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SLOVAK UNIVERSITY OF AGRICULTURE IN NITRA

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BOOK OF ABSTRACTS

Slovak University of Agriculture in Nitra

FACULTY OF AGROBIOLOGY AND FOOD RESOURCES

FACULTY OF BIOTECHNOLOGY AND FOOD SCIENCES

FACULTY OF HORTICULTURE AND LANDSCAPE ENGINEERING

**Scientific Conference of PhD Students
of FAFR, FBFS and FHLE SUA in Nitra
with international participation**

-

Proceedings of abstracts



**on occasion of the Science and Technology Week
in the Slovak Republic**



**10th November 2022
Nitra, Slovak Republic**

**Scientific Conference of PhD Students of FAFR, FBFS and FHLE SUA in Nitra
- Proceedings of abstracts**

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Preface

Traditionally, art and science are treated as two separate disciplines, but it's clear that one has impact on the other. Science can be defined as a combination of art with logical thinking and creativity. Art is something that is created with imagination and skill and that is beautiful or that expresses important ideas or feelings. **Agriculture is the combination of art and science.** It combines the creativity, imagination, and skills involved in planting crops and raising animals with modern production methods and new technologies. Even Andy Warhol, famous American pop artist with Slovak roots, expressed the idea *"I think having land and not ruining it is the most beautiful art that anybody could ever want."*

To make scientific breakthroughs requires a great deal of creativity, and art is often an expression of scientific knowledge or its product.

The main aim of the Scientific conference was to provide a platform for expression and sharing of scientific knowledge of PhD students by presenting of research findings and exchange of expertise and experiences. Abstracts in this proceeding were split among the eight areas covered by conference:

- Biotechnology
- Animal production
- Applied and molecular biology
- Nutrition
- Multifunctional agriculture, environment, landscape architecture and rural development
- Plant production
- Technology, quality and safety of raw materials and foodstuffs of animal origin
- Technology, quality and safety of raw materials and foodstuffs of plant origin

The Scientific Conference of PhD Students was organised at the Slovak University of Agriculture in Nitra on occasion of the Science and Technology Week in the Slovak Republic under the auspices of doc. Ing. *Peter Ondrišík*, PhD. – dean of the Faculty of Agrobiological Sciences and Food Resources (FAFR), prof. Ing. *Norbert Lukáč*, PhD. – dean of the Faculty of Biotechnology and Food Sciences (FBFS) and prof. Ing. *Dušan Igaz*, PhD. – dean of Faculty of Horticulture and Landscape Engineering (FHLE).

We believe that the Conference has encouraged the further advancement through fruitful discussions among students and other participants; and that the scientific programme has contributed to increasing the knowledge, improving the future work, and building new friendships between PhD students from different countries and from the broader spectrum of biological sciences.

doc. Ing. Peter Ondrišík, PhD.
Dean of FAFR

prof. Ing. Norbert Lukáč, PhD.
Dean of FBFS

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SECTION

Biotechnology

***In vitro* effects of gallic acid on human ovarian granulosa cells**

Olha BALYTSKA, Michal MIHAL, Simona BALDOVSKÁ, Ladislav KOHÚT, Adriana
KOLESÁROVÁ

Supervisor: prof. Ing. Adriana Kolesárová, PhD.

Tannins, including gallotannins, are a complex of high molecular weight natural polyphenolic compounds. Tannins are common in representatives of water plants, fungi, lichens, plaunas and ferns. They are found in many higher plants, especially dicotyledons. Recently, gallotannins have attracted interest because of their potent antioxidant abilities, which are connected to their anticancer, immunomodulatory, and antiviral activity. The hypotensive and anti-inflammatory effects of gallotannins on the human body have also been proven. The aim was to study the *in vitro* effect of gallic acid at the concentrations of 1, 5, 10, 25 and 50 $\mu\text{mol/mL}$ for 24 hours on human ovarian granulosa cell lines: HGL5 cells and COV434 tumour cells. To determine cell viability AlamarBlue™ assay was performed. The secretion of transforming growth factor $\beta 2$ (TGF- $\beta 2$) and the presence of its receptor (TGF- $\beta 2\text{R}$) in HGL5 cells and COV434 tumour cells were analyzed by ELISA (Enzyme-linked immunosorbent assay). The results from our *in vitro* experiments showed that gallic acid significantly reduced the number of viable HGL5 cells at a concentration of 50 $\mu\text{mol/mL}$ ($P \leq 0.01$) compared to the control group. At the same time, there was a significant decrease in the viability of COV434 tumour cells at the concentrations of 25 $\mu\text{mol/mL}$ ($P \leq 0.01$) and 50 $\mu\text{mol/mL}$ ($P \leq 0.0001$) compared to the control. According to our results, gallic acid affected neither TGF- $\beta 2$ production, nor the presence of TGF- $\beta 2\text{R}$ receptor in HGL5 cells. In the case of COV434 tumour cells, we observed a significant decrease in the TGF- $\beta 2$ production after treatment of gallic acid at the 50 $\mu\text{mol/mL}$ concentration ($P \leq 0.05$), but with no impact on the presence of TGF- $\beta 2\text{R}$ receptor. To conclude, our results showed a dose-dependent modulatory effect of the studied gallic acid on the viability and the mechanism of intracellular communication mediated by TGF- β signalling in ovarian tumour cells in *in vitro* conditions, suggesting their promising antitumor potential. However, further research is needed to confirm the hypothesis and ascertain the effect's action.

Keywords: *gallic acid, ovarian cells, viability, growth factor, cancer*

Acknowledgement: The work was realized thanks to the financial support of the projects of the Ministry of Education, Science, Research and Sport of the Slovak Republic APVV-18-0312, DS-FR-19-0049, VEGA 1/0266/20 and KEGA 033SPU-4/202, as well as thanks to the support within the Operational Program Integrated Infrastructure for the project: demand-oriented research for sustainable and innovative food, Drive4SIFood 313011V336, co-financed by the European Regional Development Fund

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Antifungal activity of *Mentha citrata* essential oil against selected *Penicillium* fungi tested in both *in vitro* and the vapor phase conditions

Veronika VALKOVÁ, Hana ĎÚRANOVÁ, Lucia GALOVIČOVÁ, Miroslava KAČÁNIOVÁ

Supervisor: prof. Ing. Miroslava Kačániová, PhD.

The protection of root vegetables against storage pathogens is a major concern for the farmers and the food industry. Therefore, the present study assessed the antioxidant and antifungal activities (*in vitro* and *in situ*) of *Mentha citrata* essential oil (MEO) against the growth of three strains of *Penicillium* (*P. expansum*, *P. citrinum*, *P. crustosum*) inoculated on carrots. For this purpose, increasing EOs concentrations 62.5 µL/L, 125 µL/L, 250 µL/L and 500 µL/L were applied in our experiment. Firstly, the antioxidant activity (AA) of MEO was determined using the 2,2-diphenyl-1-picrylhydrazyl (DPPH) radical scavenging assay. After that, to evaluate the suitability of a carrot sample as a substrate for fungal growth, its moisture content (MC) and water activity (a_w) were also analyzed. The antifungal activity of the oil was evaluated using the agar disc diffusion method (*in vitro*) and vapor contact method (*in situ*). To determine the *in situ* fungal growth, stereological methods were employed. From our results, it is clearly evident that our EO exhibited a weak antioxidant activity ($24.5 \pm 0.2\%$). Furthermore, MC and a_w of the carrot substrate were estimated to be $81.30 \pm 2.23\%$ and 0.958 ± 0.001 , respectively, demonstrating the suitability of the food model for fungal spoilage. The strongest *in vitro* antifungal activity was displayed by MEO in the highest concentration (500 µL/L) used against all *Penicillium* strains, which inhibition zones ranged from 12.00 ± 1.73 mm (*P. expansum*) to 15.67 ± 0.58 mm (*P. crustosum*). *In situ* analysis showed complete suppression of the growth of all *Penicillium* strains in all concentrations used. Our findings suggest that MEO, as a promising natural antifungal agent, can be employed in the innovative packaging of vegetables including carrots.

Keywords: *mint essential oil, chemical composition, antioxidant activity, antifungal properties, carrot*

Acknowledgement: This research was funded by the grant APVV-20-0058 “The potential of the essential oils from aromatic plants for medical use and food preservation”.

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SECTION

Animal Production

The beef quality of imported French Charolais and Aubrac breeds raised with the same conditions

Jaroslav DÓBI, Klára VAVRIŠÍNOVÁ

Supervisor: doc. Ing. Klára Vavrišínová, CSc.

Consumption of meat has accompanied people since the animal domestication, and beef is considered one of the most biologically valuable meats. Specialized beef breeds only began to become more widespread in Slovakia after 1990. Mostly imported were French intensively breeding beef breeds. The management of beef cattle is based mainly on the use of grazing pastures, which in our conditions are concentrated mainly in the foothills and mountain areas. However, even typical grazing areas are currently affected by extreme weather swings that is why the Aubrac breed have been imported into our country. This beef breed was originally breeding in areas with an altitude of 1200 m, which were characterized by extreme weather swings, creating very modest and hardy cattle breed. The aim of the work was to compare the meat quality the one of the most productive beef breeds – Charolais (10 head) and the rustic Aubrac (7 head) beef breed, raised in the foothills of the Štiavnické vrchy. The bulls were evaluated from the same year of birth, reared until weaning from milk feeding from their mothers on pasture and after weaning intensively fattened in the stall. We found not any differences in the classification of carcasses according to conformation (classification U) or fat cover (classification 2) in these two groups. We found minimal differences in carcass yield (56.11 and 56.17 %, respectively). There found not differences between breeds in pH values 24 h after slaughter or after 7 and 10 days of maturation, respectively, and the values showed no deviations from normal beef. Beef lightness (L^* value) 7 and 10 days after slaughter was higher (42.66 and 43.64 vs. 40.02 and 41.93) in the Charolais breed. The a^* (redness) and b^* (yellowness) values at 7 days maturation were lower in the Aubrac breed (12.97 and 8.39 vs. 14.77 and 12.03). These differences were not statistically significant. Statistically significant ($P < 0.05$) of IMF content was higher in the Charolais breed (1.85 vs. 1.52). We discovered very small differences (not statistically significant), but higher in favor of the Aubrac breed were found in the content of MUFA, 3-omega fatty acids, DHA, EPA. We didn't find the Differences between PUFA and SFA. The first evaluated results show, that in addition to the Charolais breed, which has been breeding in Slovakia for a long time, the Aubrac breed is also able to achieve very good results in our conditions and is comparable to intensively beef breeds in terms of meat quality.

Keywords: *Charolais breed, Aubrac breed, SEUROP classification, carcass value, beef quality*

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SECTION

Applied and molecular biology

A new approach to anti-osteoporotic drug testing

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Supervisor: Mgr. Věra Sovková Ph.D.

In medicine, biology, and related fields, *in vitro* testing is a base for understanding the cells' behaviour and response to the environment. The development of a model for a certain type of cells or tissues with repeatable results is important for global scientific progress. In this project, we focus on the model for bone-resorbing cells – osteoclasts (OCs). OCs are cells with origin in the hematopoietic lineage. In the accurate environment, with specific growth factors (GFs), monocytes/macrophages fuse into the huge multinuclear cells, OCs. One of their typical features is an actin ring, necessary to form a sealing zone for the attachment to the bone and formation of the acid environment. To the main characteristic further belongs their ability to resorb the bone through an enzyme cathepsin K (CTSK). In the treatment of pathological bone resorption, one of the approaches is the inhibition of CTSK. Odanacatib (ODA) is a drug which decreases bone resorption by CTSK inhibition. In the first part of the project, we verified the ability of the THP-1 monocyte cell line to differentiate into OCs. In this case, we incubated THP-1 cells with different concentrations of phorbol 12-myristate 13-acetate (PMA), namely 0, 5, 50, and 100 nM. We added PMA, a substance allowing cell adhesion, to the medium while cells were seeded. To induce cell differentiation, after 24, 48, or 72 hours of PMA adhesion, the medium was changed, and GFs (MCS-F, RANKL) were added. The attachment of the cells was observed by a light microscope, metabolic activity was measured on days 12, 14, and 16 (D12, D14, D16) with the MTS assay, and the presence of the actin ring was visualized by Phalloidin staining on D16. Metabolic activity of the THP-1 cells have shown a very similar trend throughout all experimental days. Cells with no PMA after 24 h have significantly higher metabolic activity ($P < 0.5$) than other experimental groups on D12. Metabolic activity of cells incubated with 100 and 50 nM PMA for either 48 and 72 hours reached one-third of metabolic activity of the cells with 5 or 0 nM PMA on each experimental day. The actin ring was visible with 100 nM PMA and 72 hours of adhesion. Non-adhesive cells continued to grow which increased their metabolic activity. However, the cells with a proper amount of PMA adhered and with GFs started to differentiate, thus the metabolic activity was lower. For further experiments, the results from light, fluorescence microscopy and MTS assay led us to choose 100 nM of PMA for THP-1 cell adhesion for 72 hours. To test the effectivity of ODA inhibition of CTSK, we set up an experiment where 3 different concentrations, low (L), medium (M), and high (H) of ODA and no ODA (C) were added to culture media after the first OCs were visible (D0). To evaluate the cell metabolic activity we used MTS, for cell proliferation we measured the amount of dsDNA by PicoGreen assay kit and for evaluation of CTSK activity, we used fluorogenic substrate Z-LR-AMC on D1, D2, D3, and D7. Results from ODA testing showed that this osteoporotic drug did not affect cell viability or proliferation during the experiment. The most effective inhibition was found on D3 with H, when the activity was significantly lower ($P < 0.5$) than L, M, and C, with a similar trend on D7. In conclusion, we verified the possibility of using THP-1 as an osteoclastic model. This model could differ from primary cells and needs to be widely tested. Once optimized, this model could become a promising approach for testing anti-osteoporotic drugs and investigating possible positive or negative drug effects.

Keywords: *osteoclast, in vitro model, Odanacatib, THP-1*

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SECTION

Nutrition

Concentrations of elements in goat milk from organic and conventional farm

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Milk and dairy products are an important part of the human diet for numerous reasons such as easy accessibility and high biological value. Each type of milk contains the same components, but their amount varies. Caprine milk is higher in the content of elements such as K, Ca, Se, Zn and Cu in comparison with cow milk. Nowadays, consumption of goat milk and goat dairy products increases because of better digestion and its therapeutic value. However, due to environmental pollution, goat milk can contain heavy metals and trace elements as well which can harm human health. Therefore, it is important to monitor the level of trace elements in milk and dairy products which are a major source of nutrition as mentioned. The aim of the study was to determine the content of essential and toxic elements in samples of goat milk and dairy products collected from two farms in Slovakia, both from region with potentially undisturbed area but with different type of farming and compare their levels between ecological and conventional farm. The content of 22 elements (Ag, Al, As, Ba, Ca, Cd, Co, Cr, Cu, Fe, K, Li, Mg, Mn, Mo, Na, Ni, Pb, Sb, Se, Sr, Zn) in sixty-nine samples of goat milk, whey, three types of cheese, and yogurt from the ecological farm in region Orava and conventional farm in region Stredné Považie in Slovakia was measured in this study. Analysis of the elements was determined using an inductively coupled plasma-optical emission spectrometer with axial plasma configuration and with auto-sampler SPS-3. Goat milk and goat dairy products from selected farms are rich on content of essential elements. The highest concentration of four elements Ca, K, Mg, and Na in samples of goat products was found. Concentrations of analyzed major and minor minerals in analyzed samples were proportionally increased with the corresponding density of prepared milk products. The highest content of calcium was found in hard ripening cheese, however the highest content of strontium as well. Frequent regular consumption of this cheese for children is not recommended. Toxic elements were present in trace amounts or under the limit of detection. Elements Ag, As, Cd, Co, Cr, Mo, Ni, and Pb were not detected in any sample. The occurrence of Ba, Cu, Mn, and Sr was found only in the ecological farm while Sb was detected only in samples from conventional farm. Aluminum was found only in one sample of whey from a conventional farm, in one sample of soft ripening cheese, and in one sample from fresh lump cheese. According to our results, there is no huge difference among products from ecological or conventional way of farming. In our study, significant statistical differences ($P < 0.05$) were found only in levels of K, Ca, Li and Na when comparing milk samples from organic and conventional farm. Concentrations of K (1260.496 mg/kg), Li (0.018 mg/kg) and Na (293.459 mg/kg) were higher in samples from ecological farm, while concentration of Ca (1344.651 mg/kg) was higher in samples from conventional farm. No significant differences between samples of goat whey from both farms were found. The consumption of goat milk and goat dairy products from monitored farms can be consider as safe and beneficial for human health regardless of the way of farming.

Keywords: *goat milk, dairy product, essential elements, toxic elements, way of farming Slovakia*

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Health benefits of products containing bioactive substances in a selected group of obese women

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The consumption of berry fruit, as well as products from them, can be considered important in the prevention of cardiovascular diseases. Studies point to the fact that their regular consumption can improve the lipid profile in human plasma and thus lead to an improvement in health status and a reduction in the occurrence of associated diseases. The aim of the work was to find out the health benefits of consuming 100% blueberry products (juice and fiber) as sources of biologically active and health-promoting substances for selected biochemical parameters in a selected group of obese women. We observed a group of 22 women with BMI (Body Mass Index) ≥ 30 kg/m² and with an average age of 57 ± 4 years. One group of probands (n=11) consumed daily 125 mL of BIO 100% blueberry juice and the other group of probands (n=11) consumed daily 10 g of BIO 100% blueberry fiber for 8 weeks without any lifestyle changes. In the group of women consuming juice, a statistically significant difference during the intervention was found in the values of total cholesterol (increase from 6.43 ± 0.92 mmol/L to 6.92 ± 0.99 mmol/L; $P < 0.05$), LDL cholesterol (decrease from 3.70 ± 0.72 mmol/L to 3.43 ± 0.84 mmol/L; $P < 0.05$), C – reactive protein (decrease from 9.71 ± 1.5 mg/L to 4.39 ± 1.90 mg/L; $P < 0.01$) and HDL cholesterol values (increase from 1.74 ± 0.35 mmol/L to 2.03 ± 0.34 mmol/L; $P < 0.001$). The effect of juice consumption on values of triglycerides was not significant (decrease from 1.48 ± 0.55 mmol/L to 1.41 ± 0.45 mmol/L; $P > 0.05$). In the group of women consuming fiber, a statistically significant difference during the intervention was found in the values of C – reactive protein (decrease from 9.89 ± 9.01 mg/L to 7.43 ± 7.99 mg/L; $P < 0.05$), LDL cholesterol (decrease from 3.55 ± 0.97 mmol/L to 3.04 ± 0.78 mmol/L; $P < 0.05$) and HDL cholesterol (increase from 1.48 ± 0.30 mmol/L to 1.75 ± 0.36 mmol/L; $P < 0.05$). A statistically significant difference was not found between the values of total cholesterol (increase from 5.91 ± 1.44 mmol/L to 6.24 ± 1.21 mmol/L; $P > 0.05$) and triglycerides (decrease from 1.54 ± 0.77 mmol/L to 1.51 ± 0.77 mmol/L; $P > 0.05$). The results show that regular consumption of blueberry juice and fiber can reduce inflammatory reactions and have a positive effect on the modification of a human lipid profile. Their inclusion in the diet of people with obesity, metabolic syndrome, hyperlipidemia, dyslipidemia, and cardiovascular diseases, as well as healthy people, can lead to the promotion and protection of health.

Keywords: *women, obesity, blueberries, lipid profile, juice, fiber, consumption*

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The development of vegan protein bars suitable for elderly nutrition

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Europe is ageing. By 2050 the population of over 65s is expected to reach almost 150m in the region. Gains are expected for products that cater to this older demographic by boosting metabolism, immunity, as well as bone, joint, muscle, cognitive, heart, skin, eye and digestive health. Despite such challenges, the elderly targeted foodstuffs are available on limited numbers across worldwide market.

The aim of the project is to evaluate the current trends regarding the concepts and manufacturing technologies behind elderly foodstuff, and to improve them with respect to protein/amino acid and anti-inflammatory phytonutrients content.

As people age, the access and consumption of good nutrition is essential for optimal health and the maintenance of a good quality of life. In most cases, elderly people showing interest in food do retain a good appetite, are mobile and can live relatively independently, all of which are qualities associated with successful ageing. One of the biggest differences between the nutritional needs of middle-aged adults and those of the elderly is that the latter requires less energy from their food as their metabolic rate decreases. Moreover, the elderly would need a balanced diet regarding both macro- and micronutrients, including phytonutrients that can provide extra health benefits too. In a healthy elderly, the need for protein increases as lean mass is lost, so that the emphasis from proteins is being shifted towards the essential amino acids. Moreover, the optimal protein/amino acid intake is of paramount interest, especially for the frail and chronic diseases affected elderly; this is because disease and/or medications may interfere with metabolism regulation. Without proper nutritional intervention, this can lead to malnutrition and the aggravation of illnesses.

Considering all the above factors, one can understand that the elderly is a heterogeneous group for which the requirements for functional food and supplements looks particularly diverse. In the present work we present the outcome of a market survey and some of the innovation strategies for food manufacturers developing foods suitable for older people. We also evaluated some newly developed vegan protein bars with different flavors, characterized their content of bioactive compounds, and carried out their texture analysis and sensorial evaluation. All together, we found that the senior consumers would be more appreciative for protein bars with increased phytonutrient content that inhibit inflammation, but the nutrient-dense snacks should feature high digestibility and increased bioavailability.

Keywords: *Elderly nutrition, Healthy aging, Market survey, Vegan protein, Phytonutrients*

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The concentration of mycotoxins in maize silages with the addition of additives

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Silage additives are commonly used for nutritive and fermentative improvement of various types of silages. Besides these two parameters, there is a question of the hygienic quality of silage, mainly focused on the presence of mycotoxins. This study aimed to evaluate the effect of specific additives (inoculant and urea) on contamination of maize silage by mycotoxins. Maize mass was ensiled into control (C), biologically (B) and urea (U) treated variant. According to recommendation, a dose of 1 g.t⁻¹ of inoculant and 5000 g.t⁻¹ of urea were added to the matter. The treated matter was then sealed into plastic bags and stored for 2 months at a constant temperature. The mycotoxin determination was done by ELISA reader using Veratox tests. Therefore, average samples of maize silage were prepared according to Veratox protocols. Zearalenone (ZEA), fumonisins (FUM) and aflatoxins (AFL), were determined from an extract with 70% methanol, ochratoxins (OTA) and T-2 toxin from an extract with 50% methanol and deoxynivalenol (DON) from distilled water. This analysis showed the presence of all 6 mycotoxins in all variants. The concentration of DON was recorded as the highest among all mycotoxins and variants. Compared to the biological additive, urea was more effective in suppressing the development of mycotoxins, which was significant ($P < 0.05$) in the case of DON and OTA. In the case of FUM and ZEA, it reacted by increasing their concentration, and the same results were achieved with the use of a biological additive. Aflatoxins and T-2 toxin were the highest in concentration after inoculant treatment. Urea addition resulted in lower concentration of both mycotoxins mentioned above. None of the listed mycotoxins did exceed the maximum permitted and guidance limits.

Keywords: *maize silage, inoculant, urea, mycotoxins*

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Analysis of dairy nutrition in selected agricultural cooperative

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Supervisor: prof. Ing. Milan Šimko, PhD.

The aim of this work was to evaluation of milk production in the selected agricultural cooperative in terms of feed. In the diploma thesis we evaluated and compared milk production for the years 2019 and 2020 on the basis of compiled feed rations. The year 2019 and the fed ration didn't meet the requirements that the nutrition be divided according to the phase of dairy cows, which had a negative impact on milk production. The average milk production was around 21,11 litres per dairy cow, which is less than in 2020, in which different feed rations were fed in different stages of lactation, which increased the productivity to 29.24 litres per dairy cow. We also compared the individual feed ration data for 2019 and 2020 with the recommended nutrient content for the complete feed ration for dairy cows - according to individual production cycles. The feed ration fed in 2020 allowed the dairy cows to receive the required amount of nutrients compared to the dose in 2019, the values of which differed significantly from the values recommended for the individual stages of lactation. The feed ration fed to dairy cows in 2019 didn't meet the requirements for the individual stages of the production cycle of dairy cows. The average content of NDV that was fed varied in the beginning, middle and end of lactation in a percentage representation of 27%. The mentioned representation didn't meet the values for even one phase of lactation. The ADV content was 17.08% and the largest differences between the supplied and required amounts were found in the middle and late stages of lactation. Nitrogen substances were in the required amount in all phases. The year 2020 and the feeding of a different ration ensured that the dairy cows had the opportunity to receive a sufficient and optimal amount of nutrients in the individual stages of lactation. The content of the individual parameters was satisfactory in all phases except for minor deviations, but compared to the ration fed in 2019, the values were acceptable.

Keywords: *dairy cows, nutrition, feed ration, milk production*

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Effect of dietary modification on lipid profile in ApoE/LDLr^{-/-} mice

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Intermittent fasting is a dietary modification known to benefit cardiovascular health by reducing risk factors. This dietary pattern can alter the lipid profile, as well as help normalize body mass, blood pressure or glucose levels. It is a promising strategy to reduce the risk of atherosclerosis and cardiovascular diseases morbidity and mortality.

The aim of the study was to determine the impact of intermittent fasting (alternate day fasting) on body mass and lipid profile in ApoE/LDLr^{-/-} young mice.

Animals were assigned to two groups - control group, with no limits of food availability (*ad libitum* feeding) and intermittent fasting group - where food was available every other day. Animals were fed with diet for laboratory rodents (AIN-93G). Mice were weight once per week in order to control body mass gain. After 8 weeks animals were sacrificed and blood was collected to analyse serum lipids.

It was observed that body mass was significantly lower in intermittent fasting than control group (25.15 g vs 27.22 g). Dietary modification altered serum lipids and led to reducing triglycerides levels (2.99 mmol/L vs 3.09 mmol/L) and increase of HDL cholesterol levels (1.44 mmol/L vs 1.35 mmol/L), though the difference wasn't statistically significant. Intermittent fasting failed to improve both total and LDL cholesterol levels in young mice.

To conclude, intermittent fasting showed its effectiveness in reducing body mass and altered the lipid profile, but couldn't significantly improve triglycerides and HDL cholesterol levels. It is a modification successful for body weight management which can impact cardiovascular diseases risk factors.

Keywords: *diet, intermittent fasting, lipid profile, cardiovascular health*

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Bioactive substances in the prevention and treatment of human diseases

Mária LEVICKÁ

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Studies have shown that phytochemicals play an important role in diseases such as diabetes, atherosclerosis, obesity, osteoporosis, cardiovascular disease, and others. Evidence from various studies clearly shows a positive association between various phytochemicals such as carotenoids, various phenolic compounds, organic sulfur and nitrogen compounds, dietary fiber, and their functions in disease prevention and have demonstrated various modes of action. Whole plant products are significant in terms of their effect mainly because of the complexity of the bioactive compounds and their synergistic action, which is not achieved with individually ingested specific bioactive compounds.

In our study, we investigated the effect of a modified diet (Restricted Diet), on disease risk reduction and improvement of the current health status of selected 8 volunteers who underwent a 7-day Restricted Diet, which included a 36-hour phase of no food intake. Volunteers with arthritis, digestive disorders, elevated cholesterol, migraine, type 2 diabetes, hypertension, obesity, and lupus were selected.

We required baseline (before the restrictive diet) blood and urine analysis values from all probands, as well as baseline values of these physiological parameters immediately after the diet. We evaluated the baseline and baseline blood and urine values for each participating proband.

We observed positive changes in blood and urine physiological parameters in all participating probands, which we comment as a reduction in the risk of a particular disease or even achievement of optimal health status in some of them.

We observed positive changes in blood and urine physiological parameters in all participating probands, which we comment as a reduction in the risk of a particular disease, or even achieving optimal health status in some of them. Our proposed foods for the intended diet corresponded to the stated hypothesis, according to which we predicted a positive change in the current health status of the participating volunteer probands. The phytochemicals contained in the given foods of plant origin contributed to the effect of modifying the health status of the volunteer probands, for all specific health problems.

Keywords: *Diets, phytochemicals, healths, plants products, diseases.*

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A new potential therapeutic target for the prevention of atherosclerosis

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Atherosclerosis is a pathological condition characterized by a chronic, non-resolving low-grade inflammation within the arterial wall resulting from the accumulation of ApoB-containing lipoproteins. The exact causes and risk factors of atherosclerosis are unknown, however certain conditions, traits or habits may raise the chance of developing atherosclerosis. High level of total cholesterol and LDL, low level of HDL in the blood, hypertension, tobacco smoke, diabetes mellitus, obesity and sedentary lifestyle are risk factors. One of the most effective nutritional interventions that protects against obesity, diabetes as well as cardiovascular diseases is caloric restriction (CR). CR, a moderate reduction of caloric intake without malnutrition, has been consistently implicated in extension of lifespan. It was also shown that CR particularly modulates the activity of sirtuins and FoxO proteins. Resveratrol has been repeatedly discussed as being a caloric restriction mimetic (CRM) and activates sirtuins. Up to now, there are many studies of resveratrol and caloric restriction. However, the studies of the effect of resveratrol or CR on the development of atherosclerosis are not constant and only limited information available on CR in different age of mice. The scientific goal of this project is to investigate the molecular mechanisms of sirtuin activating nutrition treatment in young mice and identify a novel potential therapeutic treatment to prevent atherosclerosis. 2 months old male ApoE/LDLR^{-/-} mice were fed control (AIN 93 diet, *ad libitum*), CR diet (30% lesser than control AIN 93 diet) and RSV diet (0.04% of resveratrol addition to AIN-93G diet) for 8 weeks. At the end of experiment total cholesterol level, HDL-C, LDL-C and triglyceride (TG-C) in plasma were measured using ABX Pentra 400 analyzer (Horiba Medical). The obtained results were subjected to two-way anova followed by Turkey's post hoc and means were considered significant at $P < 0.05$ using Statistica version 14 StatSoft Inc., USA. Results are expressed in mmol/l. It was shown that RSV lowered the LDL-C compared to control (6.13 mmol/l vs 9.37 mmol/l, $P < 0.05$) and CR (6.13 mmol/l vs 10.82 mmol/l, $P < 0.01$) and CR slightly increased the LDL-C compared to control but it was not significant. RSV lowered the total cholesterol level compared to both of control and CR, however it was not statistically significant. No noticeable difference in HDL-C level in any groups. RSV showed a significant decrease in TG-C compared to CR (2.65 mmol/l vs 3.73 mmol/l, $P < 0.05$) but not compared to control. As expected, RSV showed improvements in lipid profile, however opposite effect was observed with CR.

Keywords: *Atherosclerosis, caloric restriction, Resveratrol, ApoE/LDLR^{-/-} mice*

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SECTION

***Multifunctional agriculture, environment, landscape architecture
and rural development***

Determination of Antimicrobial Activity of Water Seaweeds Extracts

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Supervisor: prof. Ing. Miroslava Kačániová, PhD.

Inflammatory bowel diseases, which cause digestive disorders and inflammation in the gastrointestinal tract, are very widespread diseases. However, due to the increased consumption of ultra-processed foods and fast food, these diseases have become very prevalent. Bacterial imbalance, intestinal permeability are involved in the development of IBD. Thus creating a need to take action by finding dietary components that can stop the proliferation of unwanted bacteria in our bowels. We present algae as a novel source of prebiotics to combat IBD. The aim of this work was to analyze the antimicrobial effects of selected sea algal species against microorganisms that cause IBD diseases by disc diffusion method. Inhibition zones on selected pathogenic bacteria (*Escherichia coli*, *Listeria monocytogenes*, *Bacillus cereus*, *Salmonella enterica* subsp. *enterica*) yeast (*Candida albicans*) and lactic acid bacteria (*Lactococcus lactis*) were detected by disc diffusion method. We tested commercially purchased dried sea algae (kombu, laminaria, hijiki, wakame, dulse, arame) from which we prepared water extracts using a vacuum evaporator. The kombu algae extract was the most effective against *E. coli* with an inhibition zone of 9.33 ± 0.58 mm and the least effective against *B. cereus* (2.33 ± 0.58 mm) and *S. enterica* (2.33 ± 0.58 mm). The laminaria algae extract produced the largest inhibition zones also against *E. coli* (6.67 ± 0.58 mm) and the smallest inhibition zones were produced against *B. cereus* (1.67 ± 0.58 mm). The hijiki algae extract was the most effective against *C. albicans* and vice versa, the least effective against *L. monocytogenes* (1.00 ± 0.00 mm). Wakame algae produced inhibitory zone against *C. albicans* up to 13.67 ± 0.58 mm. It was also least effective against *B. cereus*, similar to the other extracts with an inhibition zone size of 5.33 ± 0.58 mm. The dulse algae extract produced the largest inhibition zone compared to the other extracts. It formed inhibition zone size up to 20.33 ± 0.58 mm against *B. cerues* and the smallest 5.67 ± 0.58 mm against *C. albicans*. The arame algae extract formed inhibition zones ranging from 5.67 ± 0.58 mm (against *E. coli*) to 1.00 ± 0.00 mm (against *S. enterica*). In general, dulse algae extract had the highest antimicrobial activity. We were also interested in how the extracts affect the lactic acid bacteria present in the bowels. The algal extracts also produced zones of inhibition on *L. lactis* and ranged from 8.33 ± 0.58 mm to 2.67 ± 0.58 mm. So, it shows that algae influence the growth of pathogenic bacteria as well as on lactic acid bacteria present in the bowels. Further investigation is needed, and the effect of algae extracts on pathogenic bacteria as well as to find out the effect of algae on lactic acid bacteria as potential probiotic bacteria.

Keywords: seaweed, algae extract, antimicrobial activity, disk diffusion method

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Antimicrobial activity of *Cinnamomum camphora* essential oil

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Essential oils are a kind of secondary metabolites in aromatic plants that consist of a variety of components with wide sources and especially intense aromas, they are easily extractable and easy volatilization without residue, as well. Essential oil, which is extracted from roots, stems, leaves, seeds, and fruits of *Cinnamomum camphora* (L.), is mainly used in fragrances, health care, the chemical industry, food, and other fields. This work aimed to determine the antimicrobial activity of *C. camphora* essential oil using disk diffusion and agar microdilution methods against various gram-positive, and gram-negative bacteria and yeasts. The zones of inhibition for each microorganism were determined using the disc diffusion method by applying 10 µL of essential oil per disc. The most pronounced inhibition was detected against *Shigella sonnei* (12±0.5 mm), *Micrococcus luteus* (11±1.0 mm), and *Candida krusei* (11±0.6 mm), these zones of inhibition were evaluated as having very strong antimicrobial activity. Moderate activity was observed against *Candida tropicalis* (9±0.6 mm), *Candida albicans* (7±0.6 mm), and *Streptococcus pneumoniae* (5±1.0 mm). Weak antimicrobial activity was observed against *Yersinia enterocolitica* (4±1.0 mm), *Bacillus subtilis* (3±0.6 mm), and *Candida glabrata* (4±0.6 mm). No activity of the essential oil was recorded against *Pseudomonas aeruginosa*. Minimum inhibitory concentration (MIC) values were determined by the agar microdilution method. Concentrations ranging from 400.0 µL/mL to 0.195 µL/mL were used. Antimicrobial activity was expressed as MIC50 and MIC90. The highest minimum inhibitory concentration was detected against *P. aeruginosa* (MIC50 7.56 µL/mL and MIC90 9.76 µL/mL). High MIC values were also detected against *Y. enterocolitica*, *B. subtilis*, and *C. glabrata* at MIC50 6.56 µL/mL and MIC90 9.36 µL/mL. Intermediate MICs were observed against *C. albicans*, *C. tropicalis*, and *S. pneumoniae* (MIC50 3.67 µL/mL and MIC90 5.46 µL/mL). The lowest MIC values were observed against *S. sonnei* (12±0.5 mm), *M. luteus* (11±1.0 mm), and *C. krusei* (MIC50 0.19 µL/mL and MIC90 0.36 µL/mL). Based on our findings, we can conclude that *C. camphora* essential oil has very good antimicrobial effects which were confirmed by relatively high zones of inhibition and low MIC values. This essential oil is suitable for further analysis and could be a suitable alternative to synthetic antimicrobials.

Keywords: *Cinnamomum camphora*, essential oil, disc diffusion method, minimal inhibition concentrations

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Scientific Conference of PhD Students of FAFR, FBFS and FHLE SUA in Nitra – Proceedings of Abstracts
**SECTION Multifunctional agriculture, environment, landscape architecture
and rural development**
Reminiscence of the First Meeting – Intervention in Public Space

Katarína JANKECHOVÁ, Miroslav ČIBIK

Supervisor: prof. PhDr. Eva Kapsová, CSc.

At the city level, we perceive public spaces as places for people to meet and gather. Their quality is directly related to the quality of the surrounding environment. If everything works in this direction, mostly their use and functional content does not change over time and the emphasis is placed on their appearance and visual attractiveness. On the contrary, places with a transit function, and therefore many times without cultural functional use, need to be highlighted over time with an additive function, which is the subject of the presented research. "Do you remember how we met?" is an intervention located in the centre of Bratislava concerned with themes of individual memory, the first meetings and memories of them. It consists of an object installation art that stages a place of social interactions in public space, which is intended to be an impulse to recollection by the viewer. We think of memory as an ability that enables us to store experiences, items of knowledge and recollections. At the same time, it offers us inaccurate and subjective reproductions of the past and the possibility to reconstruct our recollections. Those are formed under the sway of our emotions and psychic disposition, which may lead to their distortion. The process and installation of the art work was preceded by data collection through respondents' reactions to the artist's question: "Do you remember how we met?". Respondents subsequently selected the sections that they regarded as essential. In writing memories, our selectivity when choosing fragments becomes deeper. We think more intensively about what we are to say and how to say it, so that this version may faithfully render our idea of the given memory. In these subjective descriptions of interactions, we can find three distinct levels of remembrance. The first is a feeling that we recall the entirety of the given event. The second level is awareness of our memory's fragmentariness. The final level is the loss of memories; this may be felt in one of the texts, whose purport is: "sorry, I don't remember". In the work these different modes of our process of recollection of the past generate two versions of memories of every meeting, which are mildly in confrontation and (do not) bear each other out. Apart from triggering a process of recollection, via the spontaneous interactions of passers-by with the installation, their conscious or unconscious nearness, was created a space for potential acquaintance-making and new memories. The intention was to design a place for people to meet and gather and to arouse in the user an impulse of recollection. As a result, the short-term intervention became a social experiment, where passers-by coming into contact with the installation behaved differently. Some voluntarily participated in the commemoration, others used the installation as part of the author's intention. The third group was limited by the design and several destructive interventions occurred due to gradual improper use, and thus it had to be prematurely uninstalled after three weeks.

Keywords: *urban landmark, open space intervention, outdoor gallery space, social interactions, installation art*

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**Chronic Effects of Carbamazepine, Progesterone and Their Mixtures at
Environmentally Relevant Concentrations on Biochemical Markers of Zebrafish (*Danio rerio*)**

Xinyue LIANG

Supervisor: Dr. András Ács, Dr. Zsolt Csenki.

The joint toxic effect of residual pharmaceutical mixtures is more toxic than the compound individually. Carbamazepine (CBZ) and progesterone (4-Pregene-3,20-dione, P4) often co-occur in the natural environment. CBZ is an anticonvulsant drug often found in surface waters. P4 is commonly used as an oral contraceptive and hormone replacement therapy. CBZ and P4 were found to have a negative effect on the reproductive success of zebrafish (*Danio rerio*). This study aimed to evaluate the chronic effects of CBZ and P4 individually and jointly at environmentally relevant concentrations by applying a suite of biomarkers in zebrafish (*Danio rerio*). Biotransformation enzymes (7-ethoxyresorufin O-deethylase (EROD), glutathione-S-transferase (GST)), antioxidant enzymes (catalase (CAT), superoxide dismutase (SOD), glutathione peroxidases (GPxSe and GPxTOT), glutathione reductase (GR)), and markers of damage (DNA strand breaks (DNAsb), lactate dehydrogenase (LDH), lipid peroxidation (LPO), and vitellogenin-like proteins (VTG)) were assessed. VTG values were increased in dose-ratio-dependent pattern after exposure to CBZ for one, two and four weeks, and a significant ($p < 0.05$) increase was detected at the 100 µg/L concentration. A significant ($p < 0.05$) drop in VTG level was observed after 28 days of exposure to 50 and 100 ng/L of P4. After 28 days of exposure to mixtures of CBZ and P4, VTG levels followed a significantly ($p < 0.05$) increasing pattern in proportion to P4. Increasing VTG levels after long-term exposure to mixtures of CBZ and P4 may support the suggestion that CBZ and P4 are acting together as synergic compounds. Biotransformation enzymes (EROD, GST), and oxidative stress marker (DNAsb), suggesting a high risk to the reproductive ability of fish in the case of co-occurring pharmaceuticals.

Keywords: carbamazepine; progesterone; oxidative stress; fish biomarker; zebrafish (*Danio rerio*); chronic effects; joint toxicity

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**Ichthyological surveys carried out for the purpose of assessing the ecological status of
the water bodies in 2022**

Andrej SEMAN

Supervisor: doc. Ing. Jana Ivanič Porhajašová, PhD.

The ecological status of surface waters, as understood by the Water Framework Directive, is an expression of the quality and function of the structure of aquatic ecosystems. In practice, it can be understood as an assessment of the extend of disturbance of aquatic societies by (primarily anthropogenic) pressures. The ecological status classification consists of the assessment of the hydromorphological elements supporting the biological elements and the biological elements themselves. One of the three biological elements is composition, abundance and age structure of fish fauna. Various assessments of the ecological status according to fish, have been carried out in Slovakia, practically since acceptance of the Water Framework Directive (WFD) in 2000. Currently, the assessment is carried out using a methodology approved in intercalibration process, through calculation of Fish Index Slovakia (FIS). FIS explicitly sets the basic requirements for sampling - ichthyological surveys.

The Water Research Institute (WRI) is coordinating the entire WFD and at the same time implementing the ichthyological surveys for determining the FIS. Until 2021, WRI provided ichthyological surveys as a supplier through a competitive company. From 2022, WRI employees began to carry out these surveys.

For 2022, it was planned to carry out surveys at 83 locations. The surveys were carried out in period from 21.4.2022, while at deadline of abstracts for the journal they had not yet been completed. By September 25, 2022, 49 surveys were done. An attempt to survey was made at three locations, but no fish were caught. At 15 locations, a survey was not conducted due to conditions unsuitable for fish life, or the impossibility of made a survey according to FIS requirements. These sites were also proposed to be removed from monitoring for fish. Until the end of the season, there are still 13 locations to be surveyed. Three locations were evaluated as unfeasible for 2022 and it is planned to carry out a survey in 2023.

Totally were caught 32 species of fish and roundmouth, with quantity of 10 129 individuals. The most frequently caught species was *Barbatula barbatula* at 28 locations. The most numerous species was *Phoxinus phoxinus* with a total number of 2478 individuals. The rarest species was *Gymnocephalus cernuus* found in just one individual.

Keywords: *fish, water bodies, ecological status, ichthyological survey*

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Scientific Conference of PhD Students of FAFR, FBFS and FHLE SUA in Nitra – Proceedings of Abstracts
SECTION **Multifunctional agriculture, environment, landscape architecture
and rural development**
Co – designing open spaces with local communities

Katarína SLOBODNÍKOVÁ

Supervisor: doc. Ing. Attila Tóth, PhD.

In recent years, we have seen more activities of formal initiatives in Slovakia that contribute to the improvement of open spaces and green infrastructure of settlements and landscape. Their founders are often collaborating professionals who want to raise awareness among the general public about current challenges and problems facing society. State concepts, plans, strategies and policies shaping open spaces and mitigating the impacts of climate change are slower to be implemented in practice. By their actions, activists draw the attention of the public and local governments to the untapped potential of many abandoned places in settlements. Their interventions often open up a discussion and cooperation between different stakeholders. Some foreign authors are critical to the overestimation of these initiatives, which, in their view, often substitute the disfunctional local government, and that does not bring out any systemic changes in urban planning. The subject of this research was to investigate local initiatives, their activities and their impact on various open spaces in Slovakia. Collected data were obtained from the web, FB pages and by interviewing initiatives, finally evaluated by comparative method. The results showed that some organisations are focused on co-designing of one particular space, while others extend their activities to various parts of the city or continue to work on more conceptual, strategic, planning projects on which they are collaborating with other stakeholders. Most of the initiatives have succeeded in gaining public interest, strengthen their activities with the community and increase the quality of unused open spaces.

Keywords: *Research by Design, co-design, participation, public open space, green infrastructure, landscape architecture*

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The importance of the hydrological measurement network for the management of river basins in urbanized areas (on the example of Kyiv)

Kostiantyn SOKOLCHUK

Supervisor: doc. Ing. Marek Sokáč, PhD.

The purpose of this study is to describe various factors that indicate the need for systematic hydrological observations in urbanized areas and changes in approaches to the study of small rivers. The study is conducted on the example of the city of Kyiv, Ukraine. The main object was the Lybid River and its catchment, as one of the largest within the city and the most representative. The study was based on the analysis of cartographic materials, open satellite images, comparison of runoff and catchment parameters from literary sources, their refinement based on field research data. Systematic studies of waterways and monitoring are almost not carried out, as a result at the moment there are significant discrepancies between the characteristics of objects and their water content depending on the source. In particular, in the assessment of the physical parameters of the catchment, according to various sources, the length of Lybid ranges from 16.05 to 17.1 km (according to our estimate - 16.49 km), the area of the catchment according to literary sources is 66.3-67.8 km², according to the result of the terrain relief analysis obtained by us, it corresponds to the value of 67.8 km². There is no stationary hydrological observation post within this territory, which leads to more important for practical purposes discrepancies in the values of water runoff. According to a number of sources, the average long-term water flow is 0.12 m³/s, the maximum projected water flow can reach 39.6 m³/s. However, according to other sources, the average long-term flow is about 1.0 m³/s, and measurements in the low-water period confirm the higher reliability of the last value, the river flow in the low water could reach 0.75 m³/s. The maximum calculated water runoff of Lybid is more than 100 m³/s, the river collector, which ends near the estuary of Lybid and after the confluence of most of the tributaries, according to separate data, is designed for 180m³/s, that is, the difference with the first value is several times. A number of areas that may be affected by such discrepancies in data have been highlighted. The first are objects located directly on small rivers. 19 road bridges and crossings, including multi-lane, 3 railway and 17 pedestrian crossings, are located on the open areas of Lybid and its tributaries. There are also at least 5 abandoned bridges, which, if destroyed by the current, can cause significant problems. The channel crosses at least 17 pipelines or their complexes (2 or more connected pipes). In three cases, the Lybid channel passes directly under houses or a parking lot, and, together with its tributaries, has more than 25 channelized sections. The next direction is new projects, including revitalization projects that require the transformation of riverbeds and banks. Publicly available revitalization projects could not take into account the height of potential water level rise, particularly due to lack of data. This direction is also related to the use of the waterside area. Were found examples when the renewal of the Lybid canal space was carried out without taking into account the possible rise of the water level, which led to the destruction of structures and could endanger visitors. The last direction is complex management of the Lybid Basin. According to the obtained results, at least 15% of the territory of the basin is occupied by parks, squares or forested parts, and the processes of development of the territories are taking place. In the absence of data, it is a difficult task to reliably assess the impact of changes in the catchment, such as buildings, the creation of a green infrastructure system, on the flow of small rivers, as well as the assessment of the effectiveness of anti-flooding measures.

Keywords: *small rivers, urban waters, river basin management, Kyiv*

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Scientific Conference of PhD Students of FAFR, FBFS and FHLE SUA in Nitra – Proceedings of Abstracts
SECTION **Multifunctional agriculture, environment, landscape architecture
and rural development**
**Assessment of climate change using GIS methods on the example of the Siverskyi Donets
river basin (within Ukraine)**

Kateryna SURAI, Kostiantyn SOKOLCHUK

Supervisor: Kostiantyn Danko, PhD (Geogr.)

For an initial assessment of climate change in a particular area, it is advisable to use maps of spatial distribution of the main climate indicators. Highly detailed maps could often be required for such assessments in small and limited areas. This problem is solved by creating such maps based on terrestrial meteorological observation data. The studied territory of the Siverskyi Donets river basin has an insufficiently dense observations network, which makes it difficult to estimate the distribution with high accuracy. Another problem is the river basin is transboundary, and data from abroad is currently unavailable. As a result, there are only 18 points for research - ordinary interpolation between them does not allow obtaining a complete picture. Also within the studied area there are 32 hydrological observation posts, and it was decided to combine this data using different methods of statistical and geospatial analyses. Therefore, two different interpolation methods were combined to complete the task: Thiessen polygons and Kriging. Interpolation was carried out in two stages.

1) Construction of Thiessen polygons based on 18 points of terrestrial meteorological observation stations. It allows estimating the coefficient of influence of these points on any other point or zone of the studied area. As the climate change assessment is conducted for the purposes of hydrological studies, the impact on river basin catchments was assessed for further synchronization of meteorological and hydrological data. The method of Thiessen polygons extrapolates data of 18 meteorological stations to the areas of 32 river catchments. Calculation of average values taking into account the influence coefficients gave the resulting value of climate indicators in 32 points of the river catchments centroids. Consequently, the number of interpolation points increased from 18 to 50 (2.8 times).

2) Map interpolation between 50 points was performed using the classic geostatistical Kriging method. It is based on the construction of the spatial distribution of values by the methods of mathematical statistics. Thus, the more input points used, the more accurate the surface will be modeled.

As a result, there were obtained detailed maps of the main climate indicators distribution – the amount of precipitation and air temperature – averaged over two climatological normals: 1961-1990, 1991-2020. These maps allow a visual assessment of climate change. The average air temperature within the studied area increased by approximately 1°C. The average amount of precipitation remain the same, but detailed maps allow us to estimate its spatial changes.

A combination of these two methods can be used for any area with insufficient number of observation points.

Keywords: *map creation, geographic information systems, interpolation, Kriging method, Thiessen polygons, Siverskyi Donets*

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Tímea ŽOLOBANIČOVÁ, Roberta ŠTĚPÁNKOVÁ

Supervisor: doc. Ing. arch. Roberta Štěpánková, PhD.

In every city we meet places that have a directly determined function. The thesis deals with the topic of lost places and clarifies their representation and role in the urban system.

The aim of the work was the integration of vague cities into the city system and their subsequent involvement in the system of functional public spaces of the seat. The work also introduces concepts such as lost place, vague terrain, places, third country or urban jungle. The literature review maps theoretical knowledge about lost places, vague terrain, cities or urban wilderness today but also history. The work tries to approach the phenomenon of lost places, which is currently little known. The analyses try to show how the current city is intertwined with these places and point to their great potential in the city system. Here there was a call to overturn the optics of contemporary urbanism and an effort to work

in a civilized way with a marginalized, peripheral, vague or lost place. Instead of traditionally ignoring such places and focusing only on beautiful or aesthetic places, the society of finding such lost places, being able to understand and finally reshape. Subsequently, the work in the design part deals with the incorporated cities in urban system, creating a modular solution to improve different types of vague spaces.

Vandalism is common in our conditions, but these places do not need direct protection. I can do the same. Therefore, they are less expensive than classic public spaces. Green and blue infrastructure applications, these places can also have equal representation and passers – by do not have to bypass them. The detailed design itself dealt with the application of blue and green infrastructure in selected places, their landscape-architectural solution with added value - art element. This has led to the strengthening of the ecological, social and local functions of the lost cities.

Keywords: *terrain vague, lost spaces, public space, sustainability, public greenery*

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SECTION

Plant Production

Genomic screening of *Lavandula* spp. depending on the climatic conditions of Slovakia

Simona ČERTEKOVÁ

Supervisors: prof. Ing. Katarína Ražná, PhD.

Genus *Lavandula* belongs to the *Lamiaceae* family and consists of 47 species. It is used in mainly in aromatherapy, traditional medicine, gastronomy, and cosmetics. Lavender can be used either dried or more frequently in form of essential oil (EO) obtained by distillation from the flower spikes. Lavender oil is complex mixture of monoterpenes, sesquiterpenes, terpenoid esters, ketones etc., with linalool and linalyl acetate being the most abundant of all. Relative abundance of these compounds is the most important determinant of quality, odor and market value of EO. Composition of lavender EO is influenced by internal and external factors (e.g., altitude, geography, temperature, etc.). The aim of our work is to analyze the genetic variability of plant natural resources of *Lavandula* spp. depending on the soil and climatic conditions of Slovakia, using molecular markers based on microRNA (miRNAs) sequences. Flowers, leaves and stems of lavender samples originated from different localities of Slovakia (Šaľa, Malé Leváre, Modra, Branovo, Tomášikovo, Stankovce, Kapoňa and Trnava pri Laborci) will be analyzed. For the screening of genome polymorphism background of EO synthesis variability in the context of environmental factors of cultivation, bioinformatic data and *in silico* tools will be applied (BLAST, <https://blast.ncbi.nlm.nih.gov/Blast.cgi>; PS RNA Target, <https://www.zhaolab.org/psRNATarget/>; Clustal Omega, <https://www.ebi.ac.uk/Tools/msa/clustalo/>; MetaCYC, <https://metacyc.org/>; DDBJ, <http://getentry.ddbj.nig.ac.jp/top-e.html>, and others). Bioinformatic data will allow us to perform a comparative *in silico* analysis of the variability of gene sequences involved in lavender EO biosynthesis and available data of species of the *Lamiaceae* family. Among the most important secondary metabolites of species from the *Lamiaceae* family are terpenoids, which are also the main component of lavender essential oil. In the lavender genome were identified genes associated with terpenoid metabolism, including genes for specific terpene synthase (TPSs). Expression levels of these genes were significantly higher, especially in those tissues where EO is being synthesized. It is well known that spatiotemporal expression of most TPSs is primarily regulated at the transcriptional level, where most of transcription factors are regulated by miRNAs molecules. The miRNA-based markers will be selected in the context of their regulatory function of the biosynthesis of aforementioned secondary metabolites. For design of these markers, the miRNAs database (miRBase, <https://www.mirbase.org/>) will be applied followed by transcriptomic analyses of selected miRNA markers by Two-Tailed qPCR.

Keywords: *Lavender, essential oil, miRNAs, molecular markers, environmental screening*

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Bee pollinators (Hymenoptera: Apoidae) diversity in Nitra city, Slovakia, during summer season

Mubarak ABDELRAHMAN SALIM EISA, Mohamed A SHEBL, Ľudovít CAGÁŇ, Robert CHLEBO, Olha MATSERA

Supervisor: prof. Ing. Ľudovít Cagáň. CSc.

The bee fauna of majority of the European countries is well studied in term of diversity and faunal checklist. Slovakian faunal diversity didn't receive much attention, especially in comparison with honeybee and beekeeping research in the country. Bees play an important role in pollination of a number of agriculturally important plants cultivated in Slovakia during the spring and summer seasons. Pollination provided by bees may assure good yield of several plants, having impact on the effectiveness of horticulture. This fact could engage decision makers and farmers in implementation of useful conservation policies and strategies for social and solitary bee conservation. The aim of this research was to study bee diversity and abundance of some sites in Nitra city and its surrounding in the course of summer 2022. Observations and recordings of wild bees were took place at open areas such as meadows, river banks, parks and botanical garden which offer suitable areas for survival of several bee species. Wide spectrum of wild plant species is blooming during July – September in Nitra and its vicinity. From the aspect of bee forage, the most visited plant species were *Melilotus officinalis*, *Carduus* sp., *Linaria vulgaris*, *Cichorium intybus*, *Salvia officinalis*, *Onobrychis* sp., *Echium vulgare*, *Rubus* sp., *Convolvulus* sp. and many others. Several bee species were observed and recorded representing the six bee families of short and long tongued bees. Bumble bees were one of the most dominant species, especially *Bombus humilis*, *Bombus pascuorum*, *Bombus lapidarius* and *Bombus terrestris*. Halictidae and Megachilidae were also abundant with frequent populations due to availability of foraging resources. *Colletes hederæ* was only recorded from Bratislava region and it is first time it was found in another Slovakian locality. One of the main drivers affecting the bee species richness and abundance was cutting the grasses which influence the presence and survival of several species.

Keywords: *Bees, Diversity, Species Richness, Species Abundance, Nitra*

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**The influence of the selected soil biostimulant on the yield potential and quality of radish
(*Raphanus sativus* L. var. *major*)**

Júlia FABIANOVÁ, Miroslav ŠLOSÁR, Erika KORPÁŠOVÁ, Ivana TIRDILOVÁ

Supervisor: doc. Ing. Miroslav Šlosár, PhD.

The aim of the research task was to evaluate the influence of the selected biostimulant on yield parameters and antioxidant activity of radish. Radish belongs to the group of less-known root vegetables. From a botanical point of view, radish belongs to the Brassicaceae family. It is characterized by its spicy taste. Thanks to the rich content of polyphenols, glucosinolates, minerals and vitamins (especially vitamin C and vitamin B), it is an important crop in a healthy diet. Radish has antibacterial, antioxidant properties and supports digestion. The Agriful preparation was tested to optimize the yield and quality of radish. The main active ingredients in Agriful are humic and fulvic acids. Agriful is a fast-acting natural soil biostimulant that supports the development and growth of the root system and thus improves nutrition, increases the availability and transport of nutrients in the plant, balances the plant's hormonal balance, restores and activates the microbial flora in the soil and promotes mineralization. The field experiment was carried out in August-November 2021, in the Institute of Horticulture, Faculty of Horticulture and Landscape Engineering. These radish varieties were evaluated: 'Red Meat' (RRC=control variant, RRA=Agriful variant), 'Kulatá černá' (RKC=control variant, RKA= Agriful variant), 'Nero Tondo d'Inverno' (RNC=control variant, RNA=Agriful variant). The application of Agriful had a statistically significant positive effect ($P < 0.05$) on the increase in total biomass (RRA +227.64%; RKA +47.13%; RNA +79.10%), tuber yields (RRA +154.16%; RKA +51.09%; RNA +59.87%) and average tuber weight (RRA +147.91%; RKA +53.06%; RNA +55.99%) after Agriful application. The antioxidant activity was determined by the DPPH method (%). The differences between the variants were statistically significant, the impact of Agriful was both positive and negative (RRK 31.43%, RRA 39.41%, RKK 15.06%, RKA 11.86%, RNK 8.18%, RNA 6.33%). Classification into quality classes was evaluated according to UNECE STANDARD FFV-59. The share of tubers in variant RR in the I. class increased by 8.27%, in the II. class it increased by 19.53% and in the Non-standard class it decreased by 27.8%. The RK variant in the I. class increased by 16.42%, in the II. class it decreased by 2.33% and in the Non-standard class it decreased by 14.08%. The RN variant in the I. class increased by 6.58%, in the II. class it increased by 15.61% and in the Non-standard class it decreased by 22.18% after Agriful application. In conclusion we recommend using the results in further research in the field of biostimulants. For small growers, we recommend the use of Agriful to increase yields when growing root vegetables.

Keywords: biostimulant, radish, yield, antioxidant activity, quality classes

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**Application of *in silico* and PCR approach in the screening of allergens in spring wheat
(*Triticum aestivum* L.)**

Silvia FARKASOVÁ

Supervisor: prof. PaedDr. Ing. Jana Žiarovská, PhD.

Due to the general increase in allergic sensitization, the prevalence of hypersensitivity reactions to multiple food sources that share homologous proteins has become a significant clinical problem. Bioinformatics provides useful tools that complement traditional laboratory techniques. The most popular methods for searching sequence databases are FASTA and BLAST (<https://www.ncbi.nlm.nih.gov>) programs. Another important set of bioinformatics tools uses pairwise sequence alignment, aimed at examining the similarity of a studied sequence to other sequences. To date, 56 allergens have been identified in spring wheat, especially α -amylase inhibitors, ω -5 gliadins, prolamins, glycoproteins and profilins cause frequent reactions in patients. *In silico* analysis was performed in two steps. In the first step, the Aller Base database (<http://bioinfo.unipune.ac.in/AllerBase/Home.html>) was used. Then a BLAST comparison was carried out of the DNA sequences of these allergens with the sequences of other cereals and pseudocereals (*Hordeum vulgare* L., *Avena sativa* L., *Fagopyrum* Moench, *Amaranthus* L.). Subsequently, primers were designed for the conserved regions of the genes and for the IgE epitopes of these allergens. Bioinformatics analysis showed a high similarity (>70%) of the genes of wheat allergens with the DNA sequences of other cereals and pseudocereals, these results were also confirmed by PCR analyses. As an example, allergen Tri 14 (lipid transfer protein) has 3 IgE epitopes: KNLHNQARSQ, KGIARGIHNL and RSIPPCCGVNLPYTI. The results of BLAST comparison showed a significant similarity ($E=2,00E-168$) with the lipid transferase and protease/amylase inhibitor gene of barley. PCR reaction was carried out with primers to match the conserved sequences and the IgE epitopes. The results showed that the sequence is also present in barley.

Keywords: *bioinformatics, in silico, allergens, wheat, PCR*

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Study of the effect of *in vitro* induced nutritional stress on linseed (*Linum usitatissimum* L.) genomic polymorphism by miRNA-based markers in the context of lignans content

Angéla HODOSY VARGAOVÁ

Supervisor: prof. Ing. Katarína Ražná, PhD.

Flaxseed is one of the richest sources of lignans, which are substances of immense importance and potential for the plant organism itself and human nutrition and health. Lignans have been identified in different parts of plant organisms, playing various roles, but primarily they act as defense substances. The aim of our study was to analyze the effect of *in vitro* induced nutritional stress in the context of lignans content by the miRNA-based markers. For the study, three linseed genotypes were selected, Agram having high content of lignans (6248.0 mg.kg⁻¹ of secoisolariciresinol), Libra having low content of lignans (2834.4 mg.kg⁻¹), and Bethune as the reference variety (2621.1 mg.kg⁻¹). Four nutrition media variants were prepared. The control variant (1) - basic culture medium Murashige & Skoog including vitamins (Duchefa), the deficiency of macroelements was presented by half of Murashige & Skoog medium with vitamins (2), next variant contained Basalt Salt mix without vitamins (3) and complete deficiency of macroelements, microelements and vitamins was presented by medium containing sucrose and agar dissolved in distilled water (4). All experimental variants were established in triplicate of 15 seeds, and grown in phytotron for 10 days, at a photoperiod of 16/8 h and a temperature of 25/23°C. Genomic DNA was isolated by NucleoSpin®Plant II isolation kit (Macherey-Nagel) and its quality control were performed by NanoPhotometer™ (IMPLEN). Selected miRNA-based stress-sensitive markers (miR168; miR408; miR395 and miR398) were applied for genomic screening by touch-down PCR followed by amplified products separation on 15% TBE-Urea® PAGE gels (Invitrogen) consequently evaluated by GeneSnap software (Syngene). Results shows higher amplification activity of miRNA-based stress-sensitive markers in the genotypes with low lignans content (Libra and Bethune) in comparison to variety Agram of high lignans content. Therefore, it is possible to assume better stress adaptive potential and the protective effect of lignans.

Keywords: *lignans, abiotic stress, miRNA markers, DNA polymorphism, linseed*

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Genetic diversity of peanut (*Arachis hypogaea* L.) Employing CDDP Markers

Lucia KLONGOVÁ

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Peanut or groundnut (*Arachis hypogaea* L.) is an annual herb, that is classified as legume in the plant family *Fabaceae*. The cultivated peanut is an allotetraploid species (AABB, $2n=2x=40$) with a large and complex genome, which is probably derived from the natural hybridization of wild diploid species *Arachis duranensis* and *Arachis ipaënsis*. Analysis and description of the genetic variability of wild and cultivated peanut species is very important to knowledge of genetic relationships. In this study, we used conserved DNA derived polymorphism (CDDP) technique. This method is simply and efficient and can be used to study polymorphism within plant population. Primers are designed to target specifically conserved sequences of plant functional genes involved and in response to abiotic and biotic stresses. DNA samples of twenty-one wild peanuts populations were amplified with three CDDP primers combinations (WRKY-F1/WRKY-R1, WRKY-F1/WRKY-R2b, WRKY-F1/WRKY-R3). The three selected primers produced a total number of 134 fragments, among which 53 (39.5%) fragments were polymorphic. The average number of amplified fragments per primer was about 44,6. The number of polymorphic fragments and polymorphism percentage ranged from 13 to 23 and 35.1% to 47.2%. The data from binary matrix were used in unweighted pair group method with arithmetic mean (UPGMA) cluster analyze. The UPGMA clustering using obtained molecular data grouped peanuts populations into three major groups with subgroups. Our results showed, that the used CDDP technique provide sufficient distinguishment of wild population of groundnuts and separated the analyzed samples into different groups based on genetic diversity, however, the level of polymorphisms that detected used markers among populations of *Arachis hypogaea* L. was low.

Keywords: *Arachis hypogaea* L., CDDP markers, genetic diversity, structure analysis

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Morphometric analysis of fruits of selected representatives of the genus *Prunus* in the Liptovská kotlina basin

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In the Štôla village (Liptovská kotlina basin, N Slovakia), an old landrace of *Prunus insititia* was discovered, which is probably connected with the Benedictine activity in the 14th and 15th centuries in this area. During the field survey we also recorded the hybrid taxon *P. × fruticans* (*Prunus spinosa* × *Prunus insititia*) in the area. The aim of the research was to analyse the variability of the fruits of the two taxa and to assess their distinctness on the basis of the results. The analysis of fruit variability is important for the determination of taxa of the genus *Prunus*. Two individuals of *P. insititia* and two individuals of the hybrid taxon *P. × fruticans* were analysed. From a random selection of 30 fruits (drupes), we evaluated the following taxonomically significant morphological characters: weight, fruit width and length, and fruit pedicel length. For morphological characters of drupes, we considered the following characters: weight, length, width and thickness of drupe. We then calculated the relative roundness and slenderness indices and the ratio of stone width to stone length. The length of *P. × fruticans* fruit ranged from 24.86 mm to 17.27 mm, the width ranged from 23.30 mm to 14.60 mm, and the pedicel length averaged 11.95 mm. The average weight of the fruit was 6.24 g. The drupe length of *P. × fruticans* varied from 16.93 mm to 11.63 mm and the width ranged from 12.45 mm to 8.75 mm. The average stone thickness was 7.06 mm and the weight was 0.56 g. For *P. insititia*, we found that fruit length ranged from 25.46 mm to 10.91 mm and width ranged from 21.27 mm to 10.57 mm. The average fruit weight was 4.95 g and the pedicel length was 15.28 mm. The stone length in the *P. insititia* sample varied from 16.61 mm to 12.23 mm and the width varied from 9.95 mm to 6.85 mm. The mean stone thickness and weight were 6.72 mm and 0.42 g, respectively. The relative proportion of stone width and length in the *P. insititia* sample was 62.65 and 70.70 in the *P. × fruticans* sample, indicating the validity of separating them as separate taxa. In a preliminary sensory evaluation of the taste of *P. insititia* fruits, we found that it is a unique genetic resource that can be exploited in future breeding. The damson plum landrace may also contribute to the development of agro-tourism in the area. The evaluation of antioxidants and cytometric analysis will be the subject of further research. In the future we want to increase the number of individuals in data set.

Keywords: *fruits, P. × fruticans, P. insititia, morphometric analysis*

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Variability of the presence of homologues of profilin and vicilin in legumes

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Legumes are an irreplaceable part of the human diet mainly due to their high protein content, but also due to the balanced amount of nutritional components. However, in addition to nutritionally important substances, legumes also contain a relatively high amount of anti-nutritional components, which include allergens. The most important legume allergens are the profilin family allergens, which belong to the most widespread proteins binding actin and vicilin allergen, which we classify as globulins 7/8S, a superfamily of cupins. Globulins are also classified as dominant allergens. These allergens cause severe allergic reactions that trigger so-called anaphylaxis which can lead to death. In addition to well-known allergenic species such as soybeans and groundnut, other types of legumes such as beans (*Phaseolus vulgaris*), lentils (*Lens culinaris*), peas (*Pisum sativum*), chickpeas (*Cicer arietinum*), and broad beans could potentially cause these allergic reactions as well. It was this fact that led to the study of allergens profilins and vicilins in individual types of legumes, which are not as significant from an allergenic point of view as soybeans and groundnut, which is also known as the peanut. In addition to the genomic approach, the studies were accompanied by *in silico* analyses. Using free databases such as AllerBase, we have compiled a comprehensive overview of the mapped allergens in the monitored species of legumes. Thanks to bioinformatics, primer pairs were made for genome-wide detection of profilin and vicilin allergens in the monitored varieties of legume species, where oligonucleotide primers were used for profilin detection, which were designed using profilin found in fruits. Oligonucleotide primers were designed using pea vicilin by NCBI database (<https://www.ncbi.nlm.nih.gov/>). They were used to amplify a specific region of the vicilin allergen. Using oligonucleotide primers designed in this way, a genomic analysis was carried out, which detected the variability of the presence of profilin and vicilin allergens in individual varieties in the monitored legume species. The selected legume varieties were evenly represented by high-yielding varieties, regional varieties, popular varieties, but also almost extinct varieties.

Keywords: *allergen, vicilin, profilin, legume, PCR, genomic*

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Labile forms of organic carbon in garden ecosystem

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Supervisor: Erika Tobiašová, Ladislav Ducsay

Labile forms of organic carbon are important parameters that allow to study changes in a short-time period in garden ecosystems and can be a suitable indicators of healthy production. The experiment was located in the gardens of Slovak University of Agriculture on the soil type Eutric Fluvisol in the growing systems of strawberries (S) and cauliflower (C). Each of them included a control variant, variant with the application of a microbial isolate, variants with the application of AGRIFUL, GROUNDFIX and their combination, and finally a variant with the application of an inhibitor, while in all of which the DASA was applied. The contents of organic carbon did not change significantly in 2022 compared to 2021. In the case of labile forms of organic carbon, the fraction of cold water extractable organic carbon (CWEOC) reacted most sensitively to time of sampling. The influence of the crop was manifested on labile carbon oxidizable by KMnO_4 (C_L). Its content was lower in the case of strawberries, compared to cauliflower that is an annual crop with more significant intervention on the soil. This is also confirmed by the higher values of hot water extractable organic carbon (HWEOC) in the case of strawberries compared to cauliflower. The reason can be the richer microbial biomass in the rhizosphere zone, which has not been disturbed for a long time. In the case of individual variants, C_L and CWEOC contents were higher in 2021 compared to 2022, in spite of lower values in control variant. In the case of HWEOC, it was the opposite, with the exception of the variant with the application of microorganisms. The above points to a close dependence between microbial community and HWEOC. Considering its potential response to changes in microbial community, this parameter seems to be the most suitable indicator of healthy soil.

Keywords: *organic carbon, Eutric Fluvisol, cauliflower, strawberries*

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Tackling common ragweed with herbicides in sunflower, soybean, and corn

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Supervisor: Assoc. Prof. Peter Tóth, PhD.

Ambrosia artemisiifolia L. (Asteraceae) has become a major threat to agriculture in many parts of the world. The world's agriculture heavily relies on the use of chemical protection against ragweed in the most endangered crops, sunflower, corn, and soybean. To select literature for this review, 4 databases were used, Web of science, Scopus, Springer, Science Direct. The following keywords were used: chemical control, common ragweed, sunflower, corn, and soybean. Fifty papers were used for this review. This study has limited ventures to investigate how chemicals can influence seed germination and growth of ragweed in the broader agricultural systems. The article considers possibilities of pre-emergent and post-emergent plant protection. Sunflower is one of the most endangered crops by ragweed primarily because both plants belong to the same family. The top pre-emergent choice of herbicide protection is flurochloridone. The CLEARFIELD and Express Sun cultivation systems are useful when resistance to some herbicides was achieved. CLEARFIELD in sunflower allows the use of imidazolinone herbicides as a post-emergence option. This technology is characterized as a non-GMO process. For the CLEARFIELD, imazamox has become the cornerstone herbicides in Europe. Central Control and Testing Institute in Agriculture in Bratislava registered varieties of CLEARFIELD and List of registered varieties of ExpressSun™. Transgenic soybean resistant to glyphosate resulted to the expanded herbicide protection in soybeans. The use of glyphosate allowed the simplification of weed control and flexibility of work. However, the frequent use of glyphosate in corn has led to the development of glyphosate-resistant weeds including ragweed. The review compares the possibilities of using herbicides in Slovakia and other countries. It also draws attention to the possibility and impossibility of using certain active substances in different countries. This contribution aims to review the use of chemical control to regulate ragweed to consolidate prominent recent findings in the field.

Keywords: *Ambrosia artemisiifolia*, chemical control, resistance, Clearfield

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Analysis of genomic variability of citrus PR-10 allergen homologues

Dagmar MORAVČÍKOVÁ

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Worldwide, citrus is one of the most popular fruit crops. They are source of nutrients such as vitamins and minerals. However, citrus fruits can cause allergies in humans. Food allergens are divided due to structural similarity into so-called families. So far, have recognised 17 confirmed and two putative families of PR (pathogenesis-related) proteins. Knowledge of these families, their biological stability/lability can help to reveal the severity of clinical reactions and the and gain deeper insights of a phenomenon called cross-reactivity. In many types of foods, including citrus, are express homologues of Bet v 1 (the birch pollen allergen), which is the most common sensitizing allergen in our latitudes. Bet v 1 birch pollen allergen belongs to PR-10 (pathogenesis-related class 10) protein family. The similarity between allergens can induce a cross-reaction and therefore is important to investigate the similarity between these allergens or other proteins that could be potentially allergenic. However, the genes that encode these allergens should also be investigated. In a bioinformatic comparison the Bet v 1 allergen and their isoforms from the AllerBase database (<http://bioinfo.unipune.ac.in/AllerBase/Home.html>) were compared against *Citrus* (taxid: 2706). A different matches were found. We used the BBAP method (Bet v 1 homologs based amplified profile) to analyze the genomic variability of PR-10 allergen homologues in Citrus. The method is based on amplification of the Bet v 1 homologues profile. Five different reverse primers and eight samples of different citrus species were used. Polymorphism was detected in all our samples. Fragments or homologues of Bet v 1 of the expected length 388 bp (base pair) were also detected when primers R2 (reverse 2), R3 (reverse 3) and R4 (reverse 4) were used. When R1 reverse primer was used, fragments length 200 bp in all citrus samples were detected. Distribution of fragments in gel was analyzed in program GelAnalyzer (<http://www.gelanalyzer.com>). A 0-1 matrix was constructed from the fragment in the gel, which served as an input file to the UPMGA (unweighted pair group method with arithmetic mean) program (<http://genomes.urv.cat/UPMGA/>). The programme was used to calculate the *Dice* distances. From these results was constructed dendrogram. Five different groups were created.

Keywords: *citrus, polymorphism, Bet v 1, food allergens, UPMGA*

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Quantitative analysis of wheat growth and photosynthetic activity under drought conditions

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Supervisor: prof. Ing. Viliam Bárek, CSc.

The aim of this study was to analyze the photosynthetic activity and growth of specific genotypes of spring wheat under conditions of insufficient water supply due to drought. The author defines the basic concepts related to this issue. It presents the basic distribution of drought, its characteristics and impact on specific genotypes of spring wheat. It also describes in detail the importance of phenotyping and phenotyping methods such as RGB imaging, analysis of chlorophyll fluorescence and it also describes the effects of drought on two specific wheat genotypes - Slomer, representing older wheat varieties and Enola, which represents newly bred wheat varieties. In our work we used two phenotyping methods, RGB analysis and fluorescence analysis, to compare the varieties under drought conditions. Thanks to quantification of geometric and structural features by scanning the number of pixels located on the plant, we compared parameter values between the selected varieties in conditions of water optimum and water stress. We further measured plant height, circumference, width, compactness, roundness, leaf area, isotropy, eccentricity, RMS. In conditions of water optimum, the Slomer variety had higher values in the parameters of leaf area, height, width, circumference, RMS and solidity. Compared to the Slomer variety, under optimum water conditions, Enola achieved higher values in the parameters of compactness, isotropy and eccentricity. In conditions of water stress, the values of leaf area, height, girth, compactness, eccentricity and RMS of the Enola variety decreased more significantly than that of the Slomer variety, which means that in the measured parameters, the Enola variety is more sensitive to the lack of water than the Slomer variety. Furthermore, we evaluated the photosynthetic performance of wheat genotypes by the method of whole-surface imaging of the fluorescence intensity of chlorophyll *a*. Through these measurements, we found that in conditions of water optimum and water stress, the Enola variety achieved higher values in the measured parameters, but reacted more sensitively to stress factors. The results indicate that plants in drought conditions respond to stress by reducing values in most of the measured parameters. The Slomer variety formed smaller differences between the measured values in the water optimum and drought conditions, on the other hand, the Enola variety achieved greater values compared to the Slomer variety in the water optimum conditions and during chlorophyll fluorescence measurements.

Keywords: *phenotype, RGB analysis, fluorescence, drought, wheat*

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Phytotoxic effects of essential oils on plants under laboratory conditions

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Supervisor: prof. Ing. Ľudovít CAGÁŇ, CSc.

The aim of this study was to evaluate the phytotoxicity of garlic and curcuma essential oils against the cultural plants. Essential oils are volatile, natural, complex compounds characterized by a strong odor. These are one of the most important natural products derived from plants, due to their various biological properties. An oil is essential in the sense that it carries a distinct essence of the plant. Essential oils are environment friendly and readily available alternative to synthetic chemical pesticides. They have phytotoxic effects on plants as well. Laboratory experiments were conducted to determine the phytotoxic effects of plant derived oils. To perform the experiments three species of plants. They were tomato, cucumber and beans that were grown in pots in laboratory under controlled conditions. Essential oils from garlic (*Allium sativum*) (1ml/ 500ml of distilled water) and curcuma (*Curcuma longa*) (1ml/ 500ml of distilled water) were applied on plants. For the experiment 10 plants of tomato, 10 plants of cucumber and 10 plants of beans were used for the experiment with each essential oil. Data analysis reveals that garlic essential oils have more phytotoxicity against the cucumber and beans plants, while tomato plants were affected mildly. In results of the application of curcuma essential oils, beans and tomato plants were more effected as compared cucumber plants. Final results revealed that both essential oils have phytotoxic effects against the bean plants. Further studies are recommended to evaluate the phytotoxic activity of these essential oils in fields, less doses, evaluate their safety and asses their mode of action.

Keywords: *Essential oils, Phytotoxicity, Cultural plants.*

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SECTION

Technology, quality and safety of raw materials and foodstuffs of animal origin

Characterization of non-lethal aflatoxin B₁ exposure-induced inflammation and immune modulation in zebrafish embryos

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Aflatoxin B₁ (AFB₁) is one of the most hazardous compounds among secondary fungal metabolites called mycotoxins and is frequently found in cereals, oilseeds, spices, and their products. Altered environmental conditions due to climate change can promote the growth and/or toxin production of aflatoxigenic *Aspergillus* spp. leading to elevated health risk in humans and animals. In addition, exposure to AFB₁ during pregnancy pose a significant threat to the developing embryo, because the toxin can cross the placental barrier. The aim of this study was to investigate the harmful effects of non-lethal AFB₁ exposure in zebrafish embryos/larvae applying combined molecular, toxicological and immunological methods. We performed Fish Embryo Acute Toxicity (FET) test to determine the sub-lethal (<LC₁₀) concentrations. Next, we investigated morphological malformations, total body length and swimbladder area following 120 hours toxin exposure at four different sub-lethal AFB₁ concentrations including 0.1, 0.075, 0.05 and 0.025 mg/L. Drastic malformations have not been observed at the selected concentrations, however, both reduced total body length and decreased swimbladder area were detected. Next, we performed global transcriptome analysis in whole larvae to identify AFB₁ exposition-regulated molecular pathways. Our *in silico* gene ontology (GO) enrichment analysis showed that the inflammation-linked pathways were significantly enriched among AFB₁-induced genes. Therefore, we characterized the AFB₁ exposure-associated immunomodulatory effects in zebrafish embryos/larvae using neutrophil granulocyte-specific Tg(mpx:EGFP) zebrafish line and fluorescence-based measurement of nitric-oxide production. Sub-lethal AFB₁ exposition induced an altered, diffuse distribution of neutrophil granulocytes in the whole larvae and significantly increased the nitric-oxide production, especially in the abdominal region of the 120 hpf larvae. Finally, we wanted to examine AFB₁ exposure-modulated neutrophil granulocyte migration in tail fin transection model of local inflammation. Interestingly, decreased neutrophil granulocyte number was observed at the site of injury in the AFB₁-treated zebrafish larvae. Taken together, our findings suggest that sub-lethal AFB₁ exposure has a significant impact on innate immune system through induction of systemic inflammation and modulation of neutrophil response to a local injury in zebrafish embryos and larvae.

Keywords: *aflatoxin B₁, zebrafish, inflammation, embryonic exposure, innate immune system*

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Pomegranate (*Punica granatum*) as a source of natural antioxidant for meat products

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Supervisor: doc. Ing. Marek Bobko, PhD.

In the last decade, there has been an increasing number of voices demanding fewer synthetic additives in food and their elimination or at least substitution for natural-based alternatives. The meat industry is no different. In this food industry, antioxidants are the most common additives, especially in meat products such as sausages or hams. Oxidation of lipids are the prevalent reason for spoilage of such products; therefore, antioxidant addition is necessary. However, synthetic antioxidants such as BHT (Butylated hydroxytoluene) are raising health concerns in the eyes of the public and researchers. The industry is therefore looking to replace such substances with natural, primarily plant-based alternatives.

In our study, we selected pomegranate (*Punica granatum*) as a potential resource of natural antioxidants. We based our selection on various research papers reporting strong antioxidative properties of pomegranate fruit and detailed description of polyphenolic composition.

We prepared traditional Slovak sausages (Bratislavské párky) with the addition of 5 mL pomegranate juice and extracts from peel and seed to compare with negative control during the storage period of 21 days. We aimed to determine if those additions could enhance the product's shelf-life without decreasing sensory quality.

A comparison of pH values of the final meat product showed no significant variance ($P < 0.05$) in either measurement. The development of pH values of experimental groups copied the negative control and did not significantly deviate.

Regarding MDA creation in samples, the highest increase was measured, as expected, in negative control – 134% increase. Then followed 5 mL juice addition (106%), seed extract addition (86%) and peel extract addition (only 69% increase). Therefore, peel extract proved to be significantly ($P < 0.05$) more effective than any other addition.

Sensory analysis at the end of the storage period showed slight variance in all experimental parameters – appearance, taste, aroma, color, and consistency. The negative control group obtained the highest score, but the differences between the negative and experimental groups were insignificant ($P < 0.05$).

In our work, we proved that pomegranate (*Punica granatum*) has great potential as an antioxidant for the meat industry. In various forms, it can potentially delay lipid oxidation processes without altering the sensory quality or pH of the final product. However, more profound inter-discipline research is still needed.

Keywords: *meat product, antioxidant, pomegranate, sensory quality*

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Antimicrobial effect of edible coatings enriched with bioactive peptides applied to pork meat stored under freezer conditions

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Supervisor: prof. Ing. Jozef Golian, Dr.

The aim of the work was to analyze the antimicrobial effect of edible coatings consisting of a combination of chitosan, furcellaran, carp skin gelatin hydrolysate and two bioactive peptides LL37 and RW4 on pork loin samples stored at -18°C for 6 months. The analyzed meat samples were divided into four categories based on the applied coating as follows: control samples without coating, samples with coating without added peptide, samples with coating with added peptide LL37 and samples with coating containing RW4 peptide. Samples were analyzed on day 0 and subsequently at 2 monthly intervals. Before performing the individual analyses, the samples were thawed at 4 °C. Microbiological analyses were performed for total aerobic bacteria counts, *Pseudomonas* spp., fungi and yeasts and psychotropic bacteria; determination of reactive thiobarbituric acid compounds spectrophotometrically; and analyses of pH and water activity. All samples were analyzed in triplicate. The obtained results were statistically processed using STATISTICA 13.0. All coatings used exhibited antimicrobial properties by partial or complete inhibition of microbial growth of all microorganisms analyzed compared to control samples. The initial values of the water activity of the samples tested were 0.9985, with an expected gradual slight decrease over the storage period, which was not affected by the coatings in question. Similarly, the effect of the coatings used on the pH change was not observed. The initial pH values of the samples were 5,66 and during the storage period the pH values ranged from 5,39 to 5,70. A statistically significant difference from the control after two months of storage was only measured for the sample with the coating containing the RW4 peptide. The TBARS content of the samples analyzed on day 0 was 0.15 mg/kg. The greatest increase was observed after two months of storage, with values ranging from 0.16 to 0.22 mg/kg. Subsequently, the greatest decrease in TBARS was recorded after 4 months of storage, when the values of the samples ranged from 0.03 to 0.07. After 6 months of storage, there was again an increase in the values compared to the results from the fourth month of storage, but the values were not statistically different from the values measured at day 0 except in case of sample with coating obtained peptide LL37, which value was statistically significantly different but in favor in terms of antioxidative effect, because the amount of TBARS was lower. Also, most of the results indicate that the coatings in question had no effect on the changes in TBARS values compared to the control samples. Otherwise, the coatings used had no effect on the evolution of TBARS values, as there was no statistically significant difference between the samples with coatings and the control samples at each monthly analysis interval

Keywords: *edible coatings, bioactive peptides, active packaging*

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Microbiological quality of bee products

Viktória ZACHAR LOVÁSZOVÁ

Supervisor: doc. Ing. Simona Kunová, PhD.

The aim of the work was to evaluate the microbiological quality of bee products. We focused on determination of the total plate count (TPC), the number of coliform bacteria (NCB), the number of filamentous microscopic fungi (FMF) and lactic acid bacteria (LAB). We evaluated the microbiological quality of honey, bee pollen, propolis and royal jelly. We evaluated eight samples of bee products from 2021 and eight samples of bee products from 2022. The samples were from our own production.

The average TPC value in the honey samples taken in 2021 was 2.05 log CFU/g, in 2022 was 1.22 log CFU/g. The average TPC value in the bee pollen samples taken in 2021 was 2.46 log CFU/g, in 2022 was 2.40 log CFU/g. The average TPC value in the royal jelly samples taken in 2021 was 1.99 log CFU/g, in 2022 was 1.04 log CFU/g. The average TPC value in the propolis samples taken in 2021 was 2.13 log CFU/g, in 2022 was 2.28 log CFU/g. The average NCB value in the bee pollen samples taken in 2021 was 2.02 log CFU/g, in 2022 was 1.08 log CFU/g. We did not detect any colonies of coliform bacteria in the analysed samples of honey, royal jelly and propolis. The average FMF value in the honey samples taken in 2021 was 0.69 log CFU/g, in 2022 was 1.55 log CFU/g. The average FMF value in the bee pollen samples taken in 2021 was 2.41 log CFU/g, in 2022 was 2.43 log CFU/g. The average FMF value in the propolis samples taken in 2021 was 1.46 log CFU/g, in 2022 it was 2.28 log CFU/g. The royal jelly samples did not contain FMF. The average LAB value in the bee pollen samples taken in 2021 was 1.04 log CFU/g, in 2022 was 1.65 log CFU/g. The average LAB value in the propolis samples taken in 2021 was 1.04 log CFU/g, in 2022 did not detect any colonies of lactic acid bacteria. In the honey and royal jelly samples we did not determine any colonies of lactic acid bacteria. All results obtained by the analysis are within the norm. Each sample of honey meets the requirements of the decree of the Slovak Republic.

Keywords: *bee products, TPC, NCB, FMF, LAB*

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SECTION

Technology, quality and safety of raw materials and foodstuffs of plant origin

Analytical strategy for identification of unknown transformation products of mycotoxins after their decontamination by Pulsed Electric Field technology

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Mycotoxin contamination of cereals is a problem of a global scope. Different decontamination technologies are in use today, from simple non-destructive ones such as sorting and sieving, to more sophisticated physical methods exploiting irradiation, ultrasound, cold plasma or a pulsed electric field (PEF). Our recent research on this topic revealed significant influence of PEF on decontamination of mycotoxins present in cereals. The overall reduction of trichothecenes, zearalenone, enniatins, beauvericin, and tentoxin in barley was up to 31, 48, 84, 36 and 46%, respectively. For the majority of mycotoxins, decreases were also observed in water, whereas for type A trichothecenes, zearalenone, enniatins, and beauvericin, increases up to 130, 123, 629 and 192% occurred, probably associated with facilitated extraction from the matrix (100% = mycotoxins rinsed into water independent of PEF treatment). As we found out, besides the increased extractability into the electrolyte (water), the major reason of mycotoxins' reduction was their degradation and/or transformation into the different reaction products. As the identification and characterization of these unknown reaction products is of a major importance in terms of follow up toxicity and risk assessment, we developed an analytical strategy enabling characterization and confirmation of these products by using the tools of advanced analytical chemistry, including the *in silico* modelling and high resolution mass spectrometry (HRMS). For creating the database of predicted reaction products, Zeneth software was used, and these compounds were further pre-screened by ultra-high performance liquid chromatography coupled with Q-orbitrap HRMS. Positive hints of this pre-screening were further verified by evaluation of their retention times, and compliance of their HRMS/MS spectra with the *in silico* predictions. The determined degradation / transformation products of mycotoxins were mostly products of hydrolysis, elimination and/or oxidation.

Keywords: *mycotoxins, pulsed electric field, degradation, transformation, high-resolution mass spectrometry*

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Antioxidant activity and bioactive compounds of garlic (*Allium sativum* L.) cultivars

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Garlic (*Allium sativum* L.) is used worldwide as food and as a treatment for various conditions. The therapeutic effects of garlic are mainly due its bioactive compounds, such as organosulfur compounds, phenolic compounds, and saponins. The content of phenolic compounds in garlic is affected by genetic factors and growing conditions, but also by the storage conditions and technological processing. Therefore, it is important to recognize garlic cultivars with high antioxidant activity and phenolic content. Seven garlic cultivars, namely Bjetin, Eden Rose, Garpel, Havran, Mojmir, Novozamocky, and Lumir were analysed in the presented work. Samples were provided by the Experimental Garden of Slovak University of Agriculture in Nitra. This work aimed to determine the total polyphenol content, total flavonoid content, and antioxidant activity of selected garlic cultivars. Analysed parameters were analysed by the UV-VIS spectrophotometry methods. Total polyphenol content (TPC) measured by Folin – Ciocalteau assay ranged from 367.11 to 472.11 mg GAE.kg⁻¹ (gallic acid equivalent) FW (fresh weight). Total flavonoid content (TFC) measured by aluminium chloride assay ranged from 7.49 to 11.24 mg CE.kg⁻¹ (catechin equivalent) FW. Antioxidant activity measured by ABTS assay (AA ABTS) ranged from 0.91 to 1.76 mmol TE.kg⁻¹ (Trolox equivalent) FW. Antioxidant activity measured by FRAP assay (AA FRAP) ranged from 0.51 to 1.05 mmol.kg⁻¹ FW. Statistical analysis was performed using jamovi software. Statistical differences in TPC were observed between cultivars Bjetin and Garpel ($p = 0.047$), Garpel and Lumir ($p = 0.028$), Garpel and Mojmir ($p = 0.001$), and Mojmir and Novozamocky ($p = 0.016$). Statistical differences in TFC were observed between cultivars Bjetin and Garpel ($p = 0.003$), and Garpel and Mojmir (0.029). Statistical differences in AA ABTS were observed between cultivars Garpel ($p = 0.04$), Garpel and Mojmir ($p = 0.002$), and Havran and Mojmir ($p = 0.028$). Statistical differences in AA FRAP were observed between cultivars Bjetin and Garpel and Lumir ($p = 0.009$), Garpel and Mojmir ($p = 0.002$), and Mojmir and Novozamocky ($p = 0.006$). High positive correlations ($p < 0.001$) were determined between TPC and TFC (Pearson's $r = 0.792$, Spearman's $\rho = 0.746$), TPC and AA ABTS (Pearson's $r = 0.909$, Spearman's $\rho = 0.862$), TPC and AA FRAP (Pearson's $r = 0.916$, Spearman's $\rho = 0.922$), TFC and AA ABTS (Pearson's $r = 0.782$, Spearman's $\rho = 0.792$), TFC and AA FRAP (Pearson's $r = 0.793$, Spearman's $\rho = 0.808$), and AA ABTS and AA FRAP (Pearson's $r = 0.917$, Spearman's $\rho = 0.896$). Based on the results, we can state that garlic is natural source of bioactive substances, and their content influenced by its cultivar.

Keywords: *Allium sativum* L., garlic, polyphenols, flavonoids, antioxidants

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Decaffeination and heat treatment and their effect on the content of volatiles in *Coffea arabica*

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Coffee quality is a crucial attribute of customers' preferences. Sensory and chemical composition are highly correlated. One of the most intriguing characteristics of coffee is its aroma, which develops thanks to volatile compounds. These compounds are secondary metabolites, and their structure is mostly derived from fatty acids, isoprenoids, phenylpropanoids, and amino acids. It is necessary to understand changes caused by technological steps. Thus, we aimed to observe the impact of decaffeination using CO₂ and the medium roasting process, which is the most preferred among consumers on volatiles. While decaffeination, green coffee beans are soaked in highly compressed CO₂, which extracts the caffeine. The caffeine is then removed from the CO₂ using activated carbon filters. Using gas chromatography (GC-MS), we analyzed a sample of *Coffea arabica* from Colombia, microlot Finca Sofia, altitude 1500 meters above mean sea level and wet post-harvest processing. To better understand the changes in volatiles, we analyzed green beans (GC), decaffeinated green beans (GCdecaf), medium roasted beans (RCm), and medium roasted, decaffeinated beans (RCdecaf). All samples were obtained from Barzzuz Ltd. (Banská Bystrica, Slovakia). We divided detected volatiles into the following groups: furan and derivatives, aldehydes, alcohols, terpenoids, organic acids and esters, hydrocarbons – alkanes, alkene, alkynes, and aromatic hydrocarbons, heterocyclic compounds, ketones, and nitriles. The most significant changes were within furan and derivatives, where GC and GCdecaf contained only 2.6% and 4.7%, respectively, but roasting and decaffeination caused an increase to almost 40%. The most abundant were furfural, 2-furanmethanol, and 2-furanmethanol acetate. Organic acids significantly decreased from 42% in GC, to 28.2% in GCdecaf, 12.9% in RCm, and 9.9% in RCdecaf. Terpenoids were almost totally degraded due to roasting and decaffeination. The group of heterocyclic compounds significantly increased after roasting and decaffeination, from 3.6% in GC to 12.9% in GCdecaf, and 29.2% in RCm. However, a decrease was observed in RCdecaf, 26.97%. The ketones group was abundant in RCm and RCdecaf, 7.6% and 11.9%, respectively. ANOVA Duncan test proved a significant difference ($p < 0.05$) in all above-mentioned groups regarding each processing. Linear Discriminant Analysis and Principal Component Analysis further showed that furan derivatives, heterocyclic compounds, ketones, and nitriles were the most significant groups regarding the ($p < 0.001$) differentiation of coffee processing.

Keywords: *volatiles, Coffea arabica, decaffeination, roasting*

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The content of vitamin C in selected types of fruit

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Vitamin C or L-ascorbic acid is the most important vitamin in human nutrition. It is a cofactor in many enzymes and is an essential antioxidant molecule in the metabolism of plants and animals. The main sources of ascorbate are fruits and vegetables, which represent a significant part of the human diet because as a result of mutations in the coding, the ability of some organisms to synthesize ascorbate has been lost. Therefore, we focused on the solution of this vitamin in different types of fruit: cornelian cherry (*Cornus mas* L.), service tree (*Sorbus domestica*), medlar (*Mespilus germanica*), pawpaw (*Asimina triloba*), persimmon (*Diospyros kaki*) and Japanese pear (*Pyrus pyrifolia*). All types of fruit were grown in Slovakia. Fresh samples were extracted in 3% metaphosphoric acid for 3 minutes in an ultrasonic bath. The content of vitamin C in the fruit was ensured by the HPLC system Waters Separations Module 2695 with UV detector 2996. The identification was carried out by comparing the retention time of the analyte in the analyzed sample with the retention time of the calibration standard. Quantification was performed by the external standard method using the calculation of the concentration of vitamin C in the samples. The vitamin C content reached values from 31.46 µg/g (*Pyrus pyrifolia*) to 1119.61 µg/g (*Sorbus domestica*). In cornelian cherry (*Cornus mas* L.) the average content of vitamin C was 177.54 µg/g. The content of vitamin C in medlar (*Mespilus germanica*) reached the value of 73.40 µg/g, in pawpaw (*Asimina triloba*) the average content of ascorbate was 127.84 µg/g. The value of L-ascorbic acid in persimmon (*Diospyros kaki*) was 72.24 µg/g. According to our results, the observed fruit species are a rich source of vitamin C, and therefore more attention should be paid to their consumption and species conservation.

Keywords: *vitamin C, fruit, HPLC*

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Effect of different post-harvest processing on the sensory profile of *Coffea Arabica*

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This research aimed to examine all types of coffee processing (dry, pulped natural, and wet) and their impact on the sensory properties of coffee beans. Samples of green *Coffea arabica* were purchased from Barzzuz Ltd. (Banská Bystrica, Slovakia). This company imports and processes coffee. We analyzed samples from Brazil. A total of 6 samples in green and roasted form. A sensory panel of pre-selected persons analyzed selected parameters of green and roasted coffee. Our main aim was to compare the sensory parameters and point out the variability caused due to the processing method. A modified point test with nominal 3-point selected sensory parameters (color, aroma, and beans' uniformity) was performed. The aroma was determined in ground coffee and whole beans. The results were used for statistical evaluation – Principal Component Analysis, Linear Discriminant Analysis, and ANOVA. A total of 12 people were included in the sensory evaluation, 6 of whom were laymen evaluators, and 6 were from the "selected assessors" category (6 men and 6 women), while only 1 was a smoker and one did not drink coffee regularly. The results of the sensory evaluation are processed after conversion to electronic forms for the needs of non-parametric tests. The rating was analyzed using the Friedman test at the significance level ($\alpha = 0.05$) in the SensoMiner program version 1.4. Significant differences between individual processing of green coffee beans were observed in all parameters in addition to the aroma (ground). The highest values of color (3.22) and aroma (ground) was determined in the natural processing of green beans. The aroma of beans (1.73) were the highest in the wet-processed green beans. The roasted beans had the highest value of color (2.91), and aroma (ground and whole beans in wet processing). Pulped natural processing had the highest value regarding beans' uniformity (2.07). Roasting caused the significant difference in all analyzed parameters. We observed accurate sample group distribution based on parameters and processing based on PCA and LDA maps. The result revealed that different post-harvest processing factors significantly influence the coffee sensory quality, particularly color, aroma (grinding and whole beans), and uniformity. Different processing created specific coffee characters and influenced the organoleptic properties.

Keywords: *Coffea arabica*, green coffee beans, medium roasted, sensory, post-harvest

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Quantification of conjugated type A trichothecenes in cereals using immuno-affinity clean-up and enzymatic hydrolysis

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Mycotoxins are toxic secondary metabolites produced by microscopic filamentous fungi that contaminate various crops. They can occur in free forms, whose significant representatives are routinely monitored, or in modified forms, which, however, have not yet been sufficiently investigated and their analytical standards are not available in most cases. An important group of modified mycotoxins are conjugated mycotoxins, which can be formed, for example, by conjugation with glucose during plant detoxification processes already in the pre-harvest period. Currently, increasing attention has been paid to conjugated mycotoxins in plant-based foods because of their assumed bioavailability and health risks. Our study presents a method for efficient pre-concentration of type A trichothecene glycosides using immuno-affinity columns (IAC), followed by indirect determination after enzymatic hydrolysis. Analytical determination of both free and glycosylated mycotoxins was performed by ultra-high performance liquid chromatography coupled with high-resolution tandem mass spectrometry (U-HPLC-HRMS/MS). This method was then applied to 52 various oat-based products. In these products, T-2 and HT-2 were quantified in 92% of samples (in the range <0.2–31 µg/kg and <0.2–128 µg/kg, respectively). T-2-monoGlc, HT-2-monoGlc and HT-2-diGlc were detected in 69%, 92% and 38% of the samples, respectively. The most contaminated food categories were conventional oat flakes, followed by oats and oat flours. After enzymatic hydrolysis, the HT-2 content was overestimated in the range of 0–129%, with an average of 20% (for all 52 samples). The proportion of HT-2 hidden in the ‘masked’ forms is rather higher than was considered by European Food Safety Authority in 2017 for the purpose of health risk assessment (10% for the sum of HT-2 and T-2).

Keywords: *HT-2 glycosides, T-2 glycosides, immuno-affinity clean-up, enzymatic hydrolysis, high-resolution mass spectrometry*

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Effect of vacuum frying on the sensory attributes of potato chips from different varieties

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Our work focused on the sensory evaluation of vacuum fried potato chips prepared using different potato varieties. Vacuum frying represents a modern and healthy way of preparing potato chips using less fat, resulting in a lower acrylamide content in the chips. Selecting a suitable potato variety is an essential part of the technological process. We analyzed seven varieties (Melody, Manitou, Chateau, Annabelle, Agata, Colomba, Taisiya). Eight parameters (nine-point scale) were evaluated by sensory analysis (crispness, flavor, sweetness, color, potato flavor, overall taste, aftertaste, and overall impression). A total of 10 trained assessors participated in the evaluation. Regarding the color of the potato chips, the darkest (the brownest) chips were those of the Agáta variety. On the other hand, the lightest (yellow) was the Annabelle variety. Chateau and Taisiya scored the highest in the overall flavor trait, while Melody, Agata, and Manitu scored the lowest. Based on the overall evaluation of the selected chips prepared from the seven yellow potato varieties, we observed that the best chips were those of the Taisiya and Chateau variety (score 6,2). The worst variety for vacuum frying was Melody (score 4,9). For potato chip manufacturers, the choice of potato varieties is a main factor that affects the flavor and quality of the final potato chips. Vacuum frying has several advantages: by vacuum frying, we can reduce the oil content of the fried product. This heat treatment gives the product its natural color and flavor. Another crucial attribute influencing consumer preferences is the variety of potatoes used, which significantly influences the essential sensory parameters of the final product.

Keywords: *potatoes, varieties, vacuum frying, sensory evaluation*

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