cirsium arvense*) and spring barley (*Hordeum vulgare*) in different soil depths**

Tomke Wacker

*SCIENCE - University of Copenhagen, Faculty of Science*

Keywords: *Cirsium arvense*, Nitrate leaching, cover crops, rooting depth,  $^{15}\text{N}$

Autumn tillage is a common control strategy against creeping thistle (*Cirsium arvense*) in organic agriculture. Leaving the soil bare in the winter promotes soil-nitrate ( $\text{NO}_3^-$ ) leaching. If  $\text{NO}_3^-$  leaches below the root zone of the crop, it is lost from the production system. But rooting depth varies with plant species: thistles easily develop roots below 2 m, spring barley reaches only about 1 m by the end of its growing period.  $\text{NO}_3^-$  lost for barley might still be available for thistles facilitating a competitive advantage.

In a three years field experiment, we tested if preceding cover crops (CC) can increase the competitiveness of the following spring barley against thistles by reallocating  $\text{NO}_3^-$  to upper soil layers. Different undersown CC-mixtures were tested against tillage. Topsoil Nitrogen (N) fate was investigated with  $^{15}\text{N}$  tracer injected each autumn.  $^{15}\text{NO}_3^-$  enrichment in soil samples taken in the following spring from four depths down to 1.5 m are used as  $\text{NO}_3^-$  leaching indicator. Plant samples during the vegetation period and at harvest were analysed for  $^{15}\text{N}$  enrichment in thistles and barley.

While  $\text{NO}_3^-$  levels in tillage treatments are increasing with depth,  $\text{NO}_3^-$  in CC treatments is reallocated to the topsoil layer.

Spring barley had higher  $^{15}\text{N}$ -enrichment in CC treatments than under tillage at harvest in the first two years. The difference in  $^{15}\text{N}$ -enrichment in barley between the treatments was greater in early growth stages than at harvest, indicating increasing penetration depth of barley roots.

In the first year,  $^{15}\text{N}$ -enrichment in thistles were highest in the tillage treatment, implying an additional N pool in deeper layers only accessible for thistles.

In year two, thistles had a lower  $^{15}\text{N}$ -enrichment than barley in all treatments. This may be an effect of general low abundance and competitiveness of thistles in this year.

**Food - Quality, production and safety**

**Scientific Student Conference 2017**  
**Euroleague for Life Sciences**

**Session 4: 18 November 2017 at 11.40-12.40**

**Oral session 4.4. Global Health: Humans and Animals**

**Auditorium A2-70.04**

## **Dogs as a model for gastrointestinal stromal tumors (GIST) studies in humans.**

Lukasz Zdrojkowski, Jaroslaw Olszewski

*WULS-SGGW - Warsaw University of Life Sciences*

Keywords: Biological features, GIST, dog, human

**Introduction:** In dogs, gastrointestinal stromal tumors (GIST) are spontaneous diseases suspected of similar characteristics with humans. In both species mutation occurs in the same c-kit gene's exons and clinical features e.g. localization are identical. It is thought that canine GIST may be perfect model for further studies on this tumor in humans.

**Aim:** In this study, we analyze particular biological features from dogs tumors and compare it to recently published data of humans tumors.

**Material and Methods:** The study enrolled 9 dogs surgically treated for GIST in small intestine. Samples were H-E stained and immunofluorescently labeled for CD117, VEGF, p53, Ki67 and immune cells. Immune cells differentiating was based on expression of CD45/CD66 for granulocytes, CD45/CD14 for macrophages, CD45/CD3/CD4 for lymphocytes Th, CD45/CD3/CD8 for lymphocytes Tc. The samples were examined with microscopes: light microscope, confocal microscope- Leica TCS SP8 (qualitative assessment) and scanning cytometer- TissueFAXSPLUS (quantitative assessment, mean % of IF-positive cells $\pm$ SEM) respectively. Statistical evaluation was performed by Graph-Pad. Our results were compared with literature data concerning the same features in human GIST.

**Results:** All tumors were positive for CD117, with higher CD117 expression in GIST (19.30 $\pm$ 3.44) compared to normal ileum (7.24 $\pm$ 2.03). The expression of VEGF was high in canine GIST (30.23 $\pm$ 3.15) similarly to humans data, however p53 (0.92 $\pm$ 0.21) and Ki67 (0.75 $\pm$ 0.24) were much lower in canines than humans. We demonstrated similar immune cells infiltration, with 63.6% granulocytes (1.78 $\pm$ 0.62), 32.3% macrophages (0.90 $\pm$ 0.17) and 2.5% lymphocytes (0.07 $\pm$ 0.02), among them 0.6% lymphocytes Th (0.02 $\pm$ 0.004) and 1.0% Tc (0.03 $\pm$ 0.02).

**Conclusions:** Lower expression of CD117 in characteristic for dogs GIST. Differences in malignancy factors corresponds to advanced stage of disease. The tumor microenvironment is identical in dogs and humans GIST.

**Global health - Humans, animals, plants and environment**

# **The Importance of Genomics for the Conservation Management of the Critically Endangered Pygmy Hog (*Porcula salvania*)**

Manon de Visser

*WUR - Wageningen University and Research Centre*

Keywords: Genomics, conservation, inbreeding, genetics, NGS

The existence of a large number of animal species is threatened, often due to human impacts. One of these species is the critically endangered pygmy hog (*Porcula salvania*). The pygmy hog is the world's smallest and rarest wild pig species and it is currently living on the brink of extinction. Only one viable population exists in the wild, consisting of merely a few hundred individuals. The Pygmy Hog Conservation Programme (PHCP) has been managing a captive breeding and reintroduction programme for over four decades to support conservation efforts. However, little is known about the genetic background of the animals involved in the PHCP. Recent development in genome research techniques now makes it possible to sequence multiple individual genomes. The analysis of this type of data provides comprehensive insight into the demography, evolutionary history, degree of inbreeding and overall genetic diversity of the species. We analysed whole genome re-sequence data of six individual pygmy hogs: three from the wild and three from the captive population. To determine the degree of inbreeding we searched their genomes for regions of homozygosity (ROHs), i.e. regions with little genetic variation. We used the length of the ROHs as a predictor for the time frame of inbreeding where relatively long ROHs suggest recent inbreeding. We also determined overall genetic diversity and the proportion of mutations within protein coding genes that are predicted to be damaging. Genetic diversity in pygmy hogs is low compared to other pig species, inbreeding appears to be even higher in the genome of wild individuals compared to the PHCP individuals and all pygmy hogs have a relatively high proportion of harmful mutations. The results of this study are valuable to the conservation management of this and other endangered species.

**Global health - Humans, animals, plants and environment**

# **Changes in abundance of shore crabs and mesopredatory fish species in relation to temperature and predation pressure from cod along the Swedish west coast.**

Karla Rudnicki

*SLU - Swedish University of Agricultural Sciences*

Keywords: Shore crab - statistical analysis - temperature - cod - increased mesopredator abundance

Narrow near shore environments are classified to be exceedingly important because they support connected marine ecosystems. Therefore, the relevance of apprehending the response system of marine species (as well as their in-between relationship) to temperature fluctuations has become an imperative topic to understand the future predictions in significance to the ocean in term of induced climate change and human intervention. Key components in coastal food-webs are known as mesopredatory fish species, and any alterations in their abundance can cause catastrophic events along the marine ecosystem.

The aim of this research in the Kattegat Sea became a vital topic due to an increasing abundance of mesopredators which could cause cascading effects and alter the ecosystem itself. Data was collected over the years since 1976 in the Kattegat Sea region where univariate analysis supported the theory of whether there is a correlation and trend surfaces between diminished population of the *Gadus morhua*, (Atlantic cod) and temperature fluctuations with mesopredator dispersals, mainly *Carcinus maenas*, the Shore Crab. Areas that were solemnly focused for this research were at Ringhal, the nuclear power plant zone, and Vendelsöarna. Mesopredatory fish's abundances were highest in areas where there were favourable habitat attributes. Moreover, a poor abundance of piscivore *Gadus morhua* (Atlantic Cod) advocates a bottom-up cascading process. Areas such as the Baltic Sea have and are experiencing these effects and results are detrimental. As the mesopredators such as the *Carcinus maenas* increases, it is affirmative that the term "mesopredator effect" is overwhelming.

**Global health - Humans, animals, plants and environment**

## **Abstracts for poster sessions**

Due to the large diversity in poster submissions, some posters are presented in sessions with a different subtheme than the one they were originally labelled with by the author. The original subtheme chosen by the author is included in the abstract for reference.



**Scientific Student Conference 2017**  
**Euroleague for Life Sciences**

**Session 1: 17 November 2017 at 13.35-14.35**

**Poster session 1.1. Global Health: Plants and Environment**

**Copenhagen Plant Science Centre, Foyer**

## **Sirtuin 1 is involved in spindle tubulin modification in matured oocyte**

Doubravka Puldova, Lukáš Landsmann

*CULS - Czech University of Life Sciences Prague*

Keywords: sirtuin 1, oocyte, spindle tubuline modification, deacetylation

Sirtuin 1 belongs to group of NAD<sup>+</sup>-dependent deacetylases. Through the deacetylation of proteins, sirtuin 1 regulates cell functions, such as apoptosis, antioxidant scavenging and/or regulation of gene expression. In addition to somatic cells, sirtuin 1 plays an essential role in embryos and gametes, including oocytes, extremely sensitive to correct spindle-dependent segregation of chromosomes during oocyte maturation. Our hypothesis is that sirtuin 1 deacetylates tubulin of spindle apparatus in matured mouse oocyte and makes them more viable and eligible to fertilization.

Oocytes were isolated from 8-week-old ICR mice and in vitro matured for 16 hours in M16 culture medium supplemented with BML-278 (0.125, 0.25 or 0.5  $\mu$ M), a sirtuin 1 specific activator. Subsequently, the oocytes were subjected to immunocytochemical analysis of sirtuin 1 and the markers of the spindle apparatus (acetylated  $\alpha$ -tubulin and total  $\alpha$ -tubulin), followed by confocal microscope imaging (Olympus, Germany) and image analysis (ImageJ, NIH).

In the experiment, we confirmed that sirtuin 1 is exclusively located in germinal vesicle of immature oocytes and on shows spindle-like pattern in matured metaphase II oocytes. This observation pointed out sirtuin 1 deacetylation of spindle structures. Accordingly, acetylated  $\alpha$ -tubulin was stained and signal intensity was related to the total  $\alpha$ -tubulin. Our results shown that treatment with BML-278 reduces the proportion of acetylated tubulin, the greatest difference was seen in treatments of 0.25 and 0.5  $\mu$ M versus vehicle control and it seemed to be sirtuin-deacetylated.

Our observations confirmed that sirtuin 1 is present in the oocyte spindle, where it is involved in modulation of tubulin during oocyte maturation. Taken together, sirtuin 1 is an utilizable factor for improvement for human reproductive health and/or assisted reproductive technologies.

**Global health - Humans, animals, plants and environment**

# **Age vs climate: dynamics of growth in the old-growth forests of the Carpathians**

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*CULS - Czech University of Life Sciences Prague*

Keywords: Old-growth forest, forest dynamics, climate change

Old-growth forests (i.e. primary forests) represent forest communities that have managed to attain great age with natural development, untainted by direct human activity, and exhibiting unique ecological features. These forests play an important role in mitigating the effects of climate changing events by acting as the carbon sink, either through the process of carbon sequestration or through preservation of natural structural features and provision of specific dynamics, which in the end support biodiversity and preserve species richness. Old forests of the Carpathians are one of Europe's most substantial carbon reserves and a refuge for numerous European endemic species.

Age is one of the fundamental variables used for quantifying and describing ecological changes and forest dynamics, as well as predicting and modelling developmental pathways of these specific forest ecosystems. As trees age, they undergo complexed physiological and morphological changes, mostly visible as low photosynthetic rates, reduced growth, leaf size reduction, as well as metabolic changes due to changes in tree size and structural complexity, followed by reprioritizing and rebalancing of energy expenditure.

Using tree-ring analysis, growth rates of dominant species (*Picea abies*, *Abies alba* and *Fagus sylvatica*), from various species-dominated stands, are to be age-classified and size-classified, with the idea of exploring how trees have been adapting and changing throughout the past in relation to species composition, structure of stands and influence of environmental factors. Exploring the relationship between growth, old age (i.e. longevity) and climate trends, will show us how these old forests have been adapting to the past lifespan challenges and surely give us insight into how this relationship will continue to develop.

**Global health - Humans, animals, plants and environment**

# **Degradation kinetics of Diflufenican in soil and gravel - experimental design**

Sif Svendsen

*SCIENCE - University of Copenhagen, Faculty of Science*

Keywords: Degradation Kinetics; Herbicide; Diflufenican; Experimental Design

Diflufenican is a long lasting soil-acting herbicide used in both agriculture and paved areas. The herbicide is a specific inhibitor of phytoene dehydrogenase, a key enzyme of carotenoid synthesis, and works by making a thin film on the soil surface, preventing weeds to emerge.

Only a few soil-acting herbicides are approved in Denmark due to their often high application rates and risk for leaching.

Diflufenican sorps strongly to organic matter, resulting in a rather low mobility in most soils. This strong sorption is thought to decrease the risk of leaching, the bioaccessibility and metabolite formation.

However, for soils with low organic matter, the situation might be different.

The objectives for the present study is to investigate the degradation kinetics and metabolite formation of diflufenican and the two major metabolites in two soil types and two types of gravel.

The hypothesis for soils with low organic matter content is that diflufenican will be more bioaccessible for degradation, and thus pose risk for formation of more mobile metabolites with a potential for leaching to the groundwater.

The current risk assessment of diflufenican does not include soils with low organic matter, resulting in a limited knowledge of degradation in such soils.

The present poster seeks to describe the experimental design and method development for degradation of diflufenican and its metabolites in different soil types. Furthermore, it aims to give an overview over relevant guidelines when working with degradation of pesticides.

**Global health - Humans, animals, plants and environment**

# **Tree species diversity in Sila National Park (southern Italy) and how it is influenced by present and future protection activities**

Silvia Abruscato

*SCIENCE - University of Copenhagen, Faculty of Science*

Keywords: Tree species diversity, nature management planning, silvicultural tools, Calabria Region (genetic-hot spot), Natura2000 framework

Sila National Park is the area of interest, located in the Mediterranean basin, precisely in the Calabria's Southern Region of the Italian peninsula.

Calabria is a unique genetic hotspot for tree species due to the topography of the Region. During Ice Age, it promoted the presence of refugial areas that enhance tree species survival, endemism level and genetic diversity (e.g. *Abies alba* Calabrian provenance case).

The following research investigates the legacy of the mountainous broadleaved and conifer forest ecosystems in Sila National Park; drawing particular attention upon management measures applied in the past and the actual prescriptions.

The primary objective of the report is the evaluation of the present protection level of local tree species, assuming that they are characterized by high genetic variation and moderate level of adaptability.

The Natura 2000 framework is considered to be an essential protection tool for the species under study. For this reason, the report briefly analyses the conservation status assessment approach developed in the Italian context and the measures adopted by the Park Authority.

In the core of the discussion, forest development processes, silvicultural practices and essential tree species ecology have been analyzed, in order to understand limitations and strengths for temperate tree species diversity maintenance in Sila National Park.

Finally, while considering the hypothetical effects of climate change on European forest biomes, the results of this project allow us to come up with valid management recommendations to guarantee and maintain long-term protection for local tree species diversity in Sila National Park.

**Global health - Humans, animals, plants and environment**

## **Attitudes to an industry standard for site instructions**

Isabella Hallberg Sramek

*SLU - Swedish University of Agricultural Sciences*

Keywords: Forest operation, logging, forest planning

Today forest operations in Sweden are mainly performed by contractors, called performers, and they're ordered by forestry companies and forest owner's associations, called clients. Before operation the performer gets a site instruction containing everything that's important to know before operation. It's a great variation in the quality of these as there's no standard for how they should look. However, there are certifications and regulations that require their existence and that have content guidelines. Because poor site instructions yield production losses and increased risk of damage to soil and ancient monuments, there are strong incitements to industry-wide improve the quality of these. Suggestively by creating an industry standard.

This work aimed to investigate the industry's attitude to create an industry standard for site instructions and the need for one. This through telephone interviews with 18 performers and 9 clients.

The results showed that there's potential for improvement in today's site instructions and that the majority of the performers, and half of the clients, are positive to a standard. What's needed to be created is a standard directive for each forest operation, with an associated checklist for the planner and with a simple feedback feature for the performer, and guidelines for use of language, symbols and colors.

The conclusion of this study is that an industry standard is requested and that it's needed to create one.

**Global health - Humans, animals, plants and environment**

# **Pollination in Grassland under altered Soil Moisture Conditions**

Franziska Diebolder

*UHOH - University of Hohenheim*

Keywords: Climate Change, Changed Precipitation, Pollination, Grassland

Climate change involves a change in precipitation patterns. This changes plant metabolisms, the composition of plant communities and influences interaction partners like pollinators.

Therefore, we investigated how grassland plant communities and their pollination change along a gradient of hydrological conditions, from very wet to very dry. Furthermore, we studied if there are differences between chronic and pulsed stress.

Grassland communities were set up in pots where water table height and incoming precipitation were manipulated. At the communities, the percentage of forbs, the number of open flowers as well as height and size of blossoms of individual plants were estimated and measured. The number of pollinators, the number of blossoms they pollinated and the time they spent in the respective pot was monitored.

The results show that plants under wet and mesic conditions had more cover and less desiccated biomass than under dry conditions. Among the water treatments of the gradient the percentage of forbs was lower under drought conditions.

Regarding the number of opened flowers and the height and size of inflorescences, different grassland species showed different treatment responses.

The pollinator monitoring revealed that there were more pollinators under mesic conditions than under dry conditions, where because of very low flower abundance no pollinators came. Among chronic and pulsed treatments, plants formed less blossoms under pulsed than under chronic drought. Moreover, less pollinators headed for pots with pulsed logging than for pots with chronic logging.

All in all, drought seems to be a potential threat for pollinators as forbs are suppressed and plants build less blossoms so that the symbiotic relationship is disturbed.

**Global health - Humans, animals, plants and environment**

## **Invitro studies of Moringa oleifera**

Asfand Yar Chaudhary, Neha Farid

*UHOH - University of Hohenheim*

Keywords: MS Media: Murashige & Skoog Media; IAA: Indole-3- Acetic Acid; NAA: 1-Naphthalene Acetic Acid; BAP: 6-Benzylaminopurine; 2, 4-D: 2, 4-Dichlorophenoxyacetic Acid

Moringa oleifera, known as the miracle tree, is a plant of great importance. The plant is well known for its diverse medicinal and nutritional properties. The objective of the research is focused on tissue culture of Moringa oleifera through callus induction, direct multiplication as well as from seed culture. The study is also focused on optimization of sterilization protocol and media for the tissue culture processes. As expected, Moringa oleifera gave promising results using MS Media supplemented with different concentrations of Plant Growth Regulators such as IAA, NAA, BAP, Kinetin and 2,4-D.

Seed initiation gave optimum results on MS Basal media. Direct multiplication of the plant was observed with optimum results on MS media supplemented with 0.1mg/L BAP. For callus induction, effects of Plant Growth Regulator and photoperiod were observed. In Dark conditions, maximum growth was seen on MS media supplemented with 2, 4-D (2mg/L), and that in light conditions, MS media with 2,4-D (2mg/L and 3mg/L) gave almost similar results.

Initially, seed coats were removed inside the Laminar Flow Hood but this was affecting the sterilization negatively. Seed sterilization was then modified by removing seed coats and sterilizing them outside the Laminar Flow Hood. The seeds were then transferred to the LFH for further sterilization, and then cultured on the growth media. For the sterilization of the explant for direct multiplication and callus induction, firstly Ethanol was used which caused bleaching effect. Later, Ethanol was removed from the protocol, it reduced the bleaching effect to zero, and sterilization was maximized.

**Global health - Humans, animals, plants and environment**



## **Our health, our food – but what about our environment? The effect of the antibiotic oxytetracycline on *Lemna minor***

Cinderella Nowak

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Keywords: Antibiotics, chemicals, environment, plants

Antibiotics are used as human medicine and to enhance food production by preventing animal diseases. Even concentrations in the ng/L range of these pharmaceuticals have been detected in waterbodies all around the globe. The aim of the current project was to study and quantify the phytotoxic effect of the antibiotic oxytetracycline (OTC) on the higher aquatic plant *Lemna minor* L. (common duckweed) based on the OECD guideline for the testing of chemicals (test no. 221: *Lemna* sp. growth inhibition test). Six different concentrations of OTC were used besides an untreated control: 0.25, 6.25, 12.5, 25, 50 and 75 mg/L. Each concentration was replicated three times. Twelve healthy *L. minor* fronds were placed in each test vessel containing 150 ml of test solution. The chosen endpoints were frond number, frond area and fresh weight. Dose-response relationships were modelled by using a monophasic function in order to determine the EC<sub>50</sub> values. The most sensitive endpoint was frond area with an EC<sub>50</sub> of 1.40 mg/L, followed by fresh weight (1.70 mg/L) and frond number (1.74 mg/L). The usual OTC concentrations detected in waterbodies are in the ng/L to µg/L range, so that currently modelled EC<sub>50</sub> values indicate that OTC is not likely to cause direct adverse effects on *L. minor* under these environmental conditions. However, even though usually measured environmental concentrations are low, aquatic wildlife is continuously exposed to these chemical so that a long-term low-dose effect should also be taken into account. In contrast, much higher concentrations of OTC of up to 50 mg/L, have been detected in the effluents from pharmaceutical facilities located in developing countries. Here, current EC<sub>50</sub> values clearly show that such an exposure can have a drastic effect on aquatic plants such as *L. minor*.

**Global health - Humans, animals, plants and environment**

# **Honeydew, a new route of insecticide exposure to parasitoids**

Miguel Calvo Agudo

*WUR - Wageningen University and Research Centre*

Keywords: Neonicotinoids, parasitoids, hoverfly, honeydew

In agriculture, pest control is mainly based on the use of pesticides, which can induce undesirable effects on non-targeted beneficial organisms. This study analyses whether systemic insecticides can reach natural enemies and pollinators by feeding on honeydew, the sugar-rich excretion of hemipteran insects. To test this hypothesis, honeydew excreted by the citrus mealybug *Planococcus citri* Risso (Hemiptera: Pseudococcidae) reared on clementine trees *Citrus sinensis* L. Osbeck × *Poncirus trifoliata* Blanco, was collected and offered to its parasitoid *Anagyrus pseudococci* Girault (Hymenoptera: Encyrtidae) and the hoverfly *Sphaerophoria rueppellii* (Wiedemann) (Diptera: Syrphidae).

Mealybugs were subjected to three treatments: treated with the neonicotinoids i) thiamethoxam (phloem transported), ii) imidacloprid (xylem transported); or untreated. Honeydew of mealybugs treated with thiamethoxam resulted highly toxic to *A. pseudococci* and *S. rueppellii* as 60% and 100% of them died, respectively, after three days feeding on this honeydew. Honeydew of mealybugs treated with imidacloprid did also result toxic to *S. rueppellii* but not to *A. pseudococci*. Overall, honeydew has been described as a novel route of insecticide exposure for parasitoids, predators and pollinators and it should be considered in future evaluations to estimate the toxicity of insecticides.

**Global health - Humans, animals, plants and environment**

# **Environmental and economic performances of catch crops between green pea and winter wheat**

Yann Boulestreau, Walter Rossing, Joséphine Peigné, Maxime Merchier

*WUR - Wageningen University and Research Centre*

Keywords: Nitrate, catch crop, net margin

Green pea-winter wheat succession is common in northern France and Wallonia (Belgium) and is known to cause high levels of nitrate leaching. Catch crops have been proven to effectively reduce nitrate leaching in other contexts. However, their impact on nitrate leaching and on the subsequent yield varied depending on the catch crop species used. Walloon government enforces their farmers to grow catch crops between green pea and winter wheat since 2014.

Our study aimed at studying the effect of different catch crop species composition as well as bare fallow on the nitrate leaching following green pea harvest. We also looked at the yield of the following winter wheat and the corresponding farmers' gross margin. The data of a five years on-farm experiment was analyzed with the support of a mixed effect linear model. It was completed with a cost-benefit analysis based on the experimental results and with soil mineral N dynamic simulations using the model NDICEA. Based on the data available, we defined three indicators: a nitrate-leaching indicator, a mineral nitrogen uptake by catch crops indicator and a nitrate uptake indicator. Catch crops reduced nitrate levels before the leaching period below the legal threshold and reduced the nitrate-leaching indicator by more than 50% compared to bare soil.

Pure non-legumes catch crops were the most effective, reducing the nitrate-leaching indicator by 72% in average. All CC led to lower winter wheat yields compared to bare soil (between 0.1 and 0.7t/ha) except the pure legumes mix that had a positive effect in average (+0.2t/ha) but insignificant. All CC resulted in a gross margin reduction compared to bare soil ranging from a 2% to a 10% loss.

The yield differences could be partly explained by an N immobilization effect and partly by limited winter wheat emergence due to reduced seed bed quality when sowing in destructed Catch Crops.

**Global health - Humans, animals, plants and environment**

# **Evolutionary plant breeding of ancient cereals in North Italy**

Florentine Jopke

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Keywords: Evolutionary plant breeding, participatory plant breeding, ancient and modern cereal varieties, low-input farming systems, agriculture and climate change, seed production in North Italy

Bread wheat belongs to the worldwide most important crop. However, *Triticum aestivum* suffers from a decrease in genetic diversity, since agronomical changes in the 20th century. As large-scale farms with a high-energy demand are covering most arable land in Europe, most plant varieties are bred for the conventional high-input sector, which are either closely related or genetically identical. Yet, the number of organic farms, which are considered as low input systems, are observed to have increased in the last years. Today, Italy is the second country of the highest organic food production. Nevertheless, Italy is lacking specifically adapted seed material consisting of important traits, which are more suitable for low-input farming systems situated in environmental and climatically varied locations. Among other factors, the common seed legislations rooted in the European Union (EU) is contributing to the limitation to access genetically diverse marketable plant material.

To assess whether such political based breeding decisions are justified or not, this work will evaluate the actual suitability of old and local wheat varieties on low input farms.

Thus, EPB, UNISG, AIAB Piedmont and Slow Food La Spezia have developed a new research project to test 10 different varieties by participatory plant breeding and evolutionary plant breeding according their agronomic characteristics on four different low-input farming systems in the region of Liguria.

Four non-identical randomized block designs including three repetitions have been implemented on four different research farms. To substantiate the results of old and local wheat varieties being better suitable to low input farming systems, data from the pilot study of Migliorini in 2016 will serve as further reference. As other research pointed out already. It turned out, that old and local have a great potential to combat challenges farmers deal and will be dealing due to climate change.

**Food - Quality, production and safety**

**Scientific Student Conference 2017**

**Euroleague for Life Sciences**

**Session 1: 17 November 2017 at 13.35-14.35**

**Poster session 1.2. Food: Quality, Production and Safety**

**Copenhagen Plant Science Centre, auditorium**

# Evaluating Methods for the Analysis of Glucocorticoids in Animal Fats

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Keywords: Glucocorticoids, animal fat, steroid hormones, GC/MS, SPE

Glucocorticoids are pharmacologically active steroid hormones which occur naturally in animal fats. In this work, a method for the analysis of glucocorticoids in fat is evaluated. The aim is to develop a reproducible method including extraction of steroid hormones from fat tissue and analysis via gas chromatography/mass spectrometry (GC/MS).

First, seven different corticoid standard substances (cortisone, hydrocortisone, corticosterone, Reichstein's substance S, 21-hydroxyprogesterone, 17 $\alpha$ -hydroxyprogesterone and progesterone) were used for peak optimization with GC/MS. Therefore, derivatization of the side chains of the corticoid standards had to be performed. Here, the advantage of oximation and silylation reactions for transforming the carbonyl and hydroxyl groups into non-reactive silyl groups prior to GC/MS was used. Also, the ideal extraction column and an appropriate heating program of the GC/MS for good separation due to different retention times of the substances were identified. The corticoid standards were tested in a fat matrix to simulate later real sample occurrence. Thus, pork fat was spiked with the hormones and it was separated using solid phase extraction (SPE). In this case, the challenge was to find a suitable column and the right solvent that retain the corticoids long enough, while most of the fat elutes. After good parameters for standard preparation and analysis were found, actual animal fat samples were investigated. Real samples were derived from fat of badger, ibex, brown bear and fox. Since real samples empirically differ from standard samples, the methods for the real samples had to be adapted and refined again. As the limit of detection was determined as well, the hereby developed method can be applied to any animal derived food sample suspected of steroids for food safety reasons.

**Food - Quality, production and safety**

## **Antimicrobial activity of *Cannabis sativa* L. essential oil against *Staphylococcus aureus***

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Keywords: Bacteria, biofilm, essential oils, synergy

This study is focused on determining the antimicrobial activity of *Cannabis sativa* L. essential oil and its combination with antibiotic penicillin and disinfectant agent Meridasan Profi against planctonic form and biofilm growth of *Staphylococcus aureus*. To determine the minimum inhibitory concentrations (MIC) and biofilm inhibitory concentration (BIC), the microdilution method using 96-well microtiter plates has been used. The essential oil from *C. sativa* has been obtained by hydrodistillation and analyzed by gass chromatography. Results have shown that the *C. sativa* essential oil is much more effective in biofilm inhibition than in destroying planctonic cells. The biofilm has been inhibited in the concentration 256 µg/ml, the planctonic cells in the concentration >1024 µg/ml. The synergistic interaction has been found in combination of *C. sativa* and Meridasan Profi against planctonic cells (FICI <0,258) and also against biofilm growth (FICI 0,25). Combining this essential oil and penicillin has shown indifferrent interaction against planctonic cells (FICI 1,125) and additive effect against biofilm growth (FICI 0,5156). The results of this study suggest, that the essential oil of *C. sativa* has potential usage in eliminating bacterial biofilms and it can be used to enhance the effect of disinfectant agent Meridasan Profi and in other possible synergies with different compounds.

**Food - Quality, production and safety**

# **Effects of temperature increase and altered precipitation patterns on crop performance, photosynthesis and biomass allocation of oilseed rape**

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*UHOH - University of Hohenheim*

Keywords: Climate change, oilseed rape, crop performance, gas exchange, biomass allocation

Global climate change is currently one of the high controversy in life sciences and agribusiness because it will drastically affect agricultural food production. More specific knowledge is required on how crops develop under future climate change conditions. Thus, the Hohenheim Climate Change (HoCC) experiment of the University of Hohenheim (South-West Germany) was established to investigate effects of temperature increase and altered summer precipitation patterns on crops. In 2016/2017, winter oilseed rape was cultivated. The split plot design contained three treatment factors: temperature, rainfall amount and rainfall frequency, with four replicates each. Temperature was increased by 2.5°C during the whole year using heating cables to raise soil temperature. The rainfall amount was reduced by 25% and the drought period increased by 50% due to manual water supply under roofs (June 1st to August 31st). In weekly intervals, crop performance was measured during the whole growing season by assessing phenology, canopy height, leaf area index and the senescence of leaves. Gas exchange and CO<sub>2</sub> response curves were determined at specific plant development stages (stem elongation, flowering). In addition, two intermediate harvests were performed at stem elongation and flowering to examine the biomass allocation. Therefore, dry and fresh weight of stems, green leaves, senescent leaves and flowers (if available) were determined. Additionally, green leaf area was measured. First results indicate a shift to an earlier flowering date and an accelerated plant development under temperature increase. In general, temperature increase had a stronger impact on plant development than altered precipitation patterns. Overall, climate change requires future adaptations in agricultural management, harvest technology and most likely breeding objectives.

**Food - Quality, production and safety**



# **Generating process stable whey protein-pectin complexes by combined heat and shear treatment - Influence of whey protein source and processing conditions**

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Keywords: Whey protein, pectin, fat replacer, scraped-surface heat exchanger

Whey proteins as well as pectins are functional food ingredients that are currently employed in various foods. Mixing these two biopolymers in aqueous solutions leads to the formation of whey protein-pectin particles. Especially particle sizes ranging from 1-10  $\mu\text{m}$  can act as fat replacers in calorie reduced dairy products. However, the obtained whey protein pectin complexes are susceptible to environmental changes in pH, temperature or mechanical stress. Our hypothesis is that process stable particles with a defined particle size can be designed by means of a scraped-surface heat exchanger which allows to combine shear and heat treatments.

In order to study influencing factors on shear-heat-treated whey protein pectin complexes combining the advantages of both single biopolymers, reconstituted whey protein isolate as well as in-house produced ultrafiltered “ideal whey” in combination with high-methoxyl pectin were used. Protein contents were varied from 0.5 to 5.2 % (w/w) while keeping a constant protein to pectin ratio of 5:1. After mixing, the dispersions were heat-treated at 90°C for 250 s in a scraped-surface heat exchanger at various shear rates. The microstructural properties of the processed particles were characterized by particle size and fluorescence measurements as well as microscopic analysis.

Fluorescence spectroscopy showed that whey proteins unfold upon heating and form complexes with pectin. Furthermore, the outcomes revealed that with increasing shear rates particle sizes decreased exponentially. Whey proteins from ultrafiltered “ideal whey” formed larger particles and were thus more reactive than proteins from whey protein isolate. Higher shear rates needed to be applied to achieve comparable particle sizes. The application of a shear heat treatment allows to engineer process stable whey protein-pectin complexes in the targeted particle size range. Thus, desired properties can be controlled, exposing the potential to apply them as fat replacers in dairy products.

**Food - Quality, production and safety**

# **Analysis of the storage protein fractions albumin/globulin, gliadin and glutenin in different spelt wheat (*Triticum aestivum* ssp. *spelta* L.) cultivars**

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Keywords: Spelt wheat, storage protein, protein concentration, backing quality

In the last decade, spelt wheat has gained importance in agricultural cultivation. Despite the lower yield performance of spelt wheat, for example the cultivar Franckenkorn with 84.4 dt/ha, compared to wheat, for example the cultivar Kerubino with 92.7 dt/ha, spelt wheat shows a stable yield level. Due to its baking properties (viscosity, elasticity), for which the composition of the storage proteins plays an important role, spelt wheat is more focused. The aim of this work is to characterize the storage protein fractions albumin/globulin, gliadin and glutenin by means of quantitative and qualitative analysis. 20 different spelt wheat varieties were analyzed and compared. Each were grown at three locations in southern Germany (Baden-Württemberg). The following research questions should be answered: Are there differences between the total storage protein concentration and the concentration of each protein fraction between the genotypes? Does the protein composition varies between the genotypes? Do the determining parameters of the baking quality (sedimentation value, crude protein content, volume yield) show differences between the varieties? The total storage protein concentration was determined with the Bradford assay. The dye Coomassie Brilliant Blue G-250 reacts with protein, which causes a shift of the absorption maximum from blue (470 nm) to red (595 nm) so it's able to be measured in the photometer. It shows significant differences between the varieties, as does the storage protein concentrations in the individual fractions. For investigation the protein composition the SDS-PAGE (sodium dodecyl sulfate polyacrylamide gel electrophoresis) were used. It shows a different band pattern for all varieties. However, some proteins can be detected in single, multiple or all spelt genotypes. Regarding the baking quality, differences between the spelt wheat genotypes were also established by determining parameters (sedimentation value, crude protein content, volume yield).

**Global health - Humans, animals, plants and environment**

## ***Panax ginseng* as new natural emulsifier**

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Keywords: Emulsifier, Emulsion, Quillaja, Ginseng, Saponin

The search for natural emulsifiers to replace synthetic ones has increased with consumers demand for all-natural food-products. As established natural compounds often have limited applications due to their macromolecular composition, surface-active saponins have recently gained interest due to their extensive emulsion stabilizing properties. However, the overexploitation of the most widely used source of saponins from *Quillaja saponaria* Molina, has enhanced the interest in finding alternative saponin sources.

We hypothesized that saponin-containing extracts from *Panax ginseng* have emulsifying properties and can therefore be applied as natural emulsifier to stabilize oil-in-water emulsions. To verify our hypothesis, we compared two saponin-containing *Panax ginseng* extracts from different manufacturers (CJ and Finzelberg). Both extracts formed droplets with a diameter  $< 1 \mu\text{m}$  in 10% oil-in-water emulsions at a low emulsifier-to-oil ratio (1:10). Moreover, highly negative  $\zeta$ -potentials of 40 mV indicate electrostatic repulsion as a major factor contributing to the stabilization of the prepared emulsions. To investigate if ginseng extracts were suitable as emulsifiers for the food industry, we applied them under conditions that often occur in commercial processing. Ginseng CJ stabilized emulsions were stable over a wide pH range (pH 3 – 9) and up to 500 mM NaCl, whereas Ginseng Finzelberg stabilized emulsions were only stable over a smaller pH range (pH 4 – 9) and ionic strength  $\leq 100$  mM NaCl. The observed coalescence at low pH values and at high ionic strength was mainly attributed to a reduced or screened electrostatic repulsion as  $\zeta$ -potentials decreased towards electro-neutrality with decreasing pH or increasing ionic strength in all emulsions. Furthermore, all emulsions were stable when thermally processed ( $\leq 90$  °C) or stored for up to 28 days at 5 and 25 °C.

Overall, our results indicate that both extracts from *Panax ginseng* might be a promising alternative to *Quillaja* extract for the application in selected emulsion-based food and beverage products.

**Food - Quality, production and safety**

# **The Role of Cysteine-Rich Receptor-Like Kinases in *Parasponia andersonii* Root Nodule Formation and Infection of Rhizobia**

Jasper Smits

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Keywords: Nitrogen-fixation, *P. andersonii*, rhizobia, CRKs, CRISPR-Cas9

Understanding how symbiosis between plants and nitrogen-fixing bacteria is constituted, is a major question in biology. The legume-rhizobia symbiosis has received most attention and has been researched extensively with the goal of transferring this symbiotic capacity to non-legume plants. The tropical tree *Parasponia* is the only known non-legume able to enter the endosymbiosis with rhizobia. Recently, a genome comparison has been performed between *Parasponia* and the close relative *Trema*, a non-nodulating tree. On top of that, I determined the expression pattern of several genes in different tissue of *Parasponia* in a transcriptome study. This led to a set of genes likely to be involved in symbiosis. Among others, two nodule-enhanced genes were detected: PanCRK1 (*Parasponia* cysteine-rich receptor-like kinase) and PanCRK11, of which PanCRK11 is pseudogenized in *Trema*. Prior research suggest CRKs in *Arabidopsis* to be involved in protein-protein interaction, redox regulation and the sensing of extracellular reactive oxygen species (ROS). However, it remains unclear if PanCRK1 or PanCRK11 have a role in symbiosis between *Parasponia* and rhizobia. To this end, I created two mutants: *Panckr1* and *Panckr11* using CRISPR-Cas9 sgRNA-guided mutagenesis. In this research paper, I suggest a possible function for PanCRK1 and PanCRK11. The phenotype is not yet determined, but it is hypothesized that PanCRK1 is involved in nodule-organogenesis and PanCRK11 is involved in intracellular infection.

This research contributes to determining what the molecular mechanisms are this symbiosis entails, thereby contributing to the development of non-legumes to enter this symbiosis and to grow in nitrogen-poor soil.

**Food - Quality, production and safety**

# Insights for understanding food structure heterogeneities

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Keywords: Mechanical contrasts, texture, model foods, fracture mechanics, sensory perception

The aim of this study was to investigate the contribution of mechanical contrast in gels on the perception of food structure heterogeneities. Homogeneous (HO) and heterogeneous (HE) model food systems comprised from agar, k-carrageenan or gelatine were prepared. The mechanical properties were varied by varying the concentration of each gelling agent and furthermore determined by uni-axial compression. While the value of true fracture strain ( $\epsilon_H$ ) for agar, k-carrageenan and gelatine differed, the values of true fracture stress ( $\sigma_T$ ) were kept the same and ranged from 20 to 100 kPa. Structural heterogeneity was introduced by combining gels with different  $\sigma_T$  values which were presented as bi-layered systems. Two different series of HE bi-layered gels were used. Hard (HS), which were comprised from a hard upper and soft lower layer and soft (SS) which were comprised from a soft upper and hard lower layer. Direct comparison of HS and SS was achieved by keeping constant the differences of the upper with lower layer ( $\Delta H$ ) towards the value of  $\sigma_T$ . Additionally, physico-chemical characteristics such as syneresis and melting were quantified. A ranking test involving 33 consumers was used to identify the detection limit of texture contrast in food gels.

Results indicated that the discriminatory ability of the untrained panellists did not differentiate significantly for HO compared to HE systems. Heterogeneity was easier perceived in SS. The threshold obtained by the mean rank value and from the calculation of Just-Noticeable-Differences indicated that the perception of heterogeneity differed according to the value of true fracture strain ( $\epsilon_H$ ). The f-wedge test indicated that the perception of heterogeneity was mainly driven by a compression-like action exerted on the lower layer of HE. Syneresis and melting behavior showed differences within the gelling agents but did not have a significant impact on the perception of heterogeneity.

**Food - Quality, production and safety**

# Ultrafine electrospun whey protein isolate (WPI)-maltodextrin fibers as starting material for the production of glycoconjugates

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Keywords: Needleless electrospinning, glycoconjugate, maltodextrin, whey protein isolate, Maillard reaction

Glycation of whey proteins via the first stage of the Maillard reaction is capable of improving their stability as natural emulsifiers but the process is not economically feasible yet. This work reports the glycation of whey protein isolate (WPI) with maltodextrin at a high yield after heating electrospun fibers made from the reactants.

Aim of this study was to investigate the effect of four different ratios of WPI and maltodextrin (dextrose equivalent 2) (5:95; 10:90; 20:80 and 25:75 w/w) on the spinnability in a needleless setup, the degree of glycation in the spun fibers, and the binding ratio between WPI and maltodextrin.

The fiber production rate decreased from  $1.51 \pm 0.52$  to  $1.03 \pm 0.47$  g/h with increasing WPI content likely due to decreased maltodextrin chain entanglement caused by the globular whey proteins. The fiber morphology, however, remained even with fiber diameters around 1.60  $\mu\text{m}$ . After heating the fibers (60 °C, 75% RH, 48 h), glycoconjugate formation was confirmed by Fourier transform infrared spectroscopy (FTIR) and SDS-PAGE. The molecular weight of the conjugates and the reaction yield were studied by size exclusion chromatography. The binding ratio between WPI and maltodextrin was assessed via determination of free amino groups. With increasing WPI content, the binding ratio of maltodextrin per protein molecule decreased from ~2.4 to ~1.3. Preferably small polysaccharides (2-13 kDa) from the maltodextrin reacted due to steric hindrance of the bigger molecules. The highest protein specific reaction yield (43.03 % w/w) was achieved at 10:90 w/w WPI:maltodextrin (i.e. 1:1.2 mol/mol).

This study shows that electrospinning of WPI-maltodextrin solutions prior to the conjugation is a promising new way for the efficient, controlled production of glycoconjugates under mild reaction conditions.

**Food - Quality, production and safety**

# **Texture and sensory properties of wheat yeast bread without white refined sugar**

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Keywords: Wheat yeast bread, sugarless, texture properties, sensory properties

More and more people are suffering from diabetes, obesity and other diseases. One of the reasons is omnipresent white refined sugar, which is added almost to every food product available on the market, even to the „healthy” ones as yoghurts or juice. The better solutions are fruit and vegetables. They contain not only simple sugars but also carbohydrates with essential nutrients (vitamins, minerals, fiber, antioxidants), which are requisite for proper functioning of a human organism (digestion, absorption and transport). The aim of the research was to see how the addition of fruit and vegetables affect the texture and sensory properties of bread.

In the study there were investigated the texture and sensory properties of wheat yeast bread with fruit and vegetable source of sugars instead of white refined sugar. The bread with white refined sugar was also studied for comparison. Loaves of bread were made from wheat flour type 550, using biphasic method. Different fruit and vegetable were used: bananas, roasted apples, stewed apples mash, date syrup and baked sweet potato, baked carrot and baked nutmeg pumpkin purée.

Texture properties (resilience, springiness, cohesiveness, hardness, gumminess, chewiness, adhesiveness) of wheat yeast bread were determined with texturometer, using Texture Profile Analysis (TPA). Sensory properties were examined by conducting a questionnaire survey.

The results are satisfying: texture and sensory properties are comparable to regular white yeast bread and in some cases even better. The sweetness was the only parameter that did not satisfy the respondents.

**Global health - Humans, animals, plants and environment**

## **Comparing the quality of eggs in Warsaw market**

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Keywords: Eggs quality, housing system, market

From the very beginning people have eaten eggs they have collected away from birds. Eggs are used in traditional cooking all over the world as eggs are an important source of protein and many nutrients. Basically, without them life cannot exist, as they contain lipids, vitamins, minerals and other biologically active substances. Numerous recent science works show that eggs, due to high solution of biologically active substances, are the best supply while obtaining nutraceutic and biomedical substances.

The aim of this work was to compare the quality of eggs available for consumers on Warsaw market.

Material and Methods. The material of analysis came from four housing system: cages, litter, free-range and organic. Each group contained 20 eggs. All eggs underwent individual, standard morphological analysis in the following criteria: mass, color, shape and strength of their shell, as well as the share of protein and yolk, and, finally, the color of yolk. Parameters such as lipid profile and contents of vitamin in fat were analysed too.

Results. The work showed high statistical differences between the groups of analysed parameters in eggs coming from different housing systems available on Warsaw market.

**Food - Quality, production and safety**



**Scientific Student Conference 2017**  
**Euroleague for Life Sciences**

**Session 2: 17 November 2017 at 17.00-18.00**

**Poster session 2.1. Food: Quality, Production and Safety**

**Copenhagen Plant Centre, Foyer**

# **Contextualizing Participatory Guarantee Systems (PGS) in Peru: Two case studies in Lima & Apurímac**

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Keywords: Certification in organic agriculture, PGS, Peru, stakeholder perceptions

Organic agricultural standards and certification are powerful tools that ensure the integrity of organic products. The dominant certification system, Third Party Certification (TPC), has been subject to critique and Participatory Guarantee Systems (PGS) are proposed as an alternative. Ideally, they emerge from grassroots initiatives and are characterized by a broad and diverse participation of actors in a guarantee process based on trust, peer review and mutual learning. Studies about the principles and theoretical implications of PGS in their respective environments exist, but rather few empirical evidence is available on the actual functioning of PGS in practice.

This research aims at contextualizing two PGS initiatives in Peru in the regions of Lima and Apurímac. Inclusion of the perspectives of stakeholders involved in PGS on a national, regional and local level should offer a more profound understanding of how these PGS operate and the context in which the two initiatives are embedded. Qualitative and quantitative approaches have been used for data collection. PGS in Peru show a rather centralized pyramid structure. Legal non-recognition of PGS nationally is both among regional and national actors considered a major factor hampering the positive development of PGS in Peru. Better access to markets is a major motivation factor for farmers to participate in PGS, but still needs to be improved in both regions. Technical trainings in the area of PGS and organic agriculture are crucial for a sustainable implementation of PGS. Farmers acting as internal evaluators are not essential for the guarantee process, but they are potential multipliers of knowledge. PGS in Lima and Apurímac are an important tool in the agro-ecological movement in Peru and offer considerable potential to support small-scale farmers. However, official recognition and support, as well as improvements in the internal organization and communication are needed to ensure that PGS are able to fulfil their own principles.

**Food - Quality, production and safety**

# **Tourists' Plant Food Preferences in Cambodia: Impact of the Local Food Products on Tourist Experience**

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Keywords: Food preferences; tourism; local market

Nowadays eating is not intended to only satisfy hunger and provide necessary nutrients, but it is also cultural and social activity. Tourists would like to experience the local food, local culture, as well as interact with local people. This study is designed to understand the tourists' perception and preferences of traditional plant food products of Cambodia as well as to identify which factors are most important in their general attitudes, perceptions, experiences and awareness to try the local traditional food. The findings are based on a survey sample of 621 international tourists in the three most popular regions: Phnom Penh, Siem Reap, and Sihanouk Ville, in order to find differences in their consumer behaviour and demographic factors based on their traditional food experience. Respondents were asked whether they know any traditional local product and then they were asked for specific local plant food products, which were a priori selected based on an analysis of available literature sources. Significant differences were found between various demographic factors on tourists' perceptions of traditional food products, but as most known local traditional plant food products were significantly identified Kampot pepper (71.28%) and Palm sugar (70.51%) whereas in both cases, more than half of the respondents have already tasted it, were satisfied and would like to buy it again. Furthermore, the most important factors that played a significant role in deciding the respondents whether to taste local products were mainly personal interests to know local cuisine and try new food mainly at the local street markets. The final findings of the study can be used to improve and provide a better quality and range of traditional Cambodian plant foods and services to the visitors at locations they often visit and buy foods. Product design and the promotion of locality for international tourists have much potential in Cambodia.

**Food - Quality, production and safety**

## **Market survey of *Garcinia kola* (bitter kola) seeds in Yaoundé city, Cameroon**

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Keywords: Non-timber forest products, mapping of market chain, medicinal plants, vendors

*Garcinia kola* (Bitter kola) is a medicinal plant species collected in the forests of sub-Saharan Africa mainly for subsistence. Seeds represent the most valuable part, however little is known about their nutrition composition, domestication or market chain. It is generally observed that seeds are commonly traded at local markets and even attract the attention of consumers abroad. Nevertheless, roles and margins of particular nodes within the chain are not yet documented. Thus, the aim of the survey was to document who were typical sellers of bitter kola seeds and what marketing practices they used. During June and July, a survey in the streets of four different districts of Yaoundé city was conducted. Total number of 36 street vendors, divided into 24 mobile-vendors and 12 stall-holders, and 35 market-traders were interviewed via semi-structured questionnaires. Mobile-vendors were predominantly boys (95.6%) with average age of 15.6 ( $\pm 3.16$ ) years, selling seeds close to the main streets to taxi drivers to cover their school fees, and stall-holders, mainly women (58.3%) of average age 38.5 ( $\pm 7.56$ ) years, situated far from main communications were selling seeds to passing-by people. Market-traders were again particularly women (86%), 49.9 ( $\pm 9.92$ ) years old, selling bitter kola to very a diverse group of customers, similarly to stall-holders. Different selling units were observed among both types of vendors, i.e. street vendors used three seeds at an average price of 100 FCFA (€0.15), while market-traders used mainly cups for 500 FCFA (€0.76) each. Majority of all vendors (87.5%) stated that they sold seeds because of their medicinal ability. Survey points at relatively important role of middlemen as 54.8% of respondents purchased bitter kola from them, while all street vendors were buying the seeds from market-traders, nevertheless further studies are needed to document whole value-chain precisely, including consumer preferences and domestication.

**Food - Quality, production and safety**

# **Assessing the Efficiency Level of Indonesian Rice Farmers: A Non-Parametric Analysis**

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Keywords: Rice, technical efficiency, data envelopment analysis

The main purpose of this study is to determine the best practice, which might be applicable to improve output-efficiency of Indonesian rice farmers in order to achieve rice self-sufficiency. Technical efficiency of 63,408 rice farmers across 34 provinces in Indonesia was measured by using Data Envelopment Analysis (DEA). The result indicated that majority of sample rice farmers were still far away from their maximum potential output. Furthermore, Kruskal-Wallis test was executed to identify several aspects, which distinguish rice farmers with better efficiency from the less efficient ones. Higher technical efficiency scores were identified among farmers who spent longer times on formal education, utilized irrigation system, received assistance and training from external parties, involved themselves in an agricultural group, and being exposed to agricultural mechanization.

**Food - Quality, production and safety**

# **Social network analysis of stakeholder groups implementing upgrading strategies to enhance food security in rural regions of Tanzania**

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Keywords: Net-Map, upgrading strategy, food security, Tanzania, stakeholders, degree centrality, motivations, food value chain, social network analysis

Improving food security is essential for most rural Tanzanian households where the nutritional status of the country's population is low. Given the challenges of rising food demand it is highly recommended to upgrade existing smallholder food systems against upcoming vulnerabilities. The aim of this study was to assess and apprehend the role of actors and the interlinkages among the upgrading strategy/ies (UPS) groups; to determine the relationship within these UPS group actors; to recognize the differences between the different UPS groups and other actors; and to define possible success factors for UPS group performance. The study was conducted in the framework of a multi-disciplinary Trans-SEC project in Tanzania, designed to enhance food security for rural poor households by employing food securing UPS along the food value chain. Our specific focus was on two UPS, namely a) tied ridges and fertilizer micro dosing b) maize sheller and millet thresher. Research methods included individual interviews using the social network analysis tool Net-Map and focus group discussions. The Net-Map tool enabled visualizing and understanding the power relations, interlinkages among the UPS groups, and stakeholder goals, all of which facilitate knowledge transfer and material flow. The knowledge, money and material flows were similar among different groups. Motivations for participating in a UPS group differ to some extent between UPS groups and all types of actors whereby *enhancing food availability, more joy, more income, more knowledge* and *better social relations* were most frequently mentioned. The results provide understanding of the different UPS stakeholder group's performances by showing attributes of stakeholders and then relating them to their goals and perceived influence. The results further provide the basis for future strategic planning to further enhance participation and up-scaling. The study serves as a landmark for understanding stakeholders' roles and their influence in implementing upgrading strategies.

**Food - Quality, production and safety**

# **Milk miRNA as a regulator of the human transcriptome**

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Keywords: Milk, microRNA, transcriptome, bioactive compounds, exosome

Milk provides optimal nutrition to the newborn and aids in infant development due to a long list of bioactive compounds, which may lack one item: microRNAs. These small non-coding RNAs, highly present in milk, regulate the expression of over 60% of human genes post-transcriptionally. Although dietary microRNA uptake from plants remains controversial, the situation for milk may be different. Milk has unique properties, and milk-feeding occurs under unique circumstances, which facilitate microRNA uptake. Promising results have been obtained so far, but it can be difficult to understand what is known and unknown in this fast-moving field. Therefore, this review provides the current understanding of the journey that milk microRNAs make, from their biogenesis up until their possible functions in the consumer.

Milk microRNAs mainly originate from mammary endothelial cells, and are packaged in nanovesicles called exosomes. Exosomes protect their cargo from digestion. The exosome is then endocytosed by intestinal epithelial cells, where their cargo may be functional, or basolaterally secreted, either in their original exosome, or repackaged in endogenous extracellular vesicles. Next, they enter the systemic circulation through endocytosis. Milk microRNA predominantly accumulates in the brain, liver and kidneys.

Although scarcely investigated, milk microRNAs may have profound effects: several microRNAs in milk target DNA methyltransferases (DNMT), a key regulator in DNA methylation. Inhibition of DNMT by milk microRNAs may therefore lead to genome-wide hypomethylation. Additionally, there is preliminary evidence indicating that milk exosomes may aid in intestinal development, are immunoregulatory, and may modulate the gut microbiome.

Future research should focus on the effects of individual milk exosomal components; milk microRNA uptake and functionality from physiological doses in infants and adults; and dietary microRNA uptake from foods with a similar matrix (e.g. eggs). Ultimately, this may lead to better breast-feeding practices, healthier dairy products, and improved exosome- and microRNA-based therapeutics.

**Food - Quality, production and safety**

# **Carbon Benefits of Alternative Land Uses for Biofuel Production in the Brazilian Amazon.**

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Keywords: Carbon emissions, biofuel production, Brazilian Amazon biome, land use, carbon parity times

Forest and crop bioenergy can contribute to climate change mitigation by carbon sequestration in biomass and displacement of fossil fuels. Large deforested and abandoned land areas in the Brazilian Amazon region are left unmanaged for secondary forests recovery. These areas could alternatively be managed to produce biofuel to substitute fossil fuels. Current debate about land management for effective carbon emission mitigation is inconclusive and there is little knowledge about carbon benefits of using abandoned land for biofuel production relative to natural forest recovery.

This study compared the carbon emission mitigation potential of three land use alternatives established on abandoned pasture over a 100-year projection period: a) secondary forest regenerated by natural succession, b) short-rotation coppice eucalyptus plantation for wood pellet production, and c) oil palm plantation for biodiesel production. A modelling framework developed by Taeroe et al., (submitted for publication) was applied to calculate the cumulative net carbon emissions, carbon parity times and relative emissions of the land use alternatives with biofuel feedstock production relative to secondary forest, including fossil fuel substitution effects.

The study results showed that wood pellets produced from eucalyptus plantations can deliver both short- and long-term carbon benefits relative to natural forest recovery. Conversely, carbon benefits from oil palm production system were lower than those from secondary succession forest up to the year 2100.

Carbon parity times turned to be unreliable to be used as climate indicator for making conclusions about carbon benefits. The key factors in the sensitivity analysis determining the carbon mitigation potential of the assessed land use alternatives were: changes in soil carbon stock in secondary succession forest, productivity of eucalyptus plantation, and utilization of cut down oil palm biomass at the end of the rotation cycle.

**Global health - Humans, animals, plants and environment**



# **Evaluation of Effect of Ridging on the Rainwater Use Efficiency of Soybean Production in Northern Ghana**

Jessica Lloyd

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Keywords: Ghana, Soil Ridging, Soybean

As climate change continues to challenge agricultural production globally, one of its main influencing factors pertains to rainfall patterns. It is causing less frequent and more intense rainfall, which increases stress on plants and promotes erosion, requiring a shift in agricultural practices to ensure sustainable production systems.

Fluctuations in soil moisture due to the variability in rainfall must be stabilized in order to create an efficient crop production system. Soil ridging promotes the soils ability to allow water to infiltrate, have ideal permeability and water holding capacity – all necessary capabilities a soil must have in order to maintain consistent, proper moisture content.

The objectives of the research were to see if a) stabilization of soil moisture could be achieved via soil ridging and b) determine if the stabilization of soil moisture content causes a significant difference in yield compared to conventional soil preparation.

The experiment was carried out during the 2016 cropping season in the Chereponi District of Ghana's Northern Region. The ridges constructed were able to evacuate water during times of heavy rainfall whilst the troughs maintained higher soil moisture content during periods of brief drought, as compared to a neighbouring un-ridged plot. It was found that the over 14 field ridging produced an average yield of 1603 kg/ha (SEM +- 161) while non-ridged plots adjacent to the ridges produced only 1258 kg/ha (SEM +- 142). The differences in yield could be evidence of greater root penetration and nutrient scavenging, accredited from not only the increased water infiltration created by the soil ridges but also soil de-compaction which occurred during ridge formation.

**Global health - Humans, animals, plants and environment**

# **Image analysis and closed loop control of bread roll fermentation**

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Keywords: Dough fermentation, Image analysis, Fuzzy logic control, PID control

Beside judging the right amount of proofing time for a shaped loaf which is always challenging in the baking industry, in present situation, the quality loss in the baking products results from no consideration of the characteristics of raw materials and no consideration of the actual state of the dough piece. Online monitoring of volume increase of dough pieces during proofing can be used to overcome critical situations and to increase automation grade.

The volume increase of dough pieces was controlled using a digital camera and an image analyzing algorithm complemented by a Fuzzy and a PID controller. Various compositions of dough in three different states (frozen dough, cooled dough and defrosted dough) with alteration in amount of yeast were prepared in order to have doughs with different proofing behavior. A Fuzzy logic and PID controller was designed and combined with the imaging system to control the fermentation process of different types of doughs.

Final volume of dough pieces which were controlled for one hour in the fermentation chamber with both controllers as well as bubble size distribution in the final baked bread rolls were compared to find the most suitable controller for the fermentation process.

Both controllers were able to raise the final volume of the dough piece the same as the standard dough after one hour. The fuzzy logic controller was much easier to design and required less time, therefore with respect to economic views it is more suitable for controlling the fermentation process. In addition, bubble distribution around the crumb and crust in the baked bread obtained from frozen dough pieces which were defrosted and proofed with the supervision of the Fuzzy logic controller was more homogenous compared to when the PID controller was applied.

**Food - Quality, production and safety**

## **Submerged Macrophyte Patterns of Lake Constance 1967-2016**

Fionn Murphy

*UHOH - University of Hohenheim*

ELLS Excellent MSc thesis prize winner – no abstract.

Read more about the ELLS Prize for Excellent Master Thesis in the end of the Book of Abstracts.

**Scientific Student Conference 2017**

**Euroleague for Life Sciences**

**Session 2: 17 November 2017 at 17.00-18.00**

**Poster session 2.2. Global Health: Humans and Animals**

**Copenhagen Plant Science Centre, auditorium**

## **Habitat effect on nest predation on reclaimed post-mining area**

Jakub Novák

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Keywords: Land restoration, spontaneous succession, birds

Spontaneous natural succession represents an alternative to technical reclamation of post-mining areas. Generally, succession areas are considered as a suitable habitat for many (not only) bird species, including rare species. Species richness and conservation value of bird communities are higher on spontaneous succession than on technical reclamation. My pilot study was designed as a terrain experiment, using artificial ground nests, to examine the habitat effect on nest predation on Radovesice spoil heap, reclaimed post-mining site in the North Bohemian Brown Coal Basin, Czech Republic. Totally 150 installed artificial nests were fitted with two Japanese quail (*Coturnix japonica*) eggs and one plasticine egg in every second nest to determinate the probable predator. Installed nests were exposed to predators for two weeks in May 2016. I found that predation rates on nests were significantly higher in the inner parts of reclaimed spoil heap than in surrounding areas, especially on opened agriculturally reclaimed areas neighboring with the spontaneously developed areas. Mammalian predators strongly dominated over the avian predators on the spoil heap. The results of my study have shown that opened agriculturally reclaimed areas could become some form of ecological trap, especially for nesting birds. The specific effect of succession areas on the nest predation remains to be investigated in future research based on this pilot study.

**Global health - Humans, animals, plants and environment**

## **Plants and traditional knowledge: ethnobotanical inventory in province Imbabura, Ecuador**

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Keywords: Ecuador, Ethnobotany, Medicinal plants, Traditional medicine

Traditional medicine could be defined as a summary of knowledge, skills and practices, which are built on many experiences and theories. Ethnobotanical and socio-demographical data were collected in Imbabura, Ecuador, using semi-structured interviews with 34 local informants from Ibarra and Cahuasquí. In addition, quantitative approaches were used to determine medicinal use value (MUV), use report (UR), fidelity level (FL), frequency of citation (FC) and relative frequency of citation (RFC). A total of 72 medicinal plant species belonging to 38 botanical families were reported to treat diseases in the study areas. The most common families of medicinal plant species as depicted by its number of species (8 species) were Lamiaceae and Asteraceae as the dominant families. The highest number of species was used in the treatment of gastrointestinal diseases (29 species). The main route of administration was oral (83 %) and the most commonly applied methods of preparation was infusion (74 %). Highest use report was calculated for *Urtica dioica* L. - 8 UR, the highest value of relative frequency of citation (RFC) and medicinal use value (MUV) were calculated for *Marticaeria chamomilla* L.

The most important medicinal plants were evaluated *Marticaeria chamomilla* L., *Ruta graveolens* L., *Origanum vulgare* L. and *Urtica dioica* L. One of the widely used endemic and native species in Ecuador was *Aristeguietia glutinosa* (Lam.) R.M.King & H.Rob. According to comparison of place of residence and age of respondents, population in rural areas had more knowledge than the urban population and also older generations in both study areas had more knowledge than younger generations. The study area is rich in medicinal plant diversity and associated indigenous knowledge, but still needs more exploration and study.

**Global health - Humans, animals, plants and environment**

## **Ethnobotanical inventory of medicinal plants in the province of Orellana, Ecuador**

Eduardo Alberto Lara Reimers, Anna Dvořáková, Eloy Fernández Cusimamani

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Keywords: Ethnobotany, Traditional medicine, Medicinal plants, Indigenous knowledge, human health disorders.

In Ecuador, there are over 500 different species of medicinal plants, of which 228 are endangered. Those plants still play an important role in the treatment of different ailments for over 65% of the Ecuadorian population. Although the traditional knowledge of medicinal plants is strategically important for health care, it remains undocumented in some communities.

In the present study, semi-structured interviews were performed with 43 informants (65 % women, 35 % men) who were chosen by a simple random sampling in the Province of Orellana, Ecuador. The aim of the study was to conduct an inventory of medicinal plants and to analyze their cultural importance in the local medical system. Medicinal plants were collected and identified taxonomically. The data was analyzed and compared using four quantitative ethnobotanical indices: Medicinal Use Value (MUV), Use Reports (UR), the Relative Frequency of Citation (RFC) and Family Importance Value (FIV).

The study documented 68 medicinal plant species belonging to 66 genera, 27 order and 42 botanical families of 66 angiosperms. The study also reported that 1 fern and 1 equisetophyta were used for treating ailments. Annonaceae (6 species, 8.82%) and Boraginaceae (5 species, 7.35%) were the best-represented families in the studied area. The informants with the highest knowledge about medicinal plants were aged between 41-50 years. The main diseases treated (reported) were diseases of digestive system and diseases of the skin and subcutaneous tissue. *Urtica dioica* L. was reported with the highest MUV (0.136). The highest fidelity level (100 %) was recorded for *Copaifera officinalis* L., *Eucalyptus globulus* Labill., and *Origanum vulgare* L. The most useful plant species in the province was *Ilex guayusa* Loes (RFC=0.341).

The tradition and practice of using medicinal plants in the province of Orellana represents a strategy of a complementary treatment for common diseases.

**Global health - Humans, animals, plants and environment**

# **No seasonal influence on natural (auto-)antibodies in homing pigeons**

Thirsa van Wichen

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Keywords: Season, natural (auto-)antibodies, pigeon, ELISA, Western blot,

Natural antibodies (NAb) maintain homeostasis and alert the immune system of foreign antigens in the body. Also, there are natural antibodies that bind own antigens (self-antigens). These antibodies are the so-called natural autoantibodies (NAAb). NAAb have been shown in all species tested so far like men, mice and chickens. However, no study showed the presence of natural (auto-)antibodies in pigeons. Both these types of antibodies could have a large influence on the immune system, since they are related with the immune competence of individuals. Even more, it is thought that specifically these NAAb could serve as an auto-antibody fingerprint. However, it is not known if seasons influence the levels of N(A)Ab and thus also the auto-antibody fingerprint.

In this thesis both NAb and NAAb levels were tested for seasonal differences. The presence of natural antibodies was measured using ELISA. The antigens that were tested were keyhole limpet hemocyanin (KLH), human serum albumin (HuSA), bovine serum albumin (BSA) and phosphorylcholine conjugated to BSA (PC-BSA). The pigeon natural auto-antibodies reactive to liver and brain were measured with the Western blot technique. The results were analysed with SPSS, CANOCO, and Image Lab. The results show that pigeons have antibodies against the antigens in question and that pigeons are able to recognize self-antigens. However, no differences between seasons was found in both the natural (auto-)antibodies. Even though not many pigeons were available in this research, the results, some of which were significant, indicated that females have more antibodies than males. Since problems, other than with the reproductive tract, were not known during the observation period no indication was found that antibodies could predict the health status of the pigeon. The final conclusion is that pigeons can be added to the list of animals with natural (auto-)antibodies.

**Global health - Humans, animals, plants and environment**



# **Positive Pilgrimage Psychology: Exploring spiritual travel and its contribution to well-being**

Marc van Iwaarden

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Keywords: Tourism, pilgrimage, positive psychology, peak-experience, self-transcendence, spirituality.

The contribution of pilgrimage as a spiritual, mystical and peak-experience to well-being is assessed. Hardly any literature exists that adopts a positive psychological approach to pilgrimage. This study explored the subjective- as well as psychological well-being of (ex-)pilgrims through self-reported measures in an online survey. Data collected among 218 partakers of the global ‘new-day pilgrim’ movement ‘Youth With A Mission’, were analyzed using both quantitative as well as qualitative methods. The interrelationship and predictive value of the constructs personality, spirituality, self-transcendence and peak-experience is explained. The data suggests that pilgrimage as a peak-experience is not directly related to well-being, however, it has a significant indirect effect on well-being through both spirituality as well as self-transcendence. This study contributes to tourism and psychology literature as it approaches spiritual and mystical travel experiences from a unique positive psychological standpoint. Limitations and recommendations for future research are discussed.

**Global health - Humans, animals, plants and environment**

# **Application of Remote Sensing Technology for Sea Turtle Conservation Planning at Coastal Area of Trenggalek Regency, Indonesia**

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Keywords: Sea Turtle Health, Ocean Remote Sensing, Ocean Zoning,

Sea turtle is included in the 'red list' of threatened animal. The coastal area of Trenggalek Regency, East Java, Indonesia is known to be the place for olive ridley turtles (*Lepidochelys olivacea*), hawksbill sea turtles (*Eretmochelys imbricate*), and green sea turtles (*Chelonia mydas*) to lay their eggs. However, recently there was a declining trend of eggs laid which is suspected to be caused by unplanned land use change. Conservation means have not been conducted properly due to the unawareness of local community and government to the specific conservation role and function of particular coastal zones as caused by the absence of proper zoning policy. This research aimed to determine the sea turtle conservation zones at the coastal area of Trenggalek. The land capability for sea turtle conservation was determined by aggregating 5 variables of land and soil properties using Arcgis 10.0, while the land suitability was identified by overlaying 5 variables of ocean properties (ocean depth, ocean current velocity, salinity level, and temperature) using Surfer 9 and vector overlay tools in Arcgis 10.0. Remote sensing was conducted by using Landsat 8 ETM+ with supervised classification to determine which coastal areas are the best for sea turtle habitat based on its slope and vegetation. The analysis showed that the coastal area of Trenggalek is suitable for conservation site. It was concluded that for zonation policy, the coastal area can be divided into three main zones, namely protection zone, breeding zone, and limited utilization zone. The protection zones are allocated as the place for natural hatching, the breeding zones are allocated for natural inter-breeding area, and the limited utilization zones are allocated for captive breeding location and ecotourism site.

**Global health - Humans, animals, plants and environment**

# **Beneficial effects of orally administered beta-glucans on colitis induced by 2,4,6-trinitrobenzenesulfonic acid (TNBS)**

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Keywords: Beta-glucan, colitis, immune, oat, rats

Beta-glucans from cereals are a group of natural polysaccharides which also are classified as soluble dietary fiber fraction. They are appreciated for their bioactivity and immunomodulatory properties. Beneficial properties include cholesterol lowering, interactions in the treatment of obesity, improved immune response and antioxidative defense as well as the potential therapeutic effect of inflammatory bowel disease (IBD).

This study aims to investigate the potential protective effect of orally administered beta-glucans isolated from oat against TNBS-induced colitis in rats. Fifty-four rats were divided into main two groups: with colitis (group A, n=27) and control without colitis (group B, n=27). Each of these two groups were divided into three dietary subgroups fed with beta-glucan of low molecular weight (groups A1 and B1), high molecular weight (groups A2 and B2) during 21 days diet, and without this polysaccharide (groups A3 and B3). After 21 days rats were sacrificed and colons were sampled. Colitis in groups A1, A2 and A3 was confirmed by histopathology evaluation. Profile of the colon intraepithelial (IELs) and lamina propria (LPLs) leucocytes were analyzed by flow cytometry.

Obtained results shown that colitis significantly lowered LPLs and IELs population, excluding NK cells and dietary oat beta-glucan normalized these changes in molecular weight-depended manner. Briefly, in A1 group lower NK (IELs and LPLs) and higher total and B lymphocytes count (IELs), whereas in group A2 higher total, T and B lymphocytes (LPLs) and lower NK cells (IELs) count were found.

It seems that dietary beta-glucans might exhibit a protective effect on the colon and accelerate the immune response to the inflammation. The crucial conclusion is that immunostimulatory effects on colon inflammation was also observed for low molecular weight beta-glucan . It may therefore be useful in dietary therapy or dietary prophylactics.

**Global health - Humans, animals, plants and environment**

## **Fibroadenomatosis in a male cat- where can oestradiol come from?**

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Keywords: Fibroadenomatosis, Cyproteroni acetat, oestradiol, mammary tissue

Feline fibroadenomatous hyperplasia (fibroadenomatosis) is a non-neoplastic proliferation of the mammary tissue induced by progesterone. Its incidence is the highest among young adult queens (non-spayed females). Similarly, it may be found in males undergoing progestins treatment. The conventional therapy is based on a competitive progesterone antagonist, aglepristone (Alizine, Virbac).

So far, no data on estradiol's role in fibroadenomatosis progression has been published. Oestrogens can stimulate the production of the progesterone and oestrogens receptors in a mammary tissue.

A two-year-old Maine Coon male cat has been treated with cyproteroni acetat (Androcur, Bayer Pharma). After 8 weeks of therapy, a serious abnormal hyperplasia of the mammary gland was observed. Blood investigation revealed a high estradiol level (121 pg/ml) , progesterone level below 0,2 ng/ml. A three-week aglepristone therapy was undertaken, however with no clinical effect. A tamoxifen (Tamoxifen-Ebewe, Ebewe) treatment was implemented, achieving mammary glands' condition correction and their reduction. Thereafter, necrosis of enlarged nipples was observed.

The mammary glands' pairs two to four, were removed, saving the first pair for technical reasons.

Histopathological examination of mammary tissue samples confirmed fibroadenomatosis. Three months after the surgery patient's general state is better, fibroadenomatosis symptoms are gone, but estradiol's level is still that high (127pg/ml). Manual and ultrasound examination excluded any changes in testicle tissue. A survey proves that Androcur has influence on adrenal gland's steroid hormones secretion in rats and monkeys. There is a possibility that the reckless Androcur therapy induced rise of estradiol's level in our patient, which initiated advancement of fibroadenomatosis. The case is ceaselessly supervised a MRI scan is being planned.

The high level of estrogens is still being verified as a potential fibroadenomatosis-causing agent. The possible confirmation of this hypothesis would be the first clinical case reported in veterinary medicine.

**Global health - Humans, animals, plants and environment**

## **Myoelectrical activity of rumen, reticulum and abomasum in a daily cycle**

Zuzanna Sikorska, Karolina Wojciechowska

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Keywords: Telemetry, sheep, motility disorders, forestomachs, ruminants, electromyography

Motility disorders of forestomachs are common in ruminants. For more effective diagnostics and treatment, different ways of analysis the gastrointestinal tract motility are used. Many experimental methods were described in the literature, but its methodology does not allow to maintain the full welfare of the examined animals. One of new methods is telemetry electromyography. It limit the stress of animals, allows a long-term analysis of the motility and contains a relatively small number of artefacts. The study was carried out using two mature Polish Heath Sheep. Under general anaesthesia three bipolar silver electrodes were inserted in the muscular layers of the wall of forestomachs and the abomasum. During the same surgery, three-channel transmitter was placed under abdominal skin. The electrical activity of the smooth muscle fibers during contraction or relaxation can be detected as an electromyography (EMG) signal. Sheep was fed on fixed hours. The EMG signal sent by the transmitter as radio waves were recorded by using the receiver DSI coupled to PC computer. Then off-line analysis of EMG signals were performed. Mean amplitude - A [mV], mean RMS (root mean square) [mV], mean duration of electrical activity - D [s] and burst frequency - F [Hz] were analyzed. It can be assumed that all parameters increased during food intake. In abomasum frequency time of single contraction and mean amplitude was increased after food intake. Also increasing the frequency of the reticulorumen contractions was observed. In the reticulum the frequency increased but the average duration of contraction was shortened, what was caused by absence of contraction connected with returning and ruminating the cud. Regurgitation is not recorded when animals eating. It requires a silent and peace so it usually show at night.

**Global health - Humans, animals, plants and environment**

# **Implantable Biosensors: Rejection Monitoring of Cardiac Transplants**

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Keywords: Bioimpedance, Transplantation, Myocardiac, Rejection, Biosensor

Heart failure is the largest cause of hospitalization and death in developed countries. For many of those patients, there is no other option left, but to undergo a heart transplantation. Despite all the efforts of modern medicine, heart graft rejection is still an important cause of death in patients with cardiac transplantation since every transplanted tissue and solid organ bears the risk of rejection, which can finally result in the loss of the allograft with falling back into disability or even death.

To overcome limitations of the state of the art rejection monitoring methods, this project sets out to develop and evaluate titanium-dioxide coated implantable biosensors for cardiac transplant monitoring. Development in recent years has led to an overall increase in label-free technologies in biotechnological research, where time resolved measurements are used to quantify phenotypic changes of cells and tissue by monitoring biomolecular interactions without the drawbacks of conventional labelling technologies. This novel method is based on established contactless bioimpedance sensing to detect tissue changes during the early rejection process. The sensors will be implemented at the time of transplant and allow continuous monitoring with the use of state of the art wireless data transfer.

Both preliminary simulation and experimental data support our hypothesis that an electrical impedance sensory system with passivated electrodes is capable of clearly distinguishing between healthy and pathological tissue and monitor early rejection signs in cardiac tissue rejection at characteristic frequencies.

**Global health - Humans, animals, plants and environment**

## **Bisphenol S affects meiotic spindle, DNA integrity and epigenetic markers in mouse oocytes**

Eliška Koutná, Šárka Prokešová, Kamar Ghaibour

*CULS - Czech University of Life Sciences Prague*

Keywords: Bisphenol, BPS, epigenetics, reproduction, endocrine disruptors

Endocrine disruptors represent a group of chemicals, that cause harm to, among others, physiological reproductive mechanisms in animals and humans. Lately, there was a big focus on adverse effects of bisphenol A and as a result, a lot of plastics are now BPA-free. Unfortunately, it has been replaced with bisphenol S that confers even better properties such as thermostability, and its effects on reproduction and development are not fully known yet. BPS is now present in great variety of things of everyday use and is able to negatively affect many physiological functions, including female reproduction and oocyte quality. The aim of this study is to evaluate an effects of BPS on viability markers in matured oocytes. Oocytes from mice treated for 7 days with four different BPS concentrations per os (0; 0,001; 0,1; 10; 100 ng/g body weight) were isolated, in vitro matured and subjected to immunocytochemistry with specific antibody against spindle  $\alpha$ -tubulin. Concurrently, TUNEL assay for DNA damage measurement was performed. The confocal scope with spinning disc (Olympus, Germany) was used for imaging and fluorescent signal was quantified and assessed (ImageJ, NIH). Our preliminary results of  $\alpha$ -tubulin formation and state of chromatin integrity in matured oocytes suggest strong damage of these structures in mice treated with BPS even in very low doses. The oocyte spindle was malformed up to 68,8% in total and TUNEL assay proved significantly higher DNA fragmentation associated with three BPS concentrations. Accordingly, there is strong expectation of abnormal histone modifications and higher DNA methylation that can lead to failed embryonic gene transcription and developmental defects. These results will help us to further understand the epigenetic phenomena of regulation of the meiotic maturation and embryonic development, and can as well help in maintaining the global human health and improving assisted reproduction technology.

**Global health - Humans, animals, plants and environment**

**Scientific Student Conference 2017**

**Euroleague for Life Sciences**

**Session 3: 18 November 2017 at 10.35-11.35**

**Poster session 3.1. Collaboration and Global Health**

**Collaboration: Enabling Innovation and Entrepreneurship**

**Global Health: Animals, Plants and Environment**

**Copenhagen Plant Science Centre, Foyer**



## **Internet – powerful but risky solution for farmers.**

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Keywords: E-commerce, agriculture, farmers, survey, buying

Nowadays farmers are still looking for new solutions, which allow for cutting profit in situation when the prize of crops are on the same level for a long time. Majority of actual solutions is connected with cutting costs: decreasing costs of fertilizing, decreasing costs of logistics or decreasing cost of labour are just few of them. Majority of them are very expensive investments in new equipment or proper infrastructure. Cutting costs, which is connected with creating groups of producers, direct buying and data sharing, is much less popular. In case when all simple methods of increasing profit are not longer effective, farmers should aim on more complicated ways of increasing the revenue and reducing costs. Unfortunately, farmers unwillingly use direct selling and modern tools connected with internet in aim of both increasing sales and profit. Survey based on 124 farmers provides the theory, that farmers willingly use internet, Facebook, social media or online shopping, especially in case of buying agriculture equipment. Aim of study was verification which is the biggest obstacle in buying products online or establishing most effective, new channels of sales. Surveys such like these are necessary in order to creating marketplace, which can be perfect solution both for agricultural producers and consumers because of cutting supply chain.

**Collaboration - Enabling innovation and entrepreneurship in life sciences**

# **Synthesis and characterization of metal-coordinated complex coacervates**

Mariska Brüls

*WUR - Wageningen University and Research Centre*

Keywords: Underwater adhesive, complex coacervation, metal coordination

Due to their high polarity, low surface tension and insolubility in water complex coacervates have the potential to be used as underwater adhesive. However, a mechanism is still needed to tune the stiffness of the coacervates. In this thesis, we studied the effect of metal-ligand coordination cross-links on the mechanical properties of complex coacervates. To this aim, we used an universal postfunctionalisation procedure to functionalise poly(acrylic acid) (PAA) and poly(2-(dimethylamino)ethyl methacrylate) (PDMAEMA) polyelectrolytes with terpyridine metal-ligands. This method enables the synthesis of various batches of copolymers with different degrees of functionalisation but which are equal in chain length and polydispersity. With the synthesised copolymers, we prepared complex coacervates reinforced by metal complex transient cross-links. With linear rheology we demonstrated that terpyridine-metal complexes can effectively slow down stress relaxation in complex coacervates. This occurs to an extent which is related to the bond lifetime. Due to the fast kinetics of Mn(II)-terpyridine complexes, they only slow down stress relaxation to a minor extent. On the other hand, Zn(II)-terpyridine complexes increase the stress relaxation time by roughly two orders of magnitude. For coacervates with Ni(II) complexes, we didn't observe any relaxation for all the analysed timescales. Furthermore, at low salt concentration (0.1M NaCl), the contribution of the metal-terpyridine complexes on the relaxation modes is only observable in the low frequency regime. When we increased the NaCl concentration, this contribution extends to higher frequencies as salt weakens complex coacervation. In conclusion, by variation of metal ion type and salt concentration the strength of the electrostatic interactions and metal coordination bonds can be tuned independently from each other.

Therefore, metal coordination crosslinks can effectively be used to study reinforcement of complex coacervates as they allow the generation of a broad range of viscoelastic responses.

**Collaboration - Enabling innovation and entrepreneurship in life sciences**

# **Near-infrared reflectance spectroscopy (NIRS) as a very useful tool in science – example of its application while investigating food efficiency of different ungulate species**

Stipan Čupić

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Keywords: Near-infrared Reflectance Spectroscopy, NIRS, Food Efficiency, Large Herbivores

In last few decades, we could witness a constant increase of European ungulates. The growth of ungulate population results in considerable environmental and socio-economic impacts. Availability and quality of food on which large ungulates are voluntarily feeding are among the main factors driving their population dynamics. It's long been known that the nutritional quality of food is among the main factors influencing reproduction success, survival, habitat selection or seasonal movements of large herbivores. Accordingly, for game managers, it is of primary importance to have detailed knowledge of food quality on which game is voluntarily feeding. However, such studies of nutritional aspects of food quality usually require a large number of samples and thus often become very expensive and time-consuming. Near-infrared reflectance spectroscopy (NIRS) is cost- and time-effective, environmentally friendly and accurate technique, which allows estimating the chemical composition of a large number of samples. The most commonly used nutritional indices of food quality for large herbivores are nitrogen, acid detergent fiber, and neutral detergent fiber. Another approach is to evaluate nutritional characteristics of feces that bear a relationship to the quality of ingested food. Studies about food efficiency can't be carried out directly in the wild with the same quality as it can be done with the animals in captivity. We need basic information about food efficiency from animals in captivity, so that knowledge we can later extrapolate with samples collected in the wild. The aim of the article is to explain how the NIRS works, to emphasize the usefulness of the technique and to promote it among biologists and researchers from other fields. Few examples of its usage while investigating food efficiency of the free-ranging ungulates (*Cervus elaphus*) and ungulates in captivity (*Cervus elaphus hispanicus*, *Gazella cuvieri*, *Gazella dama*, and *Gazella dorcas*) will be shown.

**Global health - Humans, animals, plants and environment**

## **Fertiliser derived from human urine: novel media for alkaline urine dehydration and perceptions of alternative sanitation systems**

Christopher Friedrich

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Keywords: Decentralised sanitation, Fertiliser, Drying, Source separation, Magnesium oxide

Each year, every person excretes approximately 4 kg of nitrogen, 0.3 kg of phosphorus and 1 kg of potassium through their urine. In conventional wastewater treatment, these nutrients are usually not reused for agricultural production, although they can enhance plant growth. Dehydration technologies decrease the volume of source-separated urine and increase its nutrient density, which facilitates the use of the product as fertiliser. This study investigates the suitability of different alkaline dehydration media to increase the concentration of nitrogen in the final fertiliser product by urease inhibition. A dehydration temperature of 50 °C was used to accelerate the dehydration process. Tested materials were biochar, wheat bran, Mojave Mars Simulant, Ca(OH)<sub>2</sub>, MgO and wood ash. The results of this research could have implications for future sanitation systems as well as on extra-terrestrial agriculture on Mars. The second part of the study evaluated the perception of urine diversion toilets before and after an informative presentation at Vellore Institute of Technology, India. Analysis of the results of the study were still ongoing at the time of printing of this book.

**Global health - Humans, animals, plants and environment**

# **An assessment of soil P extractability and plant P availability for resin-based and batch extraction methods**

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Keywords: Phosphorus, soil, batch extraction methods

Phosphorus is among the most important yield-limiting nutrients in plant production. Global economically mineable P stocks are limited, moreover, they are concentrated in only a few countries worldwide. Therefore, the efficient use of P resources, P recycling from waste materials, as well as economical fertilization practices have become a research focus. Diffusive gradients in thin films (DGT), a resin-based P sampling technique originally developed for aquatic chemistry, has been put forward as a soil P test capable of precise determination of the soil P fertilization need. Unlike conventional batch extraction soil tests, DGT operates based on P diffusion into a sampler, thereby mimicking the uptake process of plant roots.

The aim of this work is a detailed assessment of the effect of soil parameters on the amount of P measured by DGT, a comparison of DGT and conventional soil tests (water extractable P, Olsen P, calcium acetate-lactate P) and their correlation with P taken up by rye (*Secale cereale* L.). This work is carried out using a set of 41 arable soils from Austria, covering a wide range of P availability, carbonate content, soil pH and soil organic carbon content.

**Global health - Humans, animals, plants and environment**

# **Field water dynamics in integrated systems in the Brazilian Cerrado region**

Severin Hubner

*UHOH - University of Hohenheim*

Keywords: Evapotranspiration, micro-lysimeter, integrated systems, Brazilian savannah

Agroforestry systems were established as a viable option for Brazilian farmers in recent decades. Shading is expected to affect the system's microclimate and thus it is likely to alter water fluxes to the atmosphere via evapotranspiration. In this study we measured the evapotranspiration (ET) with simple micro-lysimeters of four different treatments as a proxy for different land use systems at EMBRAPA Beef Cattle, the Brazilian Agricultural Research Corporation, located in Campo Grande-MS, Brasil. The four treatments are: Integrated systems with rows of Eucalypt (*Eucalyptus urograndis*) trees (ICLF), integrated systems without Eucalypt trees (ICL), continuous pasture (CP) and native Cerrado (Savannah) vegetation. In the ICLF and ICL plots *Brachiaria brizantha* was planted and in the CP plots *Brachiaria decumbens*. Within the ICLF systems, measurements were conducted in three different distances to the tree rows. Results were linked to data from the microclimate, i.e. wind speed, air humidity, global radiation.

Preliminary results indicate an evaporation at CP which is generally 1mm higher than in the other systems. Differences between the averages of the ICL and ICLF systems aren't significant but ET tends to be higher in the ICL system. Within the ICLF systems the spots further from the tree rows showed lower rates of evaporation (1mm). Differences in ET between systems could not be determined due to different growth habits of the plants inside the lysimeters. Within the ICLF systems the lysimeters furthest away from the trees usually showed a lower rate of ET which an average gap of 3mm. The differences in ET and microclimate are probably a result of lower grass canopy densities close to the tree rows and on CP. These results improve our understanding how plant canopies of integrated systems affect the systems' water pathways and their response to varying water availability.

**Global health - Humans, animals, plants and environment**

# **Design and development of a living green wall for greywater treatment**

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Keywords: Green wall, greywater treatment, water reuse

Water scarcity today is one of the most probable scenarios for life on earth in the next century considering the rapid growth of our population and our water intensive global societies and economy. Water reuse instead of consumption and improvement of water usages is key. Living green walls treating municipal greywater aim to facilitate a removal of man-made pollution through a biotechnological approach similar to long proven constructed wetlands. However, these designs require less land by utilizing a vertical design instead. This approach opens opportunities for greener and more self-sustainable urban living spaces. The greywater treating green wall will be the external part of a newly developed building façade, consisting out of 70% recycled construction and demolition waste, modularly designed to achieve easy maintenance (EU project GreenInstruct). Three panels analyzing different types of water-flow are being tested, each of them containing a mix of marsh plants (*Achillea millefolium*, *Geranium palustre*, *Mentha aquatica*, *Typha minima*, *Carex acuta*) growing in a clay like substrate: channelized 90°, cascade-like with 1° slope, cascade-like with 5° ascent angle. The treatment efficiency per panel will be assessed. Depending on the retention time within the different systems, household size and house architecture, it is expected that a typical house with about 6 m height of usable façade will be able to remove pollutants to achieve a satisfying water quality considering EU or national regulations, in order to allow water reuse (i.e. irrigation, toilet flush, washing machine, etc.).

**Global health - Humans, animals, plants and environment**

## **Rehabilitation and treatment of bats. Case study.**

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*WULS-SGGW - Warsaw University of Life Sciences*

Keywords: Bats, rehabilitation, rearing

All bat species in Poland are under strict protection. Their treatment techniques, however, are still poorly developed. The purpose of presented work is to depict problems of bats' rehabilitation and rearing on a particular example.

A female Common noctule was found in the basement of the dorm and brought to a our students scientific association on 30th November 2015 in a bad condition. It was emaciated and dehydrated and later diagnosed with inflammation by the veterinarian. Prognoses were not promising. The female refused to eat and to take fluids. It had no strength to move and did not make any sound. The bat was treated with antibiotics, irrigation and dietary supplements which were included in the diet to provide the necessary nutrients. The animal's health condition was improving day by day. It was fed with mealworms and its body mass was gradually increasing until it reached 30 grams which is the upper limit for this species. During the rehabilitation time it had the possibility of movement activity. After some time it got used to people taking care of it and did not attempt to escape.

At the end of February 2016 the female gave birth to a cub. The whole pregnancy, delivery and cub's development proceeded without problems. Over time, attempts of the first flights of the young female and mother were made. Six weeks after the birth, both were able to fly avoiding obstacles with precision.

At the end of June, fecal and urinal tests as well as physical examination were made. The results were very good and both females were released into the wild.

The observations conducted during treatment and rehabilitation of Common noctule showed that helping wild animals requires professional knowledge in the field of nutrition and veterinary medicine as well as knowledge of the species.

**Global health - Humans, animals, plants and environment**



# **Shhh! They hear us: noise as the pollutant of aquatic ecosystems and its impact on fish**

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Keywords: Noise, pollution, water, fish, bioacoustics

Anthropogenic noise has an increasingly great impact on natural environment and is widely recognized as a pollutant. As the negative impact of noise on humans is known, there are laws regarding noise in urban areas. Although researches prove noise pollution negatively impact fish, there is a lack of noise regulations in the water. Fish are an important element of the ecosystems. Therefore, there is a clear need to take care of this issue. The aim of this study is to analyze the phenomenon of the water ecosystems' noise pollution, to link it with other problems of aquatic ecosystems and to identify the threats of noise exposure to fish. The review presents the methods of measuring noise levels in the water and indicates the ways of reducing it. Water bodies are not silent, sound travels through water 4 times faster than through the air. To understand what is the role of sound in fish's life, one should realize the water is not always transparent, sound can penetrate it to much bigger depths than light. Fish often have to rely more on hearing than its eyesight. Sewage pollution decreases water transparency, increasing importance of fish hearing. Thanks to hearing, fish can navigate, communicate, find food, avoid dangers and more. Noise negatively impacts those abilities. Noise – producing activities, like ship transport, are becoming more intense. Climate change also alters water soundscape. Hence, water noise can be an increasing danger to fish. The study calls attention to come up with more research on this topic, to create proper regulations and to minimize man – made noise not only for us, but also for fish. Their welfare means ours. Fish are sentient and important beings and deserve to live in healthy conditions just as we do – with a minimum exposure to anthropogenic noise pollution.

**Global health - Humans, animals, plants and environment**

## **The impact of chickens age on S9 fraction activity**

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Keywords: Chicken, age, liver, S9 fraction, metabolism

Systemic effects of xenobiotics depends largely on livers activity. Isolated liver microsomes and isolated liver S9 fractions are common experimental models to study liver metabolism. The use of 7-ethoxycoumarin O-deethylase (ECOD) test in chicken S9 fraction can be used to screen cytochrome P450 (P450) activity in hepatic tissue. Factors including diet, age, sex, pharmaceuticals and other xenobiotics are known to affect the intensity of liver biotransformation. However, data concerning their impact on avian species is very limited. Thus, the aim of this study was to evaluate the impact of chickens age on S9 fraction activity. The experiments were conducted on S9 fraction gained from chicken livers. The samples were divided into three groups: 15- (15d), 27- (27d) and 35-day old broilers (35d). Liver S9 fractions were obtained from the 9000 g supernatant of a liver homogenate. To screen P450 activity the S9 were incubated with 7-ethoxycoumarin for 30 minutes. The amount of generated product (7-hydroxycoumarin, 7-OHC) corresponded to the activity of ECOD and thereby P450.

The obtained results indicate that livers were proportionally large to the age of chickens and did not show any anatomopathological changes. In 15d broiler chicken the intensity of 7-OHC generation amounted to  $2841 \pm 960$  nmol/min/g of the liver tissue. In case of 27d and 35d chicken the production of 7-OHC was significantly smaller and came to  $23 \pm 12$  and  $38 \pm 37$  nmol/min/g of the liver tissue, respectively. Besides, the activity of ECOD varied largely within each age group.

Concluding, the study indicates that hepatic activity measured in ECOD test significantly decreases with age, which may affect the intensity of drugs metabolism. Consequently, the age of chickens should be taken into account while deciding on treatment protocol, as the eventual therapeutical effect might depend on age.

**Global health - Humans, animals, plants and environment**

## **Veturilo system in the urban transport of Warsaw as a source of creation healthy city**

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Keywords: Veturilo system, transport, environment, health, ecology

Veturilo bicycle system is a network of self-service cycle, open 7 days a week, 24 hours a day. This system operates in Poland since 2012. Since then, we will notice a number of favorable changes have taken place in Warsaw. Quality and standard of living residents has been raised by wide access to well adapted and publicly available bicycle infrastructure. The city's investments in this type of communication have grown considerably. The structure of urban bicycles is developing very dynamically and adapts to the prevailing trends and needs of residents. Creating a healthy city influenced the active lifestyle of the inhabitants of Warsaw, who started getting more and more interested in this kind of communication.

The effects of the automotive industry are felt especially in urban areas. The streets are congested and parking space is limited, the car ceases to be an effective means of transport. Bicycle for short distances is much more efficient. We all know that motor vehicles emit flue gases that contribute to the greenhouse effect and pollute the environment. The veturilo system is a good alternative to road transport contributes to lower emissions and noise levels so the bicycle network improves the quality of the environment and retains the natural beauty. Moreover, integration of various transportation systems greatly reduces travel time. It has a wide impact on residents satisfaction.

Warsaw will be perceived as a modern city, which cares about the environment. This is important for the further development of a sustainable city.

In our study, we presents the genesis of the development of the Veturilo network in Warsaw, availability and localization. The work aims to examine the amount of pollution and noise and the impact of urban bicycles on the development of the city's communications network.

**Global health - Humans, animals, plants and environment**

**Scientific Student Conference 2017**

**Euroleague for Life Sciences**

**Session 3: 18 November 2017 at 10.35-11.35**

**Poster session 3.2. Global Health: Plants, Environment and Production**

**Copenhagen Plant Science Centre, auditorium**

# **Geochemistry of major and trace elements in the volcanic soils of the Galápagos Islands**

Tamara Dinter

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Keywords: Volcanic soils, soil formation, weathering, major elements, trace elements

The Galápagos Islands have been of interest to natural scientists since the time of Charles Darwin. Although the flora, fauna and geology have long been studied, soils have become a subject of investigation only recently and literature on this topic remains scarce. In addition to their famous populations of plant and animal life, the islands are home to over 25,000 people, and each inhabited island has designated areas for agricultural use. In this project, 130 soil samples from the agricultural zones of four islands were examined to determine the concentration of major (Al, Ca, Fe, K, Mg, Mn, Na, P) and trace (V, Cr, Co, Ni, Cu, Zn, Cd, Tl, Pb) elements.

An Aqua Regia acid digestion was carried out, with major element concentrations determined by inductively coupled plasma optical emission spectrometry (ICP-OES) and trace element concentrations by inductively coupled plasma mass spectrometry (ICP-MS). The resulting data will be examined to determine the soils' degree of chemical evolution using weathering indices. Then, correlation matrices will be calculated with respect to elevation, pH and other soil parameters. Finally, the differences in element concentrations between the islands will be examined to give an indication of soil formation processes over time, as the ages of the islands differ markedly. Knowledge of the chemical composition of Galápagos soils and associated weathering processes will assist in evaluating soil fertility and development. From this basis further research may be done on the impacts of soil composition and weathering-induced changes on agricultural activity in the Galápagos Islands.

**Global health - Humans, animals, plants and environment**

# **Integration of *Fusarium*-resistance into durum wheat**

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Keywords: Plant diseases, fusarium head blight

Wheat is considered a staple food all around the world. However, like all predominantly grown crops, it is susceptible to many pathogens – amongst them the fungi of the *Fusarium* species. As a matter of fact, fusarium head blight is one of the leading diseases in wheat crops. Not only does a *Fusarium* spp. infection significantly reduce yields, it also produces so-called mycotoxins, such as deoxynivalenol, which are actively harmful to most organisms consuming infected grains. A decent amount of resistances to fusarium head blight has been located in common wheat. However, durum wheat, which is used for a significant quantity of pasta and similar products, remains susceptible to the disease.

The goal of this work is to evaluate whether crossing durum wheat with resistant varieties of common wheat, as well as cultivated and wild emmer wheat, improves its disease resistance. The trial is conducted by artificially infecting 750 lines, generated from various crossings, by spraying them with *Fusarium culmorum* solution and mist-irrigating the field to ensure a significant level of infection. The rating of the lines, regarding the level of fusarium head blight infection, follows. Other parameters, such as plant height, lodging, establishment of the row and brittle rachis are also recorded. As expected, the single lines show significant variability in symptom occurrence due to their differing heritage. While the taller genotypes generally suffer from less severe infection, they have an undesirable tendency to lodge. However, shorter genotypes with a higher resistance to fusarium head blight could also be detected. Other additionally recorded parameters, such as rachis brittleness, need to be considered to decide whether any lines are suitable for further crossing into more economically sound durum wheat varieties.

**Global health - Humans, animals, plants and environment**

# **Screening for mycotoxin resistance candidate genes at the Fhb1 QTL using a mutant wheat population**

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Keywords: Fusarium head blight, Fusarium graminearum, Fhb1, deoxynivalenol

Fusarium head blight (FHB) is a devastating fungal disease affecting bread wheat and other small grain cereals worldwide. It is mainly caused by *Fusarium graminearum* and leads to severe losses in both yield and quality. In addition, the fungus can produce mycotoxins such as deoxynivalenol (DON) and other trichothecenes. Mycotoxin contamination of grain poses a global hazard to food and feed safety. FHB resistance is a quantitative trait with Fhb1 being the most prominent QTL. Fhb1 is located on the wheat chromosome 3BS and contributes about 25% to overall FHB resistance. The resistance mechanism to fungal spread could be resolved by the identification of a pore-forming toxin like gene. DON resistance is linked to the formation of the nontoxic DON-3-o-glycoside; however, the gene mediating DON resistance is still unknown. In previous studies the Fhb1 locus could be fine-mapped to a 860 kb sequence comprising 28 genes. The aim of this master thesis is to identify DON resistance genes. In a field experiment 1600 mutant lines of the highly resistant line CM-82036 were each infiltrated with DON solution at anthesis. The DON resistance level was evaluated 26 days after the treatment and susceptible mutants were sequenced for the candidate genes in the Fhb1 QTL interval to identify common mutations in the DON sensitive mutants. Furthermore, the susceptible mutant lines detected in the field were re-evaluated in the greenhouse by *Fusarium* inoculation and DON infiltration.

**Global health - Humans, animals, plants and environment**

## **Occurrence of the pathogen *Larssoniella duplicati* in the indigenous and new outbreak areas of *Ips duplicatus* in the Europe**

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Keywords: Double – spined spruce bark beetle, invasive species, microsporidia, *Larssoniella duplicati*, pheromone traps

Research was focused on pathogen specific for the double-spined spruce bark beetle *Ips duplicatus* (Coleoptera, Curculionidae, Scolytinae), that causes damage of spruce stands in northern and now even the middle Europe. Due to climate change this bark beetle is spreading to southern areas as invasive species. In this research there was collected material from 21 localities of four countries in Europe according to the spreading process of double-spined spruce bark beetle. The microsporidium, *Larssoniella duplicati*, that infects the midgut muscularis, the Malpighian tubules, and sometimes the ovaries of adult *Ips duplicatus*, was detected at localities in Sweden, Poland, Czech Republic and Romania and the data were analysed in the lab and compared. Average infection level of this pathogen was 16 % for all four countries together. The difference among average infection levels among groups of localities from these countries was not high so the results were not statistically significant. The infection level of *L. duplicati* did not differ between males and females too. The relatively stable infection of *L. duplicati* suggest, that the pathogen is chronic. And it is not likely to be suitable for use in biological pest control of *Ips duplicatus*. There were detected other pathogens of bark beetles. The infestation of nematodes and very low infestation of *Chytridiopsis typographi* were found and both pathogenic organisms were compared among countries too.

**Global health - Humans, animals, plants and environment**



## **Evaluation of knotweed glyphosate control effectiveness**

Martina Kadlecová

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Keywords: Alien plants, eradication, herbicide (Roundup), knotweed, vegetative reproduction

Current knowledge shows that invasive alien plants can cause local or complete extinction of domestic, often valuable, endemic species. The presented work deals with invasive taxons of the genus *Fallopia* (knotweed), which spread in the Czech Republic uncontrollably despite of nature conservation management. Their high regeneration ability from the rhizome systems and production of extremely high amount of biomass is one of the main reasons of their spreading success. Spraying by systemic herbicide – glyphosate is used as the most effective control method. Within this study, series of field and garden experiments were carried out to evaluate the effectiveness of spraying in different periods of vegetation season and also application to different physiological stages of plants. The main aim was to find how the herbicide spraying influence the following regeneration from rhizomes and to compare the reaction among parental taxa and their hybrid. All three invasive taxons from the genus were used for the study: *Fallopia japonica* var. *japonica* (Japanese knotweed), *Fallopia sachalinensis* (giant knotweed) and a hybrid *Fallopia ×bohemica* (Bohemian knotweed). Main results show strong differences in several aspects of control among taxa and also in reaction to spraying in spring/summer and autumn. The autumn application has stronger effect on above ground biomass but regeneration from rhizome buds was affected less. The selected herbicide concentration affects the rate of regeneration from rhizomes too. All studied taxa regenerate less after spraying by 8% herbicide concentration than by 5%.

**Global health - Humans, animals, plants and environment**

# **Taxonomic revision of the genus *Gracula* in the island of Sumatra and the southwest located islands**

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Keywords: Common Hill Myna, Sumatra, Morphometrics

Hill Mynas (*Gracula*) have a wide distribution range covering all of Southeast Asia. They became a popular cage bird due to their ability to mimic human speech. Massive demand had a tragic impact on the wild populations of Hill Mynas throughout their range. Since the first description of the species there have been significant discrepancies in the classification. Continuous pressure on the wild populations caused an urgent need of conservation attention in many places, which was hindered by taxonomical uncertainties. Decades of specialists' disagreements caused crossbreeding of mynas from different areas and thus disappearance of their typical characteristics. The only possible way for taxonomic revision has become a field research. This research was focused on the taxonomic revision of the Common Hill Myna – *Gracula religiosa* in Sumatra and its nearby islands, where the highest diversity of the genus' taxa occurs. The aim was to evaluate the current situation of the wild populations and to collect the largest possible set of morphometric and genetic information. The analyses uncovered that studied taxa are all clearly distinguishable. Taxon *miotera* from the island of Simeulue, often overlooked in literature, showed the largest differences as well as taxon *robusta* from Nias. If taxon *robusta* is recognised a full species, *miotera* should be upgraded to a species level as well. Mynas from the additional two locations show differences too and are both clearly distinguishable from the others. A surviving population of the Nias Hill Myna – *Gracula (r.) robusta*, last recorded by scientists in 1939 was found during this research as well as acoustic evidence of taxon *miotera* from Simeulue which was also identified as possibly extinct.

**Global health - Humans, animals, plants and environment**

## **In vitro selection for *Fusarium oxysporum f. sp. conglutinans* resistance in Brassica vegetables**

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Keywords: *Fusarium*, Brassica, cultivar, *in vitro* mutagenesis

Development of *Fusarium* resistance in six cultivars of *Brassica oleracea* var. *capitata* plants by *in vitro* chemical mutagenesis and selection, through direct and indirect organogenesis was examined. 6-day and 10-day old hypocotyl, shoot-tip explants excised from *in vitro* germinated seedlings and calli from 6-day old hypocotyl explants on MS medium, supplemented with NAA (0.2 mg/L), BAP (3 mg/L) and AgNO<sub>3</sub> (0.5 mg/L), were subjected to chemical mutagenesis treatment (DMSO (4% v/v) and EMS (0.3% v/v), for two hours at 28±2°C). Shoots developed directly from hypocotyl and shoot tip explants (in the MS medium supplemented with NAA (0.2 mg/L), BAP (3 mg/L), GA<sub>3</sub> (0.01 mg/L), AgNO<sub>3</sub> (0.5 mg/L) for shoot induction and NAA (0.2 mg/L), BAP (3 mg/L), GA<sub>3</sub> (0.01 mg/L) for development) after mutagenesis treatment and calli following mutagenesis treatment were screened for *Fusarium* resistance using *Fusarium* culture filtrate with 15% and 20% v/v selection strength for 30 and 60 days of selection periods for each strength respectively.

All six cultivars tested, developed plantlets carrying *Fusarium* resistance with different frequencies of resistance mutation induction ranging between 12.5% to 84.0 % from hypocotyl and 0.0% to 86.7% from shoot tip explants among cultivars by *in vitro* chemical mutagenesis. Furthermore, study results indicated direct organogenesis, and 10-day old hypocotyls and 6-day old shoot-tips are potential explants for *in vitro* chemical mutagenesis of *B. oleracea* var. *capitata* for *in vitro* *Fusarium* resistance screening.

**Global health - Humans, animals, plants and environment**

## **Inverse analysis of simulated infiltration with selected metaheuristics**

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Keywords: Infiltration, population-based metaheuristics, inverse analysis, preferential flow

Understanding water movement through soil is vital for agriculture, environmental science and many engineering applications. Inverse analysis is often used to identify the properties of the soil. To describe the properties of soil, parameter identification is required. In this contribution novel population-based metaheuristic optimization algorithms were tested for parameter identification on several simulated infiltration scenarios and common CEC benchmark functions from the 2013 special session on real parameter optimization. The infiltration scenarios were created using both uni-modal and dual permeability models implemented in the open-source objective library DRUtES written in FORTRAN 2003/2008. The dual permeability model is particularly interesting as it can simulate preferential flow. For parameter identification we use modified particle swarm optimization (PSO) and Teaching-learning-based optimization (TLBO). These are population-based search algorithms that don't require gradient information or a convex search space. Modifications included a shuffling mechanism and a new bad neighborhood approach utilizing information of the results from the previous iteration in updating the position of the population. Reinitializing part of the population was also studied.

We conclude that especially for higher dimensional problems reinitialization can be a powerful tool in finding better solutions. We also conclude that the performance of the algorithms on generic CEC benchmark functions is not necessarily similar to the performance of the algorithms on the infiltration scenarios. It is therefore advisable to test algorithms on artificial problems similar to real-world problems in order to select the most appropriate algorithm.

**Global health - Humans, animals, plants and environment**

# **Effects of organic soil management and root herbivory on pollinator visitation rate and seed production in *Sinapis alba***

Martina Gorla

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Keywords: Plant-pollinator interactions, soil management, root herbivory, *Sinapis alba*, plant growth, flower visitation, seed production

Insect pollination is important for the agricultural production of most of the crop species, but agricultural intensification has become a major threat to pollinators, thereby indirectly jeopardising crop production. So far, most research on pollination was focused on landscape processes. However, less is known about the effects of soil management and belowground organisms on pollinator visitation and consequently, seed production.

Here, separate and combined effects of organic soil management and root herbivory on pollinator visitation rate and seed production were tested in a factorial field experiment using potted mustard, *Sinapis alba*.

Soil organic management and underground herbivory positively affected total number of pollinator visits, but not the duration of insect visits. Plant traits (height, total number of flowers, stem and root biomass) were not affected by the treatments. The higher pollinator visitation rate, however, did not result in a higher seed production in plants grown in organic soils and attacked by root herbivores.

These results suggest that root herbivory can alter flower attractiveness to pollinators and demonstrate the plant's ability to compensate for root damage.

The present study consolidates the current knowledge on the influence of organic soil management in plant-mediated aboveground-belowground interactions and might have important implications for the design and planning of soil management strategies, able to both optimise crop pollination and maximise crop production.

**Food - Quality, production and safety**

## **How every farmer can optimize fertilization using Excel and evolution algorithms**

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Keywords: Logistic, optimization, fertilization, evolution algorithms, agriculture

Fertilization is one of the most important cost positions in every farm. In the presented case, the cost of fertilizers are up 24%. Every farmer should strive to reduce the doses of fertilization by increasing the precision of fertilization, not only for economic reasons but also because of environmental concerns. The aim is creating an app, which can be used by every farmer. Each kilogram of incorrectly applied fertilizer is a waste of money for the farmer and the loss to the environment associated with eutrophication of water and energy resources worn in process of production nitrogen fertilizers. Mistakes associated with fertilization lead at the tested farm to incorrect application of several tonnes of nitrogenous fertilizers and the loss of several thousand PLN annually. There are many solutions to record tillage operations on the fields, but most of them cannot easily export data from one application to another. There is also a lack of well-known solution that would allow to prepare a precise plan of fertilization with estimated dates and assigning fields to a particular fertilizer spreader. Discussed application uses the Solver add connected with Excel. This addition allows to use basic neural network algorithms in an easy and fast way. The application uses the methodology of the critical path analysis and evolution algorithms methodology. This application allows for the establishing such a timetable of tasks related to fertilization, which minimizes travel time between fields and the risk of occurring mistakes.

**Global health - Humans, animals, plants and environment**

**Recovery of forest soil microbial activity after multiyear drought and heavy rainfall events simulations**

Flavia Gonzalez Escolano

*UHOH - University of Hohenheim*

ELLS Excellent MSc thesis prize winner – no abstract.

Read more about the ELLS Prize for Excellent Master Thesis in the end of the Book of Abstracts.

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The ELLS Prize honours excellent Master theses in the area of life sciences written in English language. Eligible are students of ELLS universities who actively participated in ELLS study exchange programmes. Students of the University of Hohenheim must have acquired 18 ECTS of their MSc programme at other ELLS universities. Students of other ELLS universities must have acquired 18 ECTS of their MSc programme at the University of Hohenheim. Students of the ELLS Double Degree Programmes EnvEuro and EUR-Organic choosing University of Hohenheim as home or host university are also eligible for the ELLS Prize.

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**Title of thesis:** Recovery of forest soil microbial activity after multiyear drought and heavy rainfall events simulations

**Fionn Murphy - UHOH and SCIENCE**

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**Agnes Krettek - UHOH and SLU**

**Title of thesis:** Identification of new emerging pollutants in surface water using suspect screening analysis and prioritisation strategies based on regulatory databases

**Karola Bause - UHOH and WUR**

**Title of thesis:** Studies into inter- and intramolecular co-pigmentation of acylated and non-acylated cyanidin-based anthocyanins and its impact on color and thermal stability



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