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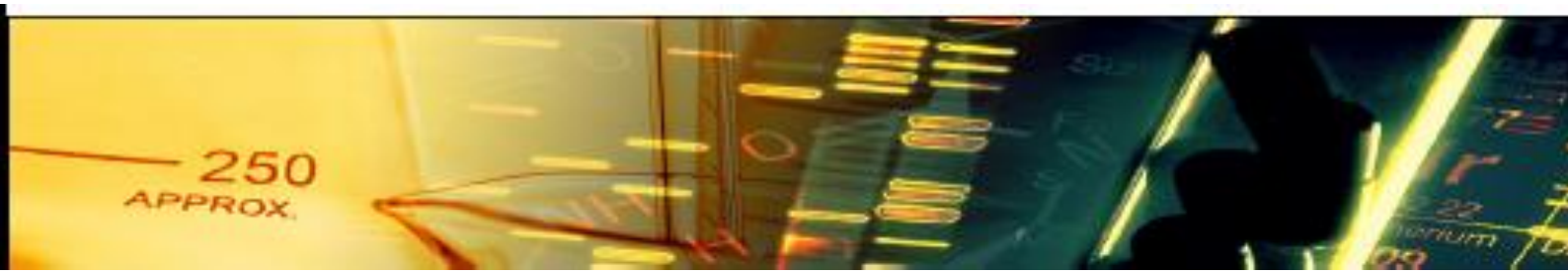

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ABSTRACT BOOK

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Oral presentation

The Impact of Fermentation Process on Bee Pollen Antibacterial and Antifungal Activity

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Abstract
Bee pollen is one of the most appreciated and oldest natural products, which chemical composition represents as a source of bioactive compounds that could be used in food industry or medicine [1]. In recent years, biologically active substances of natural origin focused a great interest of fermentation bioprocesses, which have persisted a main possibility in assay to increase a chemical variety or quantity [2]. Most of the bee pollen properties are influenced by considerable amount of phenolic compounds, mainly flavonoids, which is considered as the main reason for its antimicrobial properties [1]. The aim of this research was to determine the effect of fermentation process of bee pollen on its antibacterial and antifungal activity. Previous study shows, that solid-state fermentation of bee pollen increases total flavonoid content [3]. To our knowledge, this is the first study about the evaluation of antibacterial and antifungal activities of fermented bee pollen. Five samples of bee pollen were fermented with *L. rhamnosus* and *L. lactis* bacteria for 12 days. Spontaneous fermentation was also performed at the same conditions. Methanolic extracts of fermented and non-fermented bee pollen samples have been tested for antimicrobial activity. The antibacterial activity of bee pollen extracts was evaluated by well diffusion assay against *Escherichia coli, Staphylococcus aureus* and *Micrococcus luteus.* The results were expressed as μg of gentamicin equivalent (GEN) per millilitre of extract. The antifungal activity against mould species, namely *Penicillium roqueforti* and *Penicillium camemberti,* was also evaluated; results expressed in mm of clear zone radius around the well. The positive effect on antibacterial and antifungal activity of solid-state fermentation was revealed. Antibacterial activity of non-fermented bee pollen samples against *M. luteus* ranged from 13.46 ± 0.29 μg/ml (GEN) to 27.89 ± 0.29 μg/ml (GEN), against *S. aureus* – from 11.45 ± 0.29 μg/ml (GEN) to 25.03 ± 0.01 μg/ml (GEN), and against *E. coli* – from 1.75 ± 0.01 μg/ml (GEN) to 15.88 ± 0.01 μg/ml (GEN). Antifungal activity against different mould species did not show relatively high significant difference in non-fermented samples: against *P. camemberti* activity varied from 1.50 ± 0.01 mm to 4.50 ± 0.01 mm, against *P. Roqueforti* – from 3.00 ± 0.01 mm to 6.50 ± 0.01 mm. The antibacterial activity after fermentation increased by 1,6-2 times and the antifungal activity – 2-4 times. The results depended on botanical origin of bee pollen, the type of bacteria, which were used for fermentation, and the type of bacteria or fungi, which was used for determination of antimicrobial activity.

Acknowledgements:
This project was financed by Research Council of Lithuania project No. 09.3.3-LMT-K-712-03-0127.
Keywords: bee pollen, solid-state fermentation, antibacterial activity, antifungal activity.

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Oral presentation

Searching for Antibacterial Agents Producing Microorganisms and Evaluation of Their Properties

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Abstract

Lactic acid bacteria and yeast with a wide range of antimicrobial activity can be an effective tool dealing with pathogenic and food spoilage bacteria. Depending on the environment, microorganisms adapt, resulting in different strains that can produce antibacterial substances with different properties. Such substances are bacteriocins and killer toxins [1, 2]. Bacteriocins and killer toxins are important in food industry because microorganisms which produce them are non-pathogenic and normally colonize the human body [3].

The aim of this work is to find lactic acid bacteria and yeast which have antibacterial activity in local raw bioproducts, such as sour milk, whey, bee bread and cottage cheese. All isolated lactic acid bacteria were preliminary identified based on their staining by Gram and catalase test. Morphology (cell form) of yeast colonies were determined using optical microscope. The antibacterial activity of all isolated microorganisms using *S. aureus*, *E. coli*, *M. luteus* and *P. vulgaris* strains was determined by agar well diffusion method [4]. Seven lactic acid bacteria and five yeast strains, isolated from bioproducts, showed different kind of antibacterial activity against all tested pathogenic bacteria strains. The stability of bacteriocins and killer toxins depending on temperature and pH were also estimated. Detailed results of the work will be presented during the conference.

Keywords: lactic acid bacteria, yeast, bacteriocins, killer toxins, antibacterial activity assay, dairy products

Acknowledgement: The research funding was granted by Research Council of Lithuania project 09.3.3-LMT-K-712-03-0131

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Oral presentation

Evaluation of Invasive Species Adaptation by Applying Fluorescence Measurement

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Abstract

The chlorophyll a fluorescence was measured in situ using light-adapted pulse-amplitude modulation method at different plant growth stages during vegetation period in 10 replications every month during plant vegetation period of 2016 in grassland habitats, Kaunas distr., Lithuania. Initial fluorescence (Fs), maximal fluorescence (Fms), the maximum photochemical efficiency of PSII (Fv/Fm), photochemical quenching (ΔF) were measured to evaluated light efficiency in PSII.

Between species, the lowest determined Fs and Fms emissions were in R conf and T offi leaves and indicated the lowest PSII electron transport efficiency than that of F jap and H sosn. The highest Fs means of H sosn and F jap revealed their photosynthetic efficiency and successful adaptation to invaded environment. F jap and H sosn proved the biggest mean ETR of 38.36 and 38.13 μmol m-2 s-1. Lower values of mean photosynthetical activity, i.e. ETR of 35.35 and 35.74 μmol m-2 s-1 were determined for species with smaller bodies T offi and R conf, respectively. Y is a sensitive indicator of photosynthetic stress was the highest for F jap (0.762 μmol m-2 s-1) and H sosn (0.758 μmol m-2 s-1) and exhibited the lowest their stress and the highest adaptation facilities to new environment. R conf and T offi exhibited smaller Y values than former species which ranged between 0.710 and 0.702 μmol m-2 s-1. The biggest absorbed mean photon energy by PSII of 1327.58 and 1301.34 μmol m-2 s-1 revealed the most photo-productive species, i.e. F jap and H sosn. Light induced fluorescence parameters varied through growth period due to abiotic conditions and plant growth stage. Recorded high values of main fluorescence parameters confirm good physiological adaptation of assessed invasive species to new environment of temperate climate in Lithuania.

Keywords: Fluorescence parameters, invasive species

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Oral presentation

Quality of Composts Made From Different Biodegradable Waste

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Abstract

According Eurostat data one habitant from the European Union produced 481 kg municipal waste. Approximately 50 percent of municipal waste consists of biowaste from kitchens and other kinds of household waste [1]. 28 percent of municipal waste is recycled and only 15 percent used for composting. While in Lithuania one habitant produces 433 kg municipal waste of which only 8 percent are used to get compost [2]. It is very important to choose appropriate municipal waste treatment method. Composting of organic waste represents an important and well established part of waste management in Europe. About $9.3x10^6$ tonnes of compost and digestate are produced per year in the European Union member states and most of it is applied to agricultural soil [3]. Depending on the materials used and the composting process itself, the compost obtained contains higher or lower levels of nutrients. It can be used in horticulture, agriculture, gardens, landscaping etc. Utilization of compost and digestate follows the recycling principle and can have positive effects on physical, chemical and biological soil parameters. However, these products might contain significant amounts of pollutants that are introduced to the soil ecosystem by their application. The aim of this study was to investigate quality of composts produced from different biodegradabe waste. Five different type of composts were investigated: green waste, food waste, cattler manure, sewage sludge composts and digestate. Instrumental- chemical analyses of composts were done using international standards and requirements for soil improvement substances. The composts produced from food waste, sewage sludge, manure and digestate had similar contents of total nitrogen; however, plant available water soluble ammonia nitrogen content was the highest in digestate. Sewage sludge compost demonstrated the highest contents of total phosphorus and total sulphur. The maximum content of total and water soluble potassium was observed in manure compost. Having analysed five composts of different origin it was established that none of them exceeded the limits for polychlorbiphenyls (PCB's) recommended for composts used in agriculture. However, the most polluted by heavy metals and PCBs was sewage sludge compost. Food waste and manure composts revealed the minimum contents of heavy metals and PCBs.

Keywords: chemical composition, nutrients, biodegradable waste

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Oral presentation

New Moderator of Depressive Disorder Diagnostic - Facial and Emotional Expressions as Responses to Different Food Taste

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There is a growing body of evidence about the influence of nutrition on mental health, particularly affective symptoms [1]. There is an established influence of nutrition and individual food products on the occurrence, onset, severity, and duration of depressive disorders. Newly developed effective nutritional public health strategies could be the preventive factors of clinical depression [2;3] In a depressed person, a lack of emotions is visible in expression and behavior, with low energy, high tension, weakened sense perception, and loss of food taste. A strong preference for energy-dense foods, fat, and sweet foods; an uncontrolled eating style; satiation; and processes of liking or wanting are indicators of a negative mood. This could be explained by the influences of carbohydrates and proteins on the tryptophan ratio in the brain as well as the effects of such changes on mood and arousal with the individual differences in susceptibility to nutritional effects on mood, emotion, and aspects of brain function [4]. We hypothesize that the measure of a patient's facial expressions and emotional response to different tastes of food can be used as a diagnostic moderator for the development of a new contactless, computer-based diagnostic method for DD. The confirmation of a diagnostic hypothesis of DD using facial and emotional expressions as responses to different tastes of food can shed new perspectives on early contactless, computer-based psychiatric diagnostic strategies and early identification of suicidal tendencies, which is an important issue in public mental health.

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Keywords: depressive disorder, computer-based diagnostic method, food taste, emotion.

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Oral presentation

Xanthohumol Content in Lithuanian Hop (*Humulus lupulus* L.) Varieties

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Abstract

Hop (*Humulus lupulus* L.) is a dioecious perennial plant which is probably the most frequently used in brewery. However recently hops are analyzed for their potential application in pharmaceutical industry, because hops have various compounds which have antibacterial, anticancer, radical scavenging, peroxide reducing and antioxidant properties [1, 2]. Xanthohumol is a flavonoid, which is found only in hops, recently gained a particular interest of scientists, because it has shown strong anticancer and antioxidant effects. Xanthohumol is mostly found in the cones of hops, but literature data, shows that there is a lower amount of this compound in the leaves of hops [3]. The studies of biologically active compounds in leaves of hops would probably allow to find more applications of hop harvest as a big amount of hop leaves that are harvested each year are assumed to be almost useless. The composition of biologically active compounds depends on the part of the plant, location of cultivar, variety and phase of vegetation. The composition of volatile compounds [4] and concentration of bitter α-acids of Lithuanian hop varieties were analyzed previously [5]. The aim of this study was to evaluate and compare concentration of xanthohumol in leaves and cones of *H. lupulus* L. plant growing in Kaunas Botanical Garden of Vytautas Magnus University, Lithuania. To our knowledge, there is no data about xanthohumol content in Lithuanian hop varieties.

The concentration of xanthohumol was analyzed using high performance liquid chromatography method under isocratic conditions [6]. Results were expressed as percent of xanthohumol in dry weight of plant material. The concentration of xanthohumol in the samples of cones varied between 0.1181–0.2136 % (RSD did not exceed 3.8 %) while the concentration in the leaves was up to 84 times lower.

Keywords *Humulus lupulus*, biologically active compounds, xanthohumol, high performance liquid chromatography

Acknowledgements:

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Oral presentation

Changes In Cell Death And Behaviour Related To Electroporation Induced Extraction Of Molecules

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Electric fields are used for membrane permeabilization by creation of electropores during application of short (ns, μs) high voltage (kv/cm) electric pulses so this phenomena was called electroporation (EP). EP can be employed for various operations and is deffined by what is achieved after application of EP. For instance, electrochemotherapy (ECT) is achieved when electric fields are used together with anticancer drug, electro genetransfection (EGT) when genes are transferred into cells by electric fields, extraction of molecules from cells or tissues (PEF) etc. Despite vast usefull applications EP can cause various side effects. One of the side effects is reduction of cell viability after in vitro and in vivo scale experiments, where very less of mechanisms involved in cell death after EP were revieled till these days. Here we hypothesised that cell viability could be affected due to loss of content of vital biomolecule so called ATP, which is responsible for cellular energetic level and participates in various bioreactions. First of all, we determined that most suitable viability assays for our experiments were flow cytometry and clonogenic tests. Secondly, we created a model for EP based extraction of calcein molecules out of the cells and demonstrated that small molecular mass molecules are being extracted out of the cells after EP. Thereafter, we determined that ATP molecules are being depleted after EP. Moreover, we measured dynamics of CHO cells capability to attach surface of growth dishes which demonstrated cell incapabilty to adhere depending on EP conditions and time post effect. Finally, we demonstrated that cell permeability is time dependent process and not necessary corresponds to cell viability after EP.
It is important to mention that all of our experimental results lead to better comprehension of EP induced changes in cellular viability, stress and behaviour and this is our initial stage of our experimental course towards electro induced immunotherapy.

Keywords: electroporation, extraxtion, cell viability, ATP, cell adhesion, cell permeability

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Oral presentation

The effect of external DNA on the efficiency of bi-directional small molecule electrotransport

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Abstract

Electroporation is a widely used physical method for increasing the cell membrane permeability. After the application of electric pulses, transient electropores are formed, allowing both the leakage of compounds from the cell (electroextraction) and the delivery of small molecules (electrotransfer) and DNA (electrotransfection) to the cell. For certain clinical applications, simultaneous delivery of both small molecules (e.g. anticancer drugs) and DNA could be advantageous. However, the information about the effects of DNA on small molecule transport is very scarce.

We investigated the effect externally provided DNA has on the small molecule transport across electroporated cell membrane. For the determination of electroextraction, we used Chinese Hamster Ovary (CHO) cells loaded with green fluorescent calcein dye, and measured the loss of intracellular calcein fluorescence using flow cytometry. For the determination of small molecule electrotransport, we delivered anticancer drug bleomycin to CHO cells, and evaluated the efficiency of bleomycin electrodelivery using clonogenic assay.

Our results show that both the outward flux of calcein and the inward flux of bleomycin were positively affected by the presence of extracellular DNA during the application of the electric field. These findings suggest that a combined treatment of chemotherapy and gene therapy might be a feasible approach towards the increase in the treatment efficiency of cancer.

Keywords: Eelctroporation, calcein, DNA, belomycin

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Oral presentation
Phytochemical Analysis of Biologically Active Compounds of *Artemisia dubia* Wall. Using Spectrophotometric and Gas Chromatography–Mass Spectrometry (GC-MS) Analytical Methods

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Energy crops are becoming increasingly popular in the modern world. These plants are grown as a cheap and low maintenance alternative for many energy fields. However, many of them are not examined well (because their only purpose is to obtain energy), but they can also accumulate many other valuable substances that can be used to improve the quality of life, for example, in the field of health improvement. One such plant is from the *Artemisia* tribe - *Artemisia dubia* Wall. (1)

The aim of this investigation was to identify biologically active compounds, antioxidant activity and volatile compounds of *Artemisia dubia* Wall. *A. dubia* was collected from three different experimental areas with fertilization type: non-fertilized and fertilized with two mineral nitrogen fertilizers of different nitrogen amount: N_{90} fertilizer and N_{170} fertilizer, during different period of vegetation: beginning of blossoming, mass blossoming, end of blossoming (2). Samples were obtained from two different regions of Lithuania: Akademijos, Kedainiai district. (55.3896 ° N, 23.8624 ° E) and Vėžaičiai, Klaipėda district. (55.7175 ° N, 21.4713 ° E). Collected raw material was air-dried in Lithuanian Research Centre for Agriculture and Forestry.

In this research, using modified spectrophotometric analysis methods (3) were evaluated the total amount of phenolic compounds (using Folin-Ciocalteu reagent), the total amount of flavonoids (using $AlCl_3$ reagent) and the antioxidant activity (using the DPPH reagent). All the highest values were obtained from samples from Vėžaičiai, in samples with no fertilizers, at the beginning of the blossoming of the *Artemisia dubia* Wall.: the results showed that the biggest amount of phenolic compounds in rutin equivalents (RE) is 103.12 RE mg/g, flavonoids - 13.15 RE mg/g and the antioxidant activity - 56.49 RE mg/g.

For GC-MS analysis samples were prepared using Solid-phase microextraction (SPME), by using SPME device with Stableflex (TM) (gray color) 50/30 micrometers layer PDMS/CAR/DVB fiber (Supelco, USA) (4). For GC-MS analysis gas chromatograph model GC-2010 (Shimadzu, Japan) and mass spectrometer GCMS-QP2010 (Shimadzu, Japan) was used. For separation RTX-5MS (Restek, USA) column with dimensions of 30 m of length, film thickness 0.25 μm, inner diameter 0.25 mm was used. The results showed that the major amount of the identified volatile compounds was trans-sabinene hydrate, eucalyptol, borneol, verbenone, α-terpineol, germacrene D, trans-ocimenone and caryophyllene. There was no verbenone among the volatile compounds of *A. dubia* grown in the Vėžaičiai, but there was found a high amount of trans-ocimenone, which had only a small amount in the *A. dubia* grown in Akademija.

Keywords: *Artemisia dubia*, phenolic compounds, flavonoids, antioxidant activity, spectrophotometry, gas chromatography, mass spectrometry, solid-phase microextraction.

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Oral presentation

Cell survival: Interplay between hypoxia and pre-mRNA splicing

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Abstract

Cancer cells are often confronted with a significant reduction in oxygen availability, which is a major reason for a changeover of major cellular processes.

Hypoxic regions have been identified within all solid tumors and their presence has been linked to malignant progression, metastasis, resistance to therapy, and poor clinical outcomes following treatment. Cellular responses to hypoxia are mediated by hypoxia inducible transcription factors (HIFs). This presentation will focus on currently available data on hypoxia dependent pre-mRNA splicing influence for cell survival under reduced oxygen tension and speculation on biological relevance of cellular adaptation to hypoxic conditions.

Keywords: Cancer, Hypoxia, HIF.

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Oral presentation

Electrospray application for enchanced delivery of anticancer drugs into cells

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Abstract

Electrospray is a process based on applied high electric voltage on liquid, leading to the creation and acceleration of small sized droplets. Electrosprayed suspension with exogenous molecules on cells can trigger intracellular delivery. Here, the application study of anticancer drug delivery via electrospray as an antitumor treatment is presented *in vitro* and *in vivo*.

In vitro experiments were performed on alveolar epithelial cells (A549). Cell viability was performed with flow cytometry assay. Apoptosis/ necrosis was measured using annexin V/PI kit. In vivo experiments were done with C57BL/6J mice. Lewis lung carcinoma (LLC) cell lines were injected intradermally to induce tumor. Electrospray was performed on tumor by cutting the skin. Tumor size was measured with caliper.

Results show triggered PI transfer to cells after electrospray process. Moreover, obtained results *in vitro* showed successful cisplatin and methotrexate intracellular delivery, resulting in around 90 % of cell viability loss with methotrexate and 70 % of cell viability loss with cisplatin. In vivo experiments reveled a tumor decrease by around 2.5 times in 7 days after electrospray treatment at first and third day with both anticancer drugs.

Here we show that electrospray method can be applied to local anticancer drug delivery to cells and tissues. Therefore, such method might be adapted as a clinical anticancer therapy in the future.

Keywords: Electrospray, drug delivery, in vitro, in vivo.

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Oral presentation

Nutraceuticals based on biomodified lupine protein isolates, *Citrus paradise* L. essential oil and xylitol

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Abstract

As an addition to a normal diet, the use of food enriched with functional compounds has become increasingly popular. Alternatively, functional ingredients can be incorporated into nutraceuticals in gummy candies (GC) form. This study aimed to adapt lacto-fermented lupine protein concentrates, as high-quality protein and genistein sources, with *Citrus paradise* essential oil (EO), an antimicrobial and bean taste masking agent, and xylitol, a low glycaemic index sweetener, for preparation of nutraceuticals in GC form. For GC preparation, submerged fermentated with *Lactobacillus sakei* lupine variety Vilniai protein concentrate was selected, which had the highest protein content (90.11%), protein digestibility (89.94%) and genistein content (30.93 μg g^{-1}) and the lowest trypsin inhibitors activity (19.40%), among the concentrates assessed. GC formulated with xylitol, ascorbic acid, grapefruit EO (up to 0.2%) and lupine protein concentrate (up to 13.0%) allowed obtaining products that exhibited a good texture, high overall acceptability and contained desirable functional compounds.

Keywords: nutraceuticals, lupine protein isolates, fermentation, genistein, *Citrus paradise*, xylitol.

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Oral presentation

Enzymatic Cyclodextrin Production by Alkaliphilic Bacteria Isolated from Potato Soil

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Abstract

Raw starch degradation pathway via cyclodextrins (CD) is usually carried out by alkaliphilic bacteria by producing CGTase enzyme. CGTase convert starch and other 1, 4-linked α-glucans to CD, which are featured by hydrophilic outside and hydrophobic central cavity. Because of the ability to form inclusion complexes with various compounds, CD can be used to modify the physicochemical characteristics of low polarity drugs or used as chiral selectors in capillary electrophoresis and chromatography [1, 2].
The objective of our study was to optimize the enzymatic reaction conditions for β-CD production from alkaliphilic bacteria isolated from potato soil and evaluate isolated enzyme stability. Effective CD production from raw sources would allow to reduce high production costs and extend the uses of these cyclic polysaccharides in analytical chemistry, pharmaceutical and food industries. To authors knowledge, no such studies were carried out in Lithuania up-to date.
Previously isolated alkaliphilic bacteria were used for this study [3]. Enzymatic activity was evaluated spectrophotometrically by phenolphthalein assay measuring the quantitative ability to produce CD [4]. One unit of the CGTase activity was defined as the amount of enzyme that catalyzes the production of 1 μmol of β-CD per minute under the reaction conditions. The enzymatic cyclodextrin production was optimized using several reaction conditions. These included the different reaction substrate substituting soluble starch (pea starch, wheat starch, corn starch, potato starch), substrate concentration (0-3% (w/v)), temperature (30-70 °C), pH (4-10) and reaction time (0-120 min.). Isolated enzyme pH stability and thermostability was evaluated *by incubating the sample into various buffer solutions including acetate (pH 4, 5), TRIS-HCl (pH 6, 7, 8) and carbonate (pH 9, 10)* at different temperatures of 20 to 90 °C for 30 min.
The optimal physical conditions for β-CD production were as follows: 1% (w/v) soluble starch as main substrate, incubation temperature of 50 °C, reaction medium pH of 7 and time of 90 min. It was also determined that isolated CGTase retains more than 90% relative activity in pH values from 6 to 8 and 100% at temperature range from 20-50 °C. During the study, enzymatic activity varied from 74.60±3.38 to 205.76±8.91 mU/ml and quantity of produced cyclodextrins varied from 127.00±5.75 to 363.05±16.65 μg.

Keywords: alkaliphilic bacteria, CGTase, cyclodextrin, enzymatic activity, soil, starch

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Oral presentation

Optimisation of DNA Purification Using Silica Anionite as a Solid Phase Extraction Adsorbent

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Abstract

Currently in science there is a growing need of pure and high-quality DNA for experiments[1]. That is why it is important for a DNA purification to be fast, efficient and relatively inexpensive. Therefore, the aim of this study was to create a stationary phase for solid phase extraction (SPE) and purification of DNA.

For this work different adsorbents with attached amino groups were used as solid phase for DNA purification using different routes of synthesis of adsorbent [2] and different DNA loading buffers. Three fractions of one sample have been made – fraction of flow through when loading DNA to the column, fraction of flow through when DNA is washed with wash buffer and fraction of flow through of DNA elution. All fractions were tested using spectrometer for DNA concentration and using horizontal gel-electrophoresis to determine the quality of DNA. It has been determined, that sodium acetate buffer of pH 5.0 was the most successful purification with all adsorbent samples as it contained the least of DNA in DNA loading and DNA washing fractions and had significantly higher amount of DNA in elution fraction.

Keywords: SPE, DNA, anionite, amine group, sodium acetate buffer, electrophoresis.

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Oral presentation

Bacterial Inactivation Using Pulsed Electric Fields

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Abstract

Thermal pasteurization (TP) of milk ensures the safety of the product. However, raw milk loses its valuable nutrients and sensory characteristics due to substantial heat exposure. Pulsed electric fields (PEF) were investigated as an alternative to TP techniques. PEF could be a new quality maintaining pasteurization technique that is safe and cost effective.

Pasteurized and inoculated with E.coli O157:H7 milk (2.5% fat) was PEF-treated with PEF using 20 pulses of 24 kV/cm electric field strengths, pulse duration 25 μs, and compared with inoculated samples TP-treated at 80°C for 20 s; at 65°C for 30 min and combined TP – MF treatment, at 80°C for 20 s with membrane of 0.5 μm. Comparison PEF, TP TP-MF for reduction in count of E.coli in milk, revealed that no colonies of surviving E.coli were detected in TP, TP-MF treated samples. PEF treated samples revealed 0.19% E.coli viability when compared to control ones.

Keywords: bacterial inactivation, electroporation, pulsed electric fields.

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Oral presentation

Application of Extracts from Solid State Fermentation of Wheat Bran by *Pleurotus* sp. in Cosmetics

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Abstract

It is estimated that 11% of world population is over 60 years, therefore it is important to find ways to fulfil a growing demand for cosmetic products, treatments and techniques for an aging population [1]. The aim of this study is to produce extract for cosmetic product applying Solid State wheat bran Fermentation with *Pleurotus ostreatus* and *Pleurotus eryngii* strains. Extracts were prepared using Solid State Fermentation of wheat bran with *Pleurotus* sp. strains and analysed using spectrophotometric methods: ABTS laccase activity assay, total phenolic content determination using Folin-Ciocalteau reagent, total flavonoids content using aluminium trichloride method, DPPH radical scavenging activity assay. Prepared extracts were used for skin lightening creams preparation using laccase as skin lightening agent. Physical and chemical creams properties such as colloidal stability, pH value, viscosity, thermostability were analysed. Highest laccase enzyme activity was obtained in the **H** *P. eryngii* extract: 1.271 ± 0.029 U/ml and **A** *P. ostreatus* 0.474 ± 0.022 U/ml in these extracts lowest phenolic compounds content was calculated, respectively 0.149 ± 0.002 mg/ml RE and 0.153 ± 0.008 mg/ml RE. After SSF phenolic compounds content decreased in all fermented samples and was highest in the non-fermented wheat bran samples M WB sample 0.798 ± 0.027 mg/ml RE and N WB sample 0.723 ± 0.005mg/ml RE. Total flavonoids also decreased in fermented samples. No radical scavenging activity was obtained. For cream preparation **H** *P. eryngii* extract and **A** *P. ostreatus* was used. Both cream composition was stable and suitable for acidic skin pH. However, dermatological and effectivity of laccase as skin lightening agent studies must be made and safety of extracts evaluated in further study. Furthermore, further studies must be made to evaluate optimal SSF conditions to obtain higher laccase activity in *P. ostreatus* extracts and evaluate methodology to obtain higher phenolic compounds content and antioxidant activity.

Keywords: *P. ostreatus*, *P. eryngii*, Solid State Fermentation, cosmetics, laccase.

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Oral presentation
Size Exclusion Capillary Electrochromatography: Development of Separation Method

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Abstract

Capillary electrochromatography is one of the most successful separation techniques. This separation method is a combination of the advantages of high-performance liquid chromatography and capillary electrophoresis where electric field is applied in order to create the flow of mobile phase through small diameter column [1]. This analytical technique is based on separating molecules according to mass and charge ratio and the affinity to the stationary phase. The driving force for capillary electrochromatography is electroosmosis flow, which occurs because of the liquid flow through a porous membrane when electric field is applied. In size exclusion, separation is due to molecular mass difference and uncharged molecules are driven through the column by electroosmotic flow. To our knowledge there is no report of capillary electrochromatography for size exclusion separation of the macromolecules reported yet. The aim of this research was to synthesize homogeneous monolith for the separation of macromolecules using capillary electrochromatography method with contactless conductivity detector and to optimize the separation method [3]. Agarose is a linear polysaccharide polymer that can be used in analytical methods in order to separate molecules [2]. Agarose gel was modified using epoxyamine in 2 % of NaOH medium with $NaBH_4$ additive. The reaction was performed for 24 hours. Modified and 4 % agarose gel were mixed and washed with electrolyte. 75 μm I.D. fused silica capillary was filled with prepared modified agarose gel using pressure and was used for the analysis of 1 % dextran solutions using electrical field. Optimized conditions were: 30 mM acetic acid buffer, pH 3.35 was used as a background electrolyte, applied voltage was 4 kV, total capillary length was 45 cm, capillary length to the detector was 40 cm, separation temperature was 25 ºC, time of the analysis 60 min. The results obtained will be reported in the presentation.

Keywords: capillary electrochromatography contactless conductivity detector, agarose gel, dextran.

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Oral presentation

Acrylic Continuous Beds for Bioseparation: Synthesis and Characterization

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Abstract

Continuous beds, also described as monoliths, are a continuous porous material, that is covalently attached to a capillary wall due to capillary wall modification process. Stationary phase forms micro-, meso-, macropores and has a bimodal pore size distribution [1]. S. Hjerten was the first who published about continuous beds application for high-performance liquid chromatography in 1989 [2]. Due to formed perfusive channels, continuous beds have good hydrodynamic permeability. Monoliths gained a lot of interest because of their benefits against particulate stationary phases. Such advantages are: easy *in situ* preparation, more efficient separation, biocompatibility and more. Their porous morphology can be regulated by many factors during polymerization [3].

The aim of this work was to synthesize acrylic continuous beds, characterize their structure parameters, hydrodynamic permeability and determine how total monomer concentration in polymerization mixture can influence continuous beds morphology. During this work, two stationary phases with different total monomer concentration %T were synthesized: continuous bed S17, which total monomer concentration was 17% and S23, which %T was equal to 23%. Hydrodynamic permeability was determined measuring water flow through capillaries at relative pressure 1 bar/cm. All capillary column and structure parameters were determined by inverse size exclusion chromatography using polystyrene standards. Detailed results of the work will be presented during the conference.

Keywords: continuous beds, acrylate monomers, monoliths, hydrodynamic permeability, inverse size exclusion chromatography.

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Oral presentation

Computer Vision Application for Narcissus Bulb Size Grading

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Abstract

Real-time process control always been an important part of most industrial production areas. Computer vision is one of the most prominent methods for quality control in manufacturing, even more so with the increase in availability of hardware and software components for such task. Main motivation for the implementation of computer vision is economical gain and possible manufacturing process improvement in terms of time efficiency. Despite of tangible evidence of benefits, such quality control and measurement systems are not yet widely adopted in agriculture. During industrial scale narcissus bulb processing, information regarding bulb size is of great importance, needed for sale and replanting management. Earlier collection of such data in the processing pipeline allows for higher economical returns and reduction of manual labor. In this research a computer vision system was developed for the purpose of virtual narcissus bulb size grading on an industrial scale.

Computer vision system was comprised of an Android operating system running device with a camera and image processing software based on Python scripting language. Camera was positioned at a fixed high over a conveyor belt carrying narcissus bulbs. Data for processing was collected as a series still images taken in 30s intervals. System was calibrated to get the pixel/mm ratio in the captured images. Output from the system is the distribution of bulbs by sizes. Bulbs were sized by their circumference in intervals: <8cm, 8-10 cm, 10-12cm, 12-14cm, 14-16cm, >16cm. Different approaches were evaluated for sharpening the edges of the measured objects. Obtained results were expressed as percentage of total number of bulbs measured. For the validation of the results, same bulbs were graded using mechanical grading riddles. A no bigger than 10 % (from the total amount) difference between virtual and mechanical grading results was found. This difference can be explained by the fact that virtual grading evaluates the percentage of bulbs in term of number of bulbs, while mechanical grading evaluates the same percentage in terms of total mass of bulbs graded. Further development of the correction factors (to convert to percentage of total mass) is needed. Even with currently achieved agreement between two methods of grading it is possible to more effective manage bulb processing leading to economical and manual labor savings.

Keywords: Computer vision, quality control, metrology, Narcissus bulbs, produce sorting

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Oral presentation
Phytochemical Analysis of Different Medicinal Herbal Teas and Evaluation of their Microbiological Properties

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Abstract

Natural products with antioxidant properties have been extensively utilized in the pharmaceutical and food industry. Medicinal herbs are safe and have less side effects than chemical treatments. Medicinal herbal tea has a beneficial effect on the health - the containing antioxidants can help to bind free radicals, caused by infectious processes or side effects of medicine. In order to evaluate total content of phenolic compounds, flavonoids and activity three herbal teas have been chosen - "Bronchos", "Hemoranta" and "Diabetoset". Phytochemical analysis has been done using spectrophotometric method with methanol and water extracts. A new QUENCHER procedure was applied in order to achieve better recovery of total content of phenolic compounds in solid substance of different samples. Composition of essential oil components were determined using gas chromatography – mass spectrometry (GC-MS) method, using solid phase microextraction (SPME). Antibacterial activity is assessed using an agar disk and well methods. Bacterial cultures that were used are *Escherichia coli* ATCC 25922 and *Staphylococcus aureus* ATCC 25923.

Keywords: Herbal tea, medicinal herbs, phenolic compounds, flavonoids, antioxidants, spectrophotometer, gas chromatography, quencher, antibacterial activity

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Oral presentation
Effect of Natural Antioxidants on Quality of Cold Smoked Pork Sausages

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Abstract

The taxifolin (TXF) is recently rediscovered as a highly potential antioxidant with reported therapeutic properties. The aim of this work was to evaluate the antioxidant and antimicrobial activity of TXF when it is used together with ascorbic acid (AA), linalool, dipeptide carnosine (CAR), lactic acid (LA) and their mixtures in cold smoked pork sausages during storage. The activity of tested materials against lipid and protein oxidation, the grower of microorganisms and stability of TXF has been evaluated in sausages after 0, 30, 60, 90 and 150 days of storage. The evaluation of TXF stability has been performed by UHPLC analysis. On the 150 day of storage the total amount of TXF was 40% less in sausages with TXF+LA and 54% less - with TXF+AA, comparing with the amounts at 1st day of storage. The retained amount of TXF in the samples without acids was 60% less, comparing with the initial amount. TXF antioxidant capacity (DPPH) was the higher in the samples with LA or AA and effectively inhibited the processes of lipid peroxidation as well as slowed down the rate of lipolysis. Moreover, TXF mixtures with acids reduced the number of total aerobic bacteria, mold and yeast during storage of sausages. The outcome of this study can help develop new meat products with better nutritional quality and beneficial health properties.

Keywords: cold smoked sausages, taxifolin, ascorbic acid, lipid oxidation.

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Oral presentation

Development and Characterization of the Gummi - Supplements, Enriched with Probiotics and Prebiotics

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Abstract

The aim of this study was to develope gummi - supplements based on probiotics (*Lactobacillus plantarum* LUHS135 and *Lactobacillus paracasei* LUHS244), prebiotics (psyllium husk), and apple pomace as an pectin source, and to evaluate viable lactic acid bacteria (LAB) count, total phenolic compounds (TPC) content, antioxidant activity, colour coordinates, texture parameters, and overall acceptability of the developed gummi - supplements. In addition, antimicrobial properties of the used LAB strains and their composition against *Pseudomonas aeruginosa*, *Proteus mirabilis*, *Escherichia coli*, *Salmonella enterica*, *Staphylococcus aureus*, *Enterococcus faecalis*, *Streptococcus mutans* were investigated. Significant influence on TPC content has agar/gelatin selection, and the antioxidant activity of gummi - supplements was depended on the strain of LAB, and the use of psyllium husk. LUHS244 inhibited all the tested pathogenic strains. The developed gummi - supplements formula simply allowed to produce higher value products with high content of the viable probiotic cells, without specific processing steps.

Keywords: gummy- supplements, probiotics, prebiotics.

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Oral presentation

Multistage Solvent Extraction Influence on *Artemisia Dubia WALL.* Biomass Characteristics

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Abstract

In recent years, there has been increasing interest in the use of agricultural biomass for energy purpose in many northern countries. This has created demand for novel, high biomass yielding, specific quality crops for sustainable use.[1] Artemsia dubia Wall., also known as mugworth, is a grass plant, with a very high growth yield and is currently being considered as one of the more popular biofuel alternatives. The purpose of the research is to maximize the use of this plant by adding an additional biotechnological step to the equation - extraction. Using Thermal equipment research and testing laboratory standards and equipment, thermal capabilities, moisture and ash content was determined. As for the extracts gotten from solvent-solvent extraction, it was seen that small concentrations of both polar and nonpolar fractions are required to trigger noticeable allopathic activates on *Lepidium sativum* seeds germination and growth. Also the phenolic contents of these fractions were determined, noticing low doses of phenols in non-polar solvents to those of polar ones. Finally, thermal capabilities, together with organogenic and ash content decreased significantly after solvent extraction.

Keywords: mugworth, solvent fractionation, multiple extraction, downstream biotechnology, Artemisia dubia Wall., biomass, biofuel, phenolic content, allelopathy.

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POSTER PRESENTATIONS

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Poster presentation

Whole Genome Sequencing of Ciprofloxacin and Ceftriaxone Resistant *Campylobacter jejuni* MM26-781 Assigned to Novel ST Isolated from Wild Bird in Lithuania

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Abstract

Whole genome sequencing (WGS) is a tool which has increased our understanding of the evolutionary and epidemiological dynamics of *Campylobacter jejuni*.

The aim of this study was whole genome sequencing of *Campylobacter jejuni* MM26-781 isolated from wild bird in Lithuania, assigned to novel ST-6424 (CC179), to detect genetic variations and better understand the molecular mechanisms that govern antimicrobial resistance.

The draft genome sequence contained 1.68 Mbp, comprising 1,651 coding genes, 40 tRNAs, 1 rRNAs and 69 pseudogenes with an average G+C content of 30.4 %. The RAST annotated a total of 305 subsystems in the genome of *C. jejuni* MM26-781 strain, with the maximum number of genes associated with amino acids and derivatives metabolism (18.93%) and protein metabolism (14.43%). Among Virulence, Disease and Defense subsystem identified by RAST we identified a number of antimicrobial resistance genes. These included *CmeABC* multidrug efflux pump and *CmeR* transcriptional repressor, various families of multidrug resistance efflux pumps (*CmeA, CmeB, CmeC, MATE, MFS, MacA, MacB, RND, AcrB, OM*) fluoroquinolone resistance (*gyrA, gyrB*) and β-lactamase. Further investigation of the genome with the ResFinder 3.0 tool identified resistance gene *blaOXA-448* (encoding β-lactamase), five amino acid changes in *gyrA* gene and two amino acid changes in *CmeR* gene. Without these antimicrobial factors, *C. jejuni* MM26-781 also harbored a distinct Crispr (clustered regularly interspaced palindromic repeats) system between 86215 and 86580 bp, with 14 Crispr repeats (GTTTTAGTCCCTTTTTAAATTTCTTTATGGTAAAAT) and genes encoding *Cas1*, *Cas2* and *Csn* family proteins and one possible Crispr between 307644 and 307731 bp. The draft genome sequences of *C. jejuni* MM26-781 have been deposited to GenBank (NCBI) under the accession number PYWT00000000.

Keywords: WGS, *C. jejuni*, *blaOXA-448, gyrA*, antimicrobial resistance.

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Poster presentation

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Total phenolic content differences between healthy and infected lettuce

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The aim of the study was to compare the total phenolic content in healthy and infected by pathogen *Botrytis cinerea* lettuces. As it is known, plants are sensitive to infections caused by pathogens similarly to animals or humans. Therefore, photosynthesis executors developed defence mechanism during evolution. Secondary metabolites such as phenols act as protection from pathogens and UV. According to what is the total phenolic content in the plant is possible to indicate plant's immune system status and biotic or abiotic stress level.

'Lollo Bionda' and 'Lollo Rossa' lettuces (*Lactuca sativus* L.) were grown for 5 weeks in the growth chamber. Day/night temperatures of 21±2 / 17±2 °C were established with a 16-h photoperiod and relative humidity of 50–60 %. The single-spore *B. cinerea* isolate LT13B_FRA_76 maintained on Potato Dextrose Agar (PDA) at 22 ˚C in the dark for 7 days. The 50 mm diameter isolate was used for inoculation of plants. Measured total phenolic content by spectrophotometer of healthy and infected lettuce for 10 days lasting experiment every day.

As expected our experiment demonstrated the total phenolic content is increasing in infected green and red leafy lettuces after 24 hours of inoculation. Our results confirmed by the literature that induced phenolics synthesis is often enhanced under biotic or abiotic stress. The total phenolic content of healthy and infected 'Lollo Bionda' and 'Lollo Rossa' lettuces dramatically decreased on the 3rd day of artificial infection. After this decreasing phenolic content of 'Lollo Bionda' started to increase till the next day and on the 6th day of experiment healthy and infected lettuce phenolic content reached the same concentration level, respectively the phenolic content of 'Lollo Rossa' lettuce reached it on the 9th day of research. The results showed differences of phenolic content between uninfected and infected green leafy lettuce after 6 days of inoculation, respectively 0,62 and 0,97 mg g^{-1} and red leafy lettuce after 5 days of inoculation, respectively 0,93 and 1,11 mg g^{-1}. To sum up phenolic content observing is quite a good approach for early disease detection and it gives useful information about plant 's immune system status, but further researches need to be done.

Keywords: phenolic content, inoculation, *Botrytis cinerea*, lettuce

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Poster presentation

Qualitative and quantitative composition variability of triterpenic compounds in apple's samples of cultivars grown in Lithuania

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Introduction. Apples are among the most commonly consumed fruits in the world [5]. It is an important source of various biologically active compounds for the human body. Apples are rich in phenolic compounds, organic acids, vitamins, micro- and macro-elements, dietary fiber and triterpenic compounds [4]. Pentacyclic triterpenic compounds detected in apples, have antibacterial, antidiabetic, anti-inflammatory, antiviral, cholesterol lowering, gastroprotective, hepatoprotective and hypolipidemic effects [1–3]. Triterpenic compounds inhibit inflammation enzymes: nitric oxide synthetase, 5-lipooxygenase and cyclooxygenase-2 [6, 7].

The aim of this research – to determine qualitative and quantitative composition variability of triterpenic compounds in apple fruit samples of cultivars grown in Lithuania.

Tasks:

1. Selection extraction conditions of triterpenic compounds from lyophilized apple fruit samples.
2. Determination of the quantitative and qualitative composition of triterpenic compounds in whole apple's fruit samples of different cultivars grown under Lithuanian climate conditions.
3. Determination of the quantitative and qualitative composition of triterpenic compounds in apple's peel and flesh samples of different cultivars cultivated in Lithuanian climate conditions.

Methodology. The following apple cultivars were included in the study: 'Aldas', 'Auksis', 'Connel Red', 'Ligol', 'Lodel', and 'Rajka'. The apple trees were grown in the garden of the Institute of Horticulture, Lithuanian Research Centre for Agriculture and Forestry, Babtai, Lithuania. The slices of whole apples, it's peel and flesh were lyophilized with a ZIRBUS sublimator 3×4×5/20 (ZIRBUS technology, Bad Grund, Germany). The samples of whole apples, it's peel and flesh extracted with 100% (v/v) acetone in ultrasonic bath for 10 minutes at room temperature. Triterpenic compounds analysis was performed by high-performance liquid chromatography (HPLC) method. The results of the experiments were calculated in absolute dry lyophilized raw material.

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Poster presentation

Investigations of European Cranberry Bush (*Viburnum opulus*) for Breeding of New Cultivars

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Abstract
European cranberrybush (*Viburnum opulus* L.) is a native plant in Lithuania which is widely used in folk medicine. Flowers, bark and leaves are an important medicinal raw because of the large amounts of tannins, carotenoids, isovalerianic acid, saponins, and glycosides [1,2,3]. Moreover, fruit of this species could be a valuable dietary product as well as a source for the production of food supplements. The aim of present study was to investigate variation of yield, fruit properties and biochemical components of *V. opulus* accessions and select the potential donors of valuable properties for breeding of new cultivars.
The constant large average yield was typical of the cultivars 'Leningradskaja Otbornaja', P3 and 'Zarnica' (8.5-6.2 kg/bush). The number of fruit in a raceme varied from 28.1±5.83 ('Upninkai') to 51.0±6.1 (cultivar 'Krasnaja Grozd'). Evaluation of fruits chemical composition revealed the large amounts of flavonols. The largest amount of flavonols was found in the fruits of cultivar 'Krasnaja Grozd' and clone P1, respectively 18.1 and 17.9 g/100g). Accessions were compared according to the amounts of ascorbic acid, carotenoids, anthocyanins and phenolic compounds. The fruits of different accessions accumulated from 22.9 mg/100g (P3) to 49.9 mg/100g ('Leningradskaja Otbornaja') of anthocyanins and from 732.5 mg/100g ('Souzga') to 1280.0 mg/100g (P3) of total phenolics. The smallest amounts of anthocyanins were detected in fruits of the clone P3 (22.9 mg/100g) and the smallest amount of phenolic compounds was in fruits of the cultivar 'Souzga' (732.5 mg/100g). The ascorbic acid content ranged from 13.0 mg/100g ('Souzga') to 44.7 mg/100g (P3). Fruits of the cultivars 'Leningradskaja Otbornaja' and 'Upninkai' accumulated the largest amounts of carotenoids (2.7-2.8 mg/100g).
The most valuable accessions ('Leningradskaja Otbornaja', P1, P2 and 'Krasnaja Grozd') in respect of the largest amounts of biologically active substances were selected for breeding of new cultivars.

Keywords: anthocyanins, ascorbic acid, carotenoids, flavonols, fruit.

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Poster presentation

The Dependence Of Electrotransfection Efficiency On The Duration Of Cell Growth Passage

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Abstract

In clinical applications, such as DNA vaccination and gene therapy, gene electrotransfer is used as one of the most promising and efficient technique. The proper establishment of the gene transfer method ensures the improvement of gene therapy protocols. Electroporation has been increasingly employed in *in vitro* and *in vivo* protocols, and much attention has been given to increasing its transfection potential. Electroporation is a relatively safe and simple technique to deliver nucleic acids to the cell that acts by rendering cells transiently permeable using short periods of high voltage. To achieve the maximal introduction of plasmid DNA into cells and, at the same time, to prevent undesirable cell deaths, electro transfection conditions should be determined for every single cell type individually. In the present study, we determined the duration of cell growth passage for in vitro transfection of CHO cells. Time of 24 h and 48 h cell passage before the experiment was chosen. Electrotransfection efficiency with all plasmid concentrations significantly differed when comparing 24 h and 48 h passage time. Transfection efficiency from 47.28±0.41% after 24 h passage time fell to 19.87±1.02% after 48 h of cell passage time using same electric field parameters. But there was very less viability change when comparing cell passage time of 24h and 48 h. The cell passage time, if optimized, may generate a reproducibly high proportion of transfected cells among the different cell types.

Keywords: Electroporation; Gene; CHO cell; Plasmid; Transfection efficiency

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Poster presentation

The Effect of Heat Wave, Elevated CO_2 and N Deprivation on Growth of *Brassica napus*

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Abstract

Heat waves, broadly defined as a period of consecutive days where conditions are hotter than normal, including seasonally extreme events, are predicted to increase in frequency and severity with global climate change. The interactive effect of simulated summertime heat wave, elevated atmospheric CO_2 and nitrogen deprivation as well as the recovery following treatments were investigated in this study with agronomically important crop *Brassica napus* (summer rapes). The experiment was conducted in closed-top growth chambers under controlled environment. The heat wave (HW) treatment (+12 °C of ambient air temperature) either at ambient or elevated CO_2 (400 and 800 μmol mol^{-1}) and under adequate or deprived soil N (160 and 60 kg ha^{-1}) was applied at 13 BBCH growth stage for 7 days. A 7-day long recovery period under ambient climate (i.e. temperature and CO_2, AC) conditions, upon relief of the heat wave, was also applied. Both the above and the below-ground growth responses of *Brassica napus* to HW treatment were dependent on CO_2 and N availability, though in somewhat different manner. Surprisingly, under adequate N conditions, the HW treatment had a positive effect on leaf area (LA) and shoot dry weight (DW) and this positive effect was additionally reinforced by elevated CO_2 (HWC treatment). Under N deprivation, however, the above, especially, and the below-ground growth responses were to a large extent lower and did not differ between climate conditions (AC, HW and HWC) nor after the treatments neither after the recovery. After the 7-day recovery period, additional stimulating effect of elevated CO_2 on the above-ground growth response to HW treatment, under adequate N conditions, disappeared, although both LA and shoot DW, under HW and HWC treatments, were significantly higher, compared to those grown under AC conditions. In contrast, the root DW, under HWC treatment, was significantly higher than under HW treatment, while the latter did not differ from the control one's grown under AC conditions. These results highlight the predominant role of soil N availability on the growth responses of *Brassica napus* to heat wave treatment and suggest that the stimulatory effect of elevated CO_2 may only be useful if soil nitrogen is adequate.

Keywords: Heat wave, CO_2, N-deprivation, growth, recovery

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Poster presentation

Quality studies of different liming materials

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Abstract
Soil acidification is an ongoing natural process in nature but it can be caused by acid rain, leaching of nutrients, using physiologically acid fertilizers and other. Liming is the most economical method of ameliorating soil acidity.
An agricultural liming material is defined as a material containing calcium and/or magnesium compounds capable of neutralizing soil acidity. The amount of liming material required will depend on the soil pH profile, lime quality, soil type, farming system and rainfall. The two factors affecting the quality of liming materials are chemical composition and physical properties. The effectiveness of a liming material also depends on their particle size. Depending on the size of the particles, they are divided into dust, granular and crushed liming materials.
The aim of the research was to investigate chemical composition and structure of different liming materials. For the investigation we used: ground chalk, granulated chalk, dolomitic lime, granulated cement dust (two different fractions) and granulated cement dust with potassium additive.
Compressive strengths, neutralizing values, reactivity, elemental concentrations of the liming materials were measured. The analysis of the liming material structure was performed using X-ray diffraction.

Keywords: liming material, soil acidity.

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Poster presentation

The Design of Micro Colorimetry System for Bio-Investigations

Kotryna Drungilaitė

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Abstract

Modern day sciences require modern instruments. Expanding scope of investigations utilizes sophisticated methods and techniques. Main trend of modern day analytical instrumentation is autonomization, what is impossible without miniaturized instruments.

In this work we propose a concept of a micro colorimetry system that will be capable of performing measurements in few micro-liter volume droplets. The system utilizes wireless operation and is controlled using a smartphone, or a laptop.

High resolution, precision visible light sensor ensures the application of different colorimetric methods. In the first design stage sensor saturation issues, the frame of the system, and the controlling aspects will be discussed.

By shaping the initial microlorimeter design, the 3D printer herewith the FreeCad program were used to model and print certain parts, such as a case, which would cover and protect the sensor from the exterior light rays to measure only the desired light radius. A smartphone's flashlight was used for the light source to determine the maximum sensor saturation point. Changing the distance between the sensor and the light source, the sensor code variation was observed, the maximum saturation point was determined at 34196 and the most suitable distance between the objects was found.

During the presentation design and measurement issues will be discussed.

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Poster presentation

Updates of Development and Integration of Miniaturized Capillary Electrophoresis Equipment into Unmanned Aerial Vehicle for Analysis of Complex Mixtures (DRONOMOUS)

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Abstract

Capillary electrophoresis is powerful technique for separating chemical compounds in aqueous solutions. The aim of this study is develop fully automated miniaturized capillary electrophoresis equipment for chemical analysis of air samples. Integration into unmanned aerial vehicle allows to conduct air chemical analysis on spot, without need to manually collect samples. Successful integration of capillary electrophoresis into unmanned aerial vehicle will widen possibilities of environment research. Analysis system consist of two major parts. First part is automated air sample collection and extraction system, based upon gas – liquid extraction method, using 10 mM acetic acid buffer as extraction solvent. Second part is fully automated capillary electrophoresis system. Air sample extraction conditions: 50 µl of 10 mM acetic acid buffer was used as extraction solvent, extraction was conducted for 30 minutes. After extraction process, extracts are analyzed using capillary electrophoresis method. Analysis conditions are: 0.5 M acetic acids is used as background electrolyte, 50 µm inner diameter fussed silica capillary (total length - 30 cm, length to the detector – 22 cm), sample injection – hydrodynamic 50 kPa *30 s, analysis voltage 4 kV, analysis time - 9 minutes, detector type – contactless conductivity detector. Analysis results shows that miniaturized and fully automated capillary electrophoresis equipment coupled with gas – liquid extraction system is capable of conducting high effectiveness air chemical analysis.

Keywords: Capillary electrophoresis, contactless conductivity detector, gas – liquid extraction, unmanned aerial vehicle

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Poster presentation

Selection and Testing of Nuclear and Plastid DNA Markers for Genetic Diversity Researches of Lithuanian populations of *Lythrum salicaria* L.

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Abstract

Lythrum salicaria L. natural habitats in Europe are changing by anthropogenic activity, like a rising salinity in river waters. Consequences caused by water salinity may reflected in *L. salicaria* genetic diversity. Nevertheless, problem is a fact, that there are a lack of information about genetic researches and tested molecular markers of *L. salicaria*, only some invasive *L. salicaria* populations were investigated using AFLP markers in USA. Consequently, the aim of this study is to discover and verify most suitable AFLP, chloroplast DNA, nuclear ribosomal DNA and microsatellites (SSR) primers and their application conditions for genetic analysis of *L. salicaria* populations. There were used six fluorescent primers for *L. salicaria* AFLP analysis, as there were used previously in USA and preliminary results revealed E_{AGC}-6-FAM primer was best performing. Twelve pairs of tested SSR primers, previously used for *Punica granatum* populations, were inappropriate for *L. salicaria*. Two pairs of universal ribosomal DNA primers (ITS4+ITS5, ITS4+ITS7) and six different plastid DNA markers were applied for *L. salicaria* individuals, which are prepared for using of *L. salicaria* DNA sequencing. Plastid DNA markers previously used for *Phalaris arundinaceae* L., *Impatiens glandulifera* L. are suitable for *Lythrum salicaria*, however, primers originaly created for *Cucumis sativus* L. are improper.

Keywords: ITS, AFLP, *Lythraceae*, Molecular markers, cpDNA

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Poster presentation

Biological Activities of Royal Jelly and Analysis Methods for Their Evaluation

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Royal Jelly (RJ) is a secretion from the special glands of worker bees which serves as a food for queen bee and to the growing up larvae [0]. RJ has been used from ancient times for its extraordinary properties and positive health effects [0]. It is one of the natural products in which various functionalities. This study aims to review recent scientific findings and research that prove biological activity of royal jelly and to review analytical methods applied for RJ analysis. Literature shows that RJ is composed from different chemical classes of compounds such as proteins, lipids, sugars, vitamins, minerals, and free amino acids. RJ contains vitamins such as riboflavin, thiamine, niacin, folic acid, biotin, and pyridoxine and smaller amounts of vitamins C, D, A, and E. Moreover, calcium, sodium, potassium, copper, iron, zinc, and manganese are the main minerals in RJ [0]. The chemical composition of RJ indicates the presence of various bioactive substances including 10-hydroxydecanoic acid (10-HDA). For such a wide and complex chemical composition RJ has a broad spectrum of biological activity. According to the published data, RJ has the following biological properties: antimicrobial, antidiabetic, antioxidant, anti-rheumatic, antibiotic, anti-inflammatory, immunomodulatory, neurotrophic, antitumor, hipoglicemiant, hypotensive, hepatoprotective, blood pressure regulatory, anti-allergic, hipocholesterolemiant, general tonic, antiaging and etc. Biological activities of RJ are mainly attributed to the bioactive fatty acids, proteins and phenolic compounds [0]. Different spectrophotometric methods and/or tests are employed for evaluation of antioxidant activity of RJ; gas chromatography is applied for analysis of carbohydrates and lipids; total protein-nitrogen is determined by the Kjeldahl method and very important fatty acid, 10-HDA, determined by HPLC or capillary electrophoresis [0, 5]. An overview of the literature shows that owing to the broad spectrum of biological effects royal jelly can be used in various medical fields.

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Poster presentation

Qualitative and Quantitative Composition Variability of Phenolic Compounds in American Cranberry (Vaccinium Macrocarpon Ation) Fruits and Evaluation of Antioxidant Activity of Their Extraxts

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Abstract

In the past several decades, various studies have shown that cranberry fruits accumulate a promising biologically active compounds, suitable for application in medicine, pharmacy, function foods and other scientific and practical fields. One of the most important group of biologically acitive compounds in cranberry fruits is phenolic compounds. They act as natural antioxidants, have strong antimicrobial, anticancer and cardiovascular system protecting activity.

The aim of this study was the determination of composition of phenolic compounds of American cranberry (*Vaccinium macrocarpon* Aiton) fruit extracts using UPLC-ESI-MS/MS analysis and evaluation of antioxidant activity *in vitro* of these extracts using CUPRAC, FRAP, and TFPH UV-VIS spectrophotometric assays.

UPLC-ESI-MS/MS analysis was applied for determination of qualitative and quantitative composition of *Vaccinium macrocarpon* fruit extracts of 8 different cultivars ('Baiwfay', 'Bergman', 'Bain', 'Drever', 'Holliston', 'Pilgrim', 'Searles', 'Woolman').

UPLC-ESI-MS/MS analysis showed that flavonoids was a major group of phenolic compounds identified in American cranberry fruit extracts. The largest group of flavonoids was quercetin glycosides. The compounds of flavan-3-ols group (procyanidin A2, procyanidin C1, (+)-catechin and (-)-epicahechin) were also detected. The compounds from flavan-3-ols group are very important for human health. They have strong antioxidant, antimicrobial, anti-inflammatory and antiadhesive activity so cranberry fruits are widely used for the treatment of urinary tract diseases. Phenolic acids including hydroxybenzoic acids (vanillic and gallic acids) and hydroxycinnamic acids (caffeic acid, ferulic acid, p-coumaric acid and chlorogenic acid) were also identified. The greatest total amount of the identified phenolic compounds (519.53±19.41 mg/g DW) was detected in American cranberry samples of the 'Searless' cultivar, the lowest (204.36±8.22 mg/g DW) – in samples of the 'Piligrim' cultivar.

The strongest reductive activity evaluated by using FRAP and CUPRAC assays (0.58±0.34 mmol TE/g DW and 6.15±0.47 mmol TE/g DW accordingly) was determined in extracts of the samples of American cranberry fruits of cultivar 'Bergman'. The strongest antiradical activity (1.73±0.04 mmol TE/g DW) evaluated using TFPH assay was determined in extracts of the samples of American cranberry fruits of cultivar 'Drever'.

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Poster presentation

The Application of Selected Bioactive components to Ensure the Safety and Quality of Meat Semi-finished products

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Abstract

Rosemary extract, Taurine, Creatine, Coenzyme Q10, Carnosic and Elagin acids were used to improve the quality of minced pork and beef as well as in production tests with chicken thighs marinated with bacterial cultures *(Lactobacillus spp. Staphylococcus xylosus, Pediococcus pentosaceus*). Data analysis was performed with the statistical package "SPSS for Windows", version 20.0 (SPSS Inc., Chicago, Illinois, USA). Statistically significant differences were considered when $p \leq 0.05$.

It has been found that DPPH radical binding increases with increasing concentration of the tested antioxidants. All antioxidants selected during the study had a positive effect on total antioxidant activity, they suppressed lipid oxidation in the examined minced meat samples. On 1-6 days, the highest binding of DPPH free radicals was observed in minced pork samples with a compound of Rosemary extract and Coenzyme Q10 (42.26 ± 0.03 percent), and in minced beef samples with Rosemary extract (37.24 ± 0.01 percent). From the studies performed with the selected antioxidants, the most significant differences in comparison with the control samples were found in the samples with Rosemary extract (*Rosmarinus officinalis*). The best antimicrobial properties during the whole study were shown in the samples with Rosemary extract. The minimum number of coliform bacteria was determined in a sample with Rosemary extract after 5 days of storage: in minced pork – 3.30 ± 0.34 104 CFU / g; in minced beef – 3.34 ± 0.36 104 CFU / g when ($p < 0.05$ in both cases). The highest total number of aerobic bacteria was in control groups without antioxidants. The measured pH of the active acidity ranged from 4.48 to 6.05. The effect of Rosemary extract was also noticeable on the colour of minced pork and beef as it affected the pink colour stability. Having used bacterial cultures of Lactobacillus spp. *Staphylococcus xylosus, Pediococcus pentosaceus, Lactobacillus alimentarius* combined with Rosemary extract the sensory properties of the thermally treated marinated chicken thighs improved – pink, common scent, overall taste and acceptability compared to the samples with non-bacterial cultures and without antioxidants (in all cases $p \leq 0.05$).

The effects of each antioxidant are different when used in different meat matrices, for example, the antioxidant effect of Coenzyme Q10 in minced pork is significantly higher than that of minced beef, and in mixtures with other antioxidants it may not work, for example, in marinated thigh meat. Therefore, we believe that not only the chosen concentration but also the components of the meat product affect the effect of antioxidant on the safety and quality of the meat product.

Keywords: bioactyve components, minced meat, quality, bacterial cultures

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Poster presentation

The Effect of Natural Herbal Extracts on *Cannabis sativa l.* Hemp Oils Quality Indicators

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Abstract

In this study, selected natural herbal extracts including rosemary (RE), pomegranate (PE), and green tea (GE) were chosen to investigate the effects on hemp oil stability. Hemp oil purchased from the Lithuanian local market in the bottle. The effect of selected extract on measuring the oxidative stability of oils was evaluated using the Rancimat method and chemical tests. Hemp oil with or without combining of extracts were analyzed using the Rancimat method at 120°C to identify their induction periods (IP). The changes in value of peroxide (PV), free fatty acid (FFA), acid (AV), and fatty acid composition were measured at the 1st and 27th days of storage. All samples were kept at dark place (25°C) during the storage and it was prepared with two different dosage of selected extract (30mg/l and 50mg/l for each extract). Sample with pomegranate (50mg/l) extract was showed longest induction period (1.47 h/120 °C). At the 27th day of storage, the PV in oils with extracts was little longer than in control oil ($p < 0.05$ in all cases). The applicated herbal extracts increased PV of hemp oil comparing to the control sample. The lowest AV, and FFA was shown also at control sample respectively: 1.64 (mg KOH/g), 0.82 % (oleic acid exp.) at 27th day. According to the results from the gas chromatography, hemp oil included high amount of polyunsaturated omega 3 fatty acids, it was not resistance against oxidation. The selected natural herbal extracts in recommended quantities effected negatively on oxidative stability of *Cannabis sativa l* . hemp oil.

Keywords: hemp oil, natural extracts, quality, rancimat, peroxide.

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Poster presentation

Influence Of Hypoxia On The Alternative Splicing Of Neurodegenerative Disease Related Genes

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Abstract

Alzheimer's disease is one of the most wide-spread forms of dementia, characterized by progressive loss of brain cognitive function. There are several identified causes of Alzheimer's disease: 1) accumulation of extracellular beta amyloid (Aβ) peptides in the brain cells, which are produced of amyloid precursor protein (APP); 2) accumulation of hyperphosphorylated microtubule-associated protein Tau that forms neurofibrillary tangles.

The newest data in the literature states that lack of oxygen in the brain cells (hypoxia) is involved in the development of neurodegenerative diseases. The initial step for cellular adaptation to reduced oxygen level is stabilization of hypoxia inducible factors (HIF) that activate the transcription of genes that are needed for cell survival in unfavorable environmental conditions. Apart transcription activation under hypoxic conditions changes in alternative pre-mRNA splicing occur when additional mRNA isoforms are formed, that leads to synthesis of proteins, possessing distinct activity, in the cell.

The present investigation focused on the influence of hypoxia on the formation of mRNA isoforms (APP, Tau) associated with neurodegenerative diseases will be presented in the poster.

Keywords: Alzheimer's disease, alternative splicing, APP, hypoxia, Tau.

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Poster presentation

Different Responses Of Chlorophyll Fluorescence Parameters Of Pea And Wild Mustard To Elevated Climate And Drought Stress Effect

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Abstract

Increasing CO_2 and temperature, as well the changes in precipitation have potentially important consequences for crop and weed interactions. Climate change will have obvious consequences for crop yields as any differential response between crops and weeds to changing climate will alter weed-crop interaction and potential crop yield losses. The aim of this study was to investigate the response of chlorophyll *a* fluorescence of pea (*Pisum sativum*) and weed wild mustard (*Sinapis arvensis*) under simulated climate conditions. Two climate scenarios were investigated: current climate (21 °C, 400 ppm CO_2 and drought) and elevated climate (25 °C, 800 ppm CO_2 and drought. Plants were grown in pots filled with a mixture of field soil, perlite and fine sand (volume ratio 5:3:2) in monoculture (15 plants per pot) conditions. CO_2, temperature and drought stress exposure lasted two weeks. Under drought effect grown plants were watered only 50 % of norm during exposure time. Chlorophyll *a* fluorescence measurements were performed by a Plant Efficiency Analyser (PEA) with randomly selected youngest fully expanded leaves on the last (14^{th}) day of the experiment.

Elevated climate led to different changes of chlorophyll fluorescence parameters of investigated plants, but the effect of drought was more intensive. The changes of Fv/Fm, which is an indicator of the efficiency of second photosystem (PSII), were statistically insignificant. The increase of specific energy flux per reaction centre (RC) for absorption ABS/RC was followed by an increase of trapping energy (TRo/SCo) under elevated climate and decrease under drought stress effect. The efficiency with which an electron can move from the reduced intersystem electron acceptors to the PSI and electron acceptors (delta(Ro)) was lower under the warmed climate conditions for both plants, compare to current ($p<0.05$). Drought stress resulted in even more higher delta(Ro) in both climates and both plants, but statistically significant ($p<0.05$) changes were detected only under warmed climate conditions. Higher energy usage under drought stress also indicated slightly decreased values of dissipated energy flux per cross section (DIo/CSo), but the changes were statistically insignificant. Higher electron transport flux (ETo/CSo) was detected for wild mustard, but the changes of this parameter under climate and drought effects were statistical insignificant also. Our results indicated that pea and wild mustard responded in different manner to warmed climate and drought stress conditions.

Keywords: climate change, drought, chlorophyll fluorescence, pea, wild mustard.

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Poster presentation

The changes of chlorophyll fluorescence parameters of *Echinacea purpurea* after pre-sowing seed treatment with cold plasma

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Abstract

The pre-sowing seed treatment with cold plasma (CP) is currently used in the field of agricultural science as an alternative technology for improving agricultural performance of crops. Seed exposure to CP can lead to stimulation of germination and seedling development followed by the long-term changes in plant metabolism. The objective of this study was to evaluate the persistence of effects of pre-sowing seed treatment with CP on physiological and biochemical activity of plants by chlorophyll *a* fluorescence parameters in leaves perennial medicinal plant purple coneflower (*Echinacea purpurea)* in the second season of vegetation. Seeds were processed with capacitively coupled plasma device at a pressure of 60 Pa. The duration of CP exposure was 2, 5 and 7 min. Seeds were sown to substrate four days after CP treatment and seedlings grown for two vegetation seasons. At the beginning of flowering growth stage during the second vegetation season, the chlorophyll *a* fluorescence measurements were performed by a Plant Efficiency Analyser (PEA) with randomly selected youngest fully expanded leaves. The results showed, that CP had statistically significant effect on several fluorescence parameters of *E. purpurea* even in the second year after treatment. The differences in the efficiency of second photosystem (Fv/Fm) between control and treated groups were statistically significant ($p<0.05$): this parameter was higher by 14.7, 13.5 and 14.3 % after 2, 5 and 7 min CP treatments, respectively. Electron transport flux per reaction center (ETo/RC) was also higher for plants grown from CP treated seeds. E.g., seed exposure to CP for 7 min resulted in 47.9% ($p<0.05$) increase of ETo/RC. The increase of electron transport and efficiency of the PSII might be explained by more than 50 % ($p<0.05$) decreased dissipated energy flux per reaction center (DIo/RC) after CP treatment. Higher maximum quantum yield of primary photochemistry (phi(Po)) and higher quantum yield for electron transport (phi(Eo)) was also detected for plants growing from CP exposed seeds. The obtained results indicate that pre-sowing seed treatment with CP leads not only to stimulation of seed germination, plant growth and biochemical changes in leaves of first year of seedling growing [Mildaziene et. al., Plasma. Proc. Polim., 2018], but CP induced changes in plant growth (data not shown) and chlorophyll fluorescence parameters persist in the second year of plant growth.

Keywords: pre-sowing seed treatment, *Echinacea purpurea*, chlorophyll fluorescence, cold plasma.

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Poster presentation

Biological Activities of Royal Jelly and Analysis Methods for Their Evaluation

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Royal Jelly (RJ) is a secretion from the special glands of worker bees which serves as a food for queen bee and to the growing up larvae [0]. RJ has been used from ancient times for its extraordinary properties and positive health effects [0]. It is one of the natural products in which various functionalities. This study aims to review recent scientific findings and research that prove biological activity of royal jelly and to review analytical methods applied for RJ analysis. Literature shows that RJ is composed from different chemical classes of compounds such as proteins, lipids, sugars, vitamins, minerals, and free amino acids. RJ contains vitamins such as riboflavin, thiamine, niacin, folic acid, biotin, and pyridoxine and smaller amounts of vitamins C, D, A, and E. Moreover, calcium, sodium, potassium, copper, iron, zinc, and manganese are the main minerals in RJ [0]. The chemical composition of RJ indicates the presence of various bioactive substances including 10-hydroxydecanoic acid (10-HDA). For such a wide and complex chemical composition RJ has a broad spectrum of biological activity. According to the published data, RJ has the following biological properties: antimicrobial, antidiabetic, antioxidant, anti-rheumatic, antibiotic, anti-inflammatory, immunomodulatory, neurotrophic, antitumor, hipoglicemiant, hypotensive, hepatoprotective, blood pressure regulatory, anti-allergic, hipocholesterolemiant, general tonic, antiaging and etc. Biological activities of RJ are mainly attributed to the bioactive fatty acids, proteins and phenolic compounds [0]. Different spectrophotometric methods and/or tests are employed for evaluation of antioxidant activity of RJ; gas chromatography is applied for analysis of carbohydrates and lipids; total protein-nitrogen is determined by the Kjeldahl method and very important fatty acid, 10-HDA, determined by HPLC or capillary electrophoresis [0, 5]. An overview of the literature shows that owing to the broad spectrum of biological effects royal jelly can be used in various medical fields.

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Poster presentation
Molecular Markers Linked to Resistance to BRV and *Cecidophyopsis ribis* in *Ribes* spp.

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Abstract

Introduction. *Blackcurrant reversion virus* (BRV) belongs to genus *Nepovirus.* BRV vector is gall mite (*Cecidophyopsis ribis*) and both phatogens are widespread in all countries where blackcurrants are grown. *R. nigrum* is the primary natural host of BRV, although natural infestations occur also in other *Ribes* ssp. Some *Ribes* species and cultivars are resistant to BRV or *C. ribis*, and the origin of resistance to virus is not clear. It is known that the resistance to these pathogens is heterogeneous. Several molecular markers related to resistance genes *P* and *Ce* have been identified in several *Ribes* spp. genotypes by scientific researches. Reliable molecular markers are useful for selection of *Ribes* spp. cultivars with inherited genetic resistance to BRV and *C. ribis.*

The aim of the research: evaluate the resistance of *Ribes* cultivars and species to BRV virus and gall mite using molecular methods.

Methods. The presence of the 7 molecular markers related to resistance to BRV and gall mite in 13 *R. nigrum* cultivars and 3 *Ribes* species were established. Markers were searched by PCR and AFLP methods using DNA purified by modified CTAB method. AFLP data were analysed with GeneMapper 4.0 software. Factorial analysis and phylogenetic dendrogram were performed by the DARwin program version 6.0.015.

Results. Factorial analysis has shown that tested molecular markers grouped according to the dependence on resistance to *C. ribis* or BRV. The combination of molecular markers E36/M59-107 and E41/M40-222 identifies the resistance to gall mite, combination of SCAR *Ce*-130, E41/M43-179, E41/M42-388, E41/M88-280 and E40/M43-236 – resistance to reversion virus.

In phylogenetic dendrogram cultivars and species divided into 4 groups, bootstrap 30.0 %. In this research species were used as resistance donors. 46.15 % of cultivars had genetic resistance to gall mite and reversion virus, 53.85 % – were susceptible.

Conclusion. A complex study of seven molecular markers reliably identifies the resistant *C. ribis* and the blackurrant reversion virus *R. nigrum* cultivars and species.

Keywords: blackcurrant reversion virus, gall mite, resistance, molecular markers.

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Poster presentation

Optimization of Extraction Procedure for Quantification of Succinate in Biological Samples by Gas Chromatography — Mass Spectrometry Method

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Abstract

Introduction. It is well known that ischemia/reperfusion injury induces cellular damage, which is accompanied by a variety of metabolic alterations. Several studies indicate that accumulation of mitochondrial metabolite succinate (citric acid cycle intermediate) during ischemia controls reperfusion injury through mitochondrial reactive oxygen production [1]. Gas chromatography coupled with mass spectrometry (GC-MS) is one of the technologies widely used for qualitative and quantitative analysis of small molecules. The aim of this study was to optimize extraction procedure and GC-MS method for quantification of succinate in biological samples after ischemia/reperfusion injury.

Materials and methods. Warm renal ischemia was induced by the application of microvascular clips around renal artery. At the end of ischemia (after 30 or 40 min.) the clips were removed and reperfusion was performed for 30 minutes. Mitochondria from rat's kidneys were isolated by differential centrifugation. Biological samples with mitochondria were lyophilized and were prepared for chemical analysis. The analytical procedures for quantification of succinic acid consisted of three main steps: extraction of succinic acid (the solvent was tetrahydrofuran), derivatization (trimethylsilylation with N,O-bis(trimethylsilyl)trifluoroacetamide (BSTFA)) of succinic acid to more stable and volatile compound and GC-MS separation, identification and quantification of the derivatized compound. Two different extraction procedures were chosen. Samples were evaporated to dryness with a gentle stream of nitrogen, other samples have not been evaporated. The all samples are capped, wrapped with paraffin tape, and heated at 70 ºC for 3 hours to convert the targeted analytes to their trimethylsilyl derivatives. The evaluation of the GC-MS method has been performed by full scan (total ion current — TIC) using internal and external standards. The reaserch was done using methodology on SHIMADZU GC-MS-QP2010 Ultra chromatography system with Rxi-5ms (Restek Corporation) capillary column. The oven temperature was programmed from 45 °C for 2 min, then 16 °C /min to 250 °C for 1 min, then 50 °C/min to 315 °C and held constant for 5 min. The injector temperature was 280 °C, helium using as caririer gas at 0.67 mL/min, injection mode splitless (1 min), injection volume was 1 µL, split ratio 1:20. Mass spectra scan range of m/z 40-500 amu with mass scan time 0,2 seconds, interface temperature 280 °C.

Results and discussion. Applying the GC-MS TIC procedure without evaporation succinate content was determined 73.55±104.01µg in control group, 5.26±0.60 µg in ischemia 30 min. group, 40.07±56.67 µg in ischemia 30 min./reperfusion 30 min. group and 48.28±6.47 µg in ischemia 40 min./reperfusion 30 min. group. The result of GC-MS TIC with evaporated samples analysis were 43.18±20 µg; 49.58±1,78 µg; 100.75±73,10 µg; 108.64±50,19 µg, respectively, $p<0,05$. Succinate content in some biological samples prepared without evaporation with a gentle stream of nitrogen was not detected and ratio of reference ion does not match.

Conclusions. The results show that GC-MS TIC method with evaporation was the most effective to quantify succinate in biological samples after ischemia/reperfusion injury. The results suggest that the method could be usefully integrated into biochemistry studies of mitochondrial metabolites.

Keywords: succinate, gas chromatography — mass spectrometry method, data analysis

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Poster presentation

Investigation and Optimization of Enzymatic Conversion of Phospholipids in the Production of Glucose Syrup from Wheat Starch

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The production of glucose syrup from starch has been carried out since the beginning of the 19th century the. Glucose syrup is made from a variety of raw materials, including maize, wheat, and potato starch. The geographical location of Lithuania is such that wheat is best grown there, so for the production of glucose syrup it is the most practical raw material.

However, wheat starch is one of the most complex raw materials also. Wheat starch has high content of non-starch impurities, like proteins and lipid compounds. The majority of the wheat starch lipids are called lysophospholipids, they are highly soluble in water and strong emulsifiers too. In order to remove them from the product, it is necessary to convert them to less soluble compounds like free fatty acids. Starch conversion to sugars is carried out using enzymatic hydrolysis, together with enzymatic degradation of lysophospholipids. However, it has been observed that even after the stage of ultrafiltration the product is intensely foaming in the further stages of the syrup refining. The main task of this investigation was to select a more efficient lipase mixture for the production of glucose syrups from the wheat starch, which will provide a purer filtration product. The lipid profile was determined using a modified *Blight and Dyer* method for the lipid extraction with the following analysis by high performance liquid chromatography and charged aerosol detector. The *Dumas* method was used for quantitative determination of nitrogen and protein. The total phosphorus content was determined using an ICP mass spectrometer - Elan DRC II. Protein amount also was analysed spectrophotometrically with 280 nm wave lenght. The size exclusion chromatography was used to evaluate the quality of sugars before and after ultrafiltration. The lipid content after ultrafiltration was determined with MS/MS. Ultrafiltration was carried out with Micro Pilot Plant system and tubular polymeric membranes FP 200 provided by *PCI* company. The fermentation process was performed by lysophospholipase and phospholipase PLA1, conditions for the least amount of non-degraded phospholipids were determined. Quality of the filtered syrup after conventional and optimized fermentation was compared. Conclusion was made that the mixture of the lipases improves the quality of glucose syrup.

Keywords: glucose syrup, wheat, starch, ultrafiltration, enzymes, lipids, enzymatic hydrolysis.

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Poster presentation

The association of geomagnetic storms, solar wind and stream interaction region with hyperglycemia

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Abstract
Hyperglycemia associated with the development of neurological symptoms, adversely affects platelet function [1], and is associated with increased blood coagulation [2-3], platelet aggregation, and decreased heart rate variability [4-5], i.e. with markers that are negatively affected by increased geomagnetic activity. There is a possibility that the short period between two geomagnetic storms (separated by 5 or fewer days) or other space weather event has a substantial negative impact on the risk of hyperglycemia in patients with acute coronary syndromes [6].
We investigated the association between cardiovascular characteristics of 1,553 randomly selected patients with acute coronary syndrome (ACS) who were admitted for inpatient treatment in Kaunas city during 2000–2003 and geomagnetic storms, fast solar wind, or stream interaction regions (SIR). We hypothesized that days of these space weather events, 1-3 days after, and the period between two events, named as intersection days (1-3 days after the event, which coincided with 1-3 days before the event) might be associated with patients' cardiovascular characteristics. The multivariate logistic regression was applied, and the patients' risk was evaluated by odds ratio (OR); the combined impact of space weather variables was analyzed.
After analysis we found that risk of hyperglycemia on admission during GS intersection days was higher by 2.463 times ($p = 0.002$). In addition, the SIR (days of the event and 1-3 days before and after) was associated with an increased risk of hyperglycemia during admission. The risk of hyperglycemia detected during hospital admission increased during weekends (OR = 1.79; $p < 0.001$) and on days classified as "1-3 days before and after SIR" (OR = 1.34; $p = 0.037$). On days of GS and 1-3 days after that coincided with days of FSW and SIR, the risk increased by 1.57 times (OR = 1.57; $p < 0.001$). The highest increase in the risk (by almost 5 times) (OR = 5.40; $p = 0.008$) was observed on days of FSW intersection occurring on the 1st day after SIR.
Keywords: geomagnetic activity, hyperglycemia, solar wind, stream interaction regions.
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Poster presentation

Qualitative and Quantitative Analysis of Eucalyptus (*Eucalyptus Globulus* L., *Eucalyptus Viminalis* L.) Leaf Essential Oil

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Eucalyptus (*Eucalyptus* L'Hér.) belongs to myrtle family, Myrtaceae. It is common in Australia, but also cultivated in Europe. The leaves of this plant are used to treat upper respiratory tract infections and they also have anti-inflammatory effect [1]. Biological activity of herbal extracts depends on phytochemical composition. Due to diversity cultivation conditions, there is a need to investigate the phytochemical composition of this plant. The aim of the research was to investigate the qualitative and quantitative composition of eucalyptus leaf essential oils.

In this research, the samples were used Eucalyptus leaf raw materials which are sold in Europe. Essential oils were obtained using distillation method. Qualitative analysis was performed using DC-MS method. Gas chromatography was applied for quantitative evaluation of eucalyptus leaf essential oils.

Qualitative analysis of the composition of eucalyptus leaf essential oil showed that α-pinene, 1,8-cineol (eucalyptol), α-terpinyl acetate, aromadendrene and globulol were identified in all samples. Cymen, pinocarveol, terpinen-4-ol and terpineol were found in eight out of nine samples. Quantitative analysis showed that 1,8-cineol varies from 258 µg/ml to 23707 µg/ml in different eucalyptus essential oil samples.

In conclusion, the results of the research show that the biological compounds in eucalyptus leaf essential oil samples varies significantly. Therefore the difference between different types of tea raw materials can influence the effect on the human body.

Keywords: Eucalyptus globulus, Eucalyptus viminalis, essential oil.

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Poster presentation

Investigation Of Cell Viability Regulation By Calcium Electroporation

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Abstract

Electroporation is a method, developed in order to deliver exogenous biocompounds (anticancer drugs, nucleic acids, proteins, etc.) to cells and tissues, which are mostly designed for cancer treatment purposes.

The synergistic effect of electroporation and chemotherapeutic agents has been widely studied for cancer cell treatment both *in vitro* and *in vivo*. An alternative to chemotherapeutic drugs can be Ca^{2+} ions which are universal signal messengers that regulate a multitude of cellular functions (exocytosis, metabolism, gene expression, cell cycle, etc.). However, overthreshold Ca^{2+} concentrations are toxic to the cells. After calcium electrotransfer cell death is induced due to sudden increase in the amount of Ca^{2+} which can further lead to ATP depletion, ROS production, membrane lipid alterations, membrane pore opening and/or other processes. Thus, artificially induced increase in intracellular calcium ion concentration can be exploited to significantly facilitate cancerous cell death as well as reduce tumour growth.

In this research we have analyzed Chinese hamster ovary cell viability and metabolic activity by using different calcium concentrations (0 – 5 mM) and different number of 1200 V/cm electric field strength and 100 μs duration pulses (1 – 4 HV). Our results show that during electroporation cell viability decreases as calcium concentration is increased. Thus, using electroporation in combination with calcium ions, depending on parameters, we are getting 20 - 100 % cell death. Similarly, the cell metabolic activity decreases with increasing calcium concentration (after 30 min, 12 h and 24 h).

In overall, our results show that by properly adjusting biophysical parameters calcium electroporation can be exploited as an effective technique for significant cell viability decrease.

Keywords: electroporation, calcium, chemotherapy, cell death, Chinese hamster ovary cells.

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Poster presentation

Impact of $BaSO_4$ Particles on the Viability of *Escherichia Coli*

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Abstract

With the constant advances in nanotechnologies and emerging nanoproducts market, the need to investigate not only chemically active but also stable particles such as $BaSO_4$ effects on the environment become evident. Such breakthroughs may result in undesirable environment developments and negatively affect bacteria, plant life, humans. The inevitable process of car stopping is related with the $BaSO_4$ particles emission because of break pad waning. Approximately 220000 tons of breaking pads per year worldwide are grinded and their small particles spread around the environment. Such enormous quantities may result in biological effect on the environment and human well-being. Risk assessment of barium sulphate nanoparticles require careful evaluation of its mobility, reactivity, environmental toxicity, and stability. Thus far, few studies have been conducted on the toxicity to the environment caused by direct and indirect exposure to barium sulphate nanoparticles. Until now, no clear studies have been carried out to evaluate the effects of barium sulphate nanoparticles on bacteria. This work contains information on the stability of the barium sulfate nanoparticle suspension, the minimum inhibitory concentration for gram-negative *E. coli* bacteria and zeta potential differences.

Keywords: Barium sulphate nanoparticles, Zeta potential, minimal inhibitory concentration.

References should be listed as below:
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Poster presentation

Treatment of carrots by ozone and the environmental impact of technological processes

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Abstract

More than half of agricultural products don't reach consumers in the world, because they are lost. The production of food uses a lot of energy resources. To solve this problem alternatives are being created to reduce energy losses.

The study researches how to increase consumer satisfaction with product quality and in the same time reduce impact on the environment in the preparation for consumption of fresh carrots. It also explores the extent to which the effective reduction in fresh carrot losses would be across the supply chain.

In this case, when carrots are washed with ozonated water there is not only reduction in product loss but also increase in the productivity. In the farm in which carrots are prepared for market ozonated water is introduced in the commercial preparation line by introducing it in the final stage of processing by spraying products with ozonated water. This allows the surface of the products to be disinfected.

The evaluation was carried out with the SimaPro 8.0.5 program, where two scenarios were compared with each other: in the first scenario there was used the usual carrot treatment line and in the second scenario there was used processing line that sprayed ozonated water on the products.

Keywords: carrots, ozonated water, carrot treatment, life cycle assessment

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Poster presentation

Phenolic compounds and antioxidant activity of lingonberry (*Vaccinium vitis-idaea* L.) leaves extracts during different vegetation periods

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Abstract

Lingonberry (*Vaccinium vitis-ideae* L.) is a short evergreen shrub that belongs to *Ericaceae* family. Bioactive components such as phenolic compounds, flavonoids, and proanthocyanidins have pharmacological properties. Studies have shown that lingonberry leaves have antimicrobial, antivirus, anti-fungal, anti-inflammatory and antioxidant effects. Determination of phenolic compounds and antioxidant activity is an important factor assessing the quality of herbal raw material.

The aim of the research was to investigate the antioxidant activity and total phenolic compounds content of lingonberry leaves growing naturally during different vegetation periods. Leaves of lingonberry were collected from April to October during the year 2017, from forest of Jurgežeriai, near Kalvarija (coordinates: 54.4240321 and 23.166862). The extracts were prepared using 0,25 mg of dried raw material and 25 ml of 60 % ethanol. Total phenolic compounds content and antioxidant capacity of the lingonberry leaves extracts were analyzed by spectrophotometric Folin-Ciocalteu and ABTS assays, respectively.

Results showed that the highest total phenolic compounds content (190,78 ± 4,47 mg/g) were determined in the extracts of the lingonberry collected in the beginning of vegetation, during April month. The highest antioxidant capacity (4433,33 ± 368,38 mg/g) were determined in extracts of the lingonberry collected in berries ripening period, during June and August months. The herbal raw material of lingonberries is recommended collect in the beginning of vegetation because of the highest phenolic compounds content and antioxidant activity. The amount of bioactive compounds is decreasing during the vegetation.

Keywords: lingonberry, phenolic compounds, antioxidant activity

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Poster presentation

Selection and Testing of Nuclear and Plastid DNA Markers for Genetic Diversity Researches of Lithuanian populations of *Lythrum salicaria* L.

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Abstract

Lythrum salicaria L. natural habitats in Europe are changing by anthropogenic activity, like a rising salinity in river waters. Consequences caused by water salinity may reflected in *L. salicaria* genetic diversity. Nevertheless, problem is a fact, that there are a lack of information about genetic researches and tested molecular markers of *L. salicaria*, only some invasive *L. salicaria* populations were investigated using AFLP markers in USA. Consequently, the aim of this study is to discover and verify most suitable AFLP, chloroplast DNA, nuclear ribosomal DNA and microsatellites (SSR) primers and their application conditions for genetic analysis of *L. salicaria* populations. There were used six fluorescent primers for *L. salicaria* AFLP analysis, as there were used previously in USA and preliminary results revealed E_{AGC}-6-FAM primer was best performing. Twelve pairs of tested SSR primers, previously used for *Punica granatum* populations, were inappropriate for *L. salicaria*. Two pairs of universal ribosomal DNA primers (ITS4+ITS5, ITS4+ITS7) and six different plastid DNA markers were applied for *L. salicaria* individuals, which are prepared for using of *L. salicaria* DNA sequencing. Plastid DNA markers previously used for *Phalaris arundinaceae* L., *Impatiens glandulifera* L. are suitable for *Lythrum salicaria*, however, primers originaly created for *Cucumis sativus* L. are improper.

Keywords: ITS, AFLP, *Lythraceae*, Molecular markers, cpDNA

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Poster presentation

The assessment of cellular DNA damage after bleomycin electrotransfer using comet assay *in vitro*

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Abstract

When high-amplitude, short-duration pulsed electric fields are applied to cells and tissues, the permeability of the cell membranes and tissue is increased. This increase in permeability is currently explained by the temporary appearance of aqueous pores within the cell membrane, a phenomenon termed electroporation. Presently one of electroporation applications is local anticancer drug delivery to tumour, termed electrochemotherapy. Bleomycin, a well know anticancer drug, is used, for electrochemotherapy. Once inside the cell, this anticancer drug induces single and double strand breaks to genomic DNA, thus ultimately causing cell death. Nevertheless, to our knowledge, there is no studies published, that indicate the quantification of DNA damage induced by BLM electrotransfer. Here we performed in vitro analysis of DNA damage of BLM electrotransfered cells using Comet assay.

Chinese hamster ovary (CHO) cell line was used for experiments. The final concentration of BLM in experiments ranged from 0.2 ng/ml to 20 μg/ml. Electroporation was performed by using electric field at 1400 V/cm voltage for the duration of 100 μs. Cells were electroporated in laboratory made EP medium (pH 7.1, conductivity 0.1 S/m, osmolarity 270 mOsm).

Results indicate a significant cells' DNA damage increase when higher BLM concentrations of were used. After bleomycin electrotransfer DNA breaks varied from 10 % at 0.2 ng/ml to 80 % at 20 μg/ml concentrations. Insignificant DNA damage was observed when cells were incubated with the same concentrations of BLM without performance of electroporation. Cell viability decrease was observed only when electroporation was performed in the presence of BLM and started to be significant at concentrations ranging between 0.2 to 2 ng/ml. At higher concentrations cell viability decreased to was around 5 %.

Keywords: electroporation, bleomycin, DNA damage.

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Poster presentation

Evaluation of antibiotic and antioxidant properties of propolis

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Abstract

Interest of scientist in means of natural antibiotics has been on a rise for the past years, and propolis has shown some promising results in this field [1]. Propolis is a resinous product of honey bees (*Apis* spp.) containing mixture of saliva, beeswax, and plants exudate. Originally, it is used for construction and maintenance of hives. Propolis, collected in different geographic regions and form different plants, varies by their chemical composition and biological activities [2-4]. The main objective of this study is to evaluate antibacterial and antioxidant activity of propolis different extracts. Three samples of propolis gathered in different geographic regions have been tested. Extracts had been prepared with methanol and water. Propolis residue from extraction were extracted using other, previously unused solvent. Antibacterial activity of aqueous and methanol extracts was determined against *Staphylococcus aureus* and *Micrococcus luteus* by agar disk diffusion and agar well diffusion methods. Phenolic compounds content, total flavonoid content and antiradical activity of the extracts were evaluated by spectrophotometric methods. Results of these tests will be presented during conference.

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Poster presentation

Introduction of *Geranium sanguineum* L., non – volatile substances in areal part

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Abstract

The introduction of the medicinal (aromatic) plants (MAP's), their diversity are increased and the genetic medicinal plant resources are accumulated. It is important to determine the regularity of the accumulation of biologically active compounds in different stages of vegetation, introduced in medicinal, spice (aromatic) plants. The dynamics of their qualitative and quantitative indicators of their biologically active compounds determines the shelf life of the medicinal plant raw material and its quality [1].

The aim current chemical analyses was to determinate non – volatile substances in *Geranium sanguineum* areal part. Methanolic extracts was analysed in different vegetation stages: intensive growth, flower budding, beginning of blossoming, massive blossoming and the end of blossoming. *G. sanguineum* was introduced in 2006 in Medicinal and spice (aromatic) plants collections of Botanical Garden at Vytautas Magnus University.

In this study determination of phenolic compounds was performed using spectrophotometry methods. The total amount of phenolic compounds was evaluated using modified Folin–Ciocalteu reagent spectrophotometry method. Modified colorimetric aluminium chloride method was carried out to determinate the total content of flavonoid compounds. Lastly, the radical scavenging activity was estimated by DPPH (2,2-diphenyl-1-picrylhydrazyl) [2].

Keywords: *Geranium sanguineum* L., introduction, analyses

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Poster presentation

The Influence of Aqueous Plant Extracts on the Quality of Curd Type Cheese

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Introduction: Nowadays the biggest considerations in bio preservation are dedicated to plant extracts or plant-derived compounds. Plants are able to produce a large number of diverse bioactive compounds. Many antioxidant and antimicrobial compounds can be found in fruits and vegetables including phenolics, carotenoids, anthocyanins, and tocopherols. As dietary compounds, they are widely known antioxidants that inhibit the oxidation of low-density lipoproteins. Attention has also been paid to their antimicrobial activity.
Aim: The aim of this study was to evaluate the effect of some aqueous plant extracts on the quality of curd type cheese.
Methods: Different aqueous extracts from fruits of guelder rose (*Viburnum opulus*), seeds of cardamom (*Elettaria cardamomum*), musk (*Myristica fragrans*) and indian cumin (*Cuminum Cyminum*), the rootstock of ginger (*Zingiber officinale*) and liquorice (*Glycyrrhiza glabra*) were prepared (1.5% concentration) and their antimicrobial activity was evaluated. Curd-type cheese was manufactured according to standard methodology. Physical- chemical properties (pH and sensory evaluation), number of lactic acid bacteria (LAB) were estimated during cheese storage and in the final product.
Results: The experiment showed that plant extracts extended shelf life of curd-type cheese as the substances contained in them acted as natural (bio) preservatives. Curd-type cheese supplemented with plant extracts was microbiologically safe compared to control sample.
Conclusions: All plant extract enhanced flavour of curd-type cheese and extended its shelf life by significantly reducing the numbers of pathogenic and spoilage bacteria.
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Poster presentation

Synthesis and Investigation of Antibacterial Activity of Some Pyrimidine Derivatives

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Abstract

This study was aimed to investigate possible inhibitory properties of pyrimidine derivatives on Gram-negative *Salmonella enterica* subsp. *enterica* ser. Typhimurium and Gram-positive *Staphylococcus aureus* subsp. *aureus* bacteria. Broth microdilluting method (Lysogenic broth as medium) was used detecting minimum inhibitory concentration (MIC) with antibiotics tetracycline and chloramphenicol. Fluorimetric method was used for detection of tetracycline fluorescence (λ_{ex} = 340 nm, λ_{emi} = 535 nm) in medium with pyrimidine derivatives. It was found that the pyrimidine derivatives do not exhibit antibacterial properties and have a minimum inhibitory concentration greater than 400 μg/mL. 2-(Phenacylthio)pyrimidine derivatives at relatively high concentrations (400 μg/mL) turbided medium and are not convenient using microdilluting method. Using relatively high 400 μg/mL concentration of 2-hydroxypyrimidines salts tetracycline MIC was increased in case of *S. enterica* ΔTolC and *S. aureus* bacteria, but only sodium salts of 2-hydroxypyrimidine and its 5-chloro derivative increased tetracycline MIC in wild strain *S. enterica* SL1344. Other compounds did not affect tetracycline MIC. The strongest accumulation of tetracycline (compared to control) was determined in the presence oxime, (tio)semicarbazones and chlorophenyloxy derivatives of 2-(phenacylthio)pyrimidines, but there is no explicit relationship between the initial accumulation of tetracycline in bacteria and change of tetracycline MIC. Semikarbazone of 2-(*p*-chlorophenacylthio)pyrimidine and *S. enterica* ΔTolC and *S. aureus* increased the initial accumulation of tetracycline in cells and reduced tetracycline MIC. In the case of the wild *S. enterica* SL1433 strain, the latter compound, although causing a higher accumulation of tetracycline, does not affect the reduction of tetracycline MIC. All the results will be presented during the conference.

Keywords: pyrimidine derivatives, antibacterial activity, antibiotics, multidrug resistance.

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Poster presentation

Phytosanitary state of ornamental plants in greenhuose

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A large variety of decorative pot-plants originated in tropics and subtropics are presently grown indoors for environment optimisation. If growth conditions for plants grown indoors are not similar to those in their origin places, they begin to live low, get weaken, and develop over-ground part injuries. Disease pathogens and pests are described visually using lupus or microscopy. Detection frequency and the violation score (0 to 4 point scale) of pathogens was calculated.

After the monitoring of phytopathological status of ornamental plants (488 taxa) in 2001–2015 in Kaunas Botanical Garden of Vytautas Magnus University (Lithuania), were found 13 species fungal diseases agents, 2 species bacterial dieseases and 6 aphids' species. 24.8% of examined plants were injured either by diseases or by pests. Mostly detected was *Botrytis* sp. which has 4.5% of plants (spread 1–100%, intensity 0–4 score): *Alocasia* x *amazonica*, *Begonia hybrida elatior* 'Anne bell' , and 'Heidrum', *Begonia* rex, *Calceolaria* x *herbeohybrida, Callisia repens*, *Chrysanthemum indicum*, *Clerodendrum thomsoniae* f., *Columnea hirta* 'Krakatau'and 'Sanne', *Cyclamen persicum*, *Fittonia* sp., *Gerbera jamensonii* f., *Hedera helix* 'Caellia'and 'Mona Lisa', *Pelargonium zonele*, *Peperomia rotundifolia*, *Peperomia caprea*, *Primula acaulis*, *P.vulgaris*, *Rosa chinensis Saintpaulia ionantha*, *Sinningia speciosa*, *Senecio cruentus*. Mildew has injured 6 plants species. Bacteriosis (agents *Xanthomonas campestris* pv. *dieffenbachiae* and *Ervinia caratovora*) has strongly injured 10% of these plants.The plant is weakened very often due to the cool weather, the lack of lighting or overwatering. Some weakened plants are often vulnerable to pathogens, namely: *Saintpaulia ionantha, Euphorbia pulcherima, Calceoaria sp., Begonia* spp., *Colunmea* spp., *Cyclamen* spp. et al. *Bromeliaceae* family and *Dracaena* genus plants are often vulnerable to root rot pathogens. Aphids have dominated among pests. 100% of *Chrysanthemum* sp. plants were injured by 3 species of aphids.

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Poster presentation

Evaluation of Genetic Structure of *Impatiens parviflora* Populations Growing in Lithuania Using Several Types of Dominant DNA Markers

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Abstract

Impatiens parviflora is an invasive annual herb which is widespread in many European countries. In Lithuania this species also is considered as successful invader of city parks and forests and is one of the most noxious alien plants. The objective of the study was to estimate genetic diversity of *I. parviflora* according to several types of dominant DNA markers. Twenty one populations of *I. parviflora* were sampled to cover all the territory of Lithuania. In total more than 300 individuals were studied, up to 16 plants were sampled in each population. The set of dominant DNA markers (4 ISSR, 8 RAPD primers and 8 AFLP primer combinations) were used for molecular analyses. Agarose gel electrophoresis and capillary electrophoresis (ABI 3130 genetic analyzer) were used for separation and identification of DNA fragments. Comparing the results of obtained data by different dominant markers, the highest polymorphism according to all used markers was assessed in the Central part of Lithuania and the least polymorphic populations were in the West part of the country. Analysis of molecular variance (AMOVA) shown that genetic diversity within populations is lower than among populations according to 3 types of DNA markers. Principal coordinate analyses (PCoA) did not reveal clear differentiation of *I. parviflora* into separate groups according to geographical location by ISSR and RAPD markers, however AFLP markers shown that populations from West part of Lithuania groups together and populations from East part of the country creates another group, Central Lithuanian populations were more dispersed. Comparing Bayesian clustering analyses, similar numbers of clusters were obtained by separate dominant DNA makers and results suggest that spread of *I. parviflora* in Lithuania might be determined by complex multiple introduction process.

Keywords: Small balsam, alien species, invasion, molecular makers

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Poster presentation

Stress Regulating Properties of two *Bacillus* sp. Bacterial Endophytes in Apple (*Malus* × *domestica* Borkh.) Culture *in vitro*

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Abstract

Vegetative propagation methods are commonly used for horticultural plants of *Rosaceae* family, such as apple, pear, cherry, peach and strawberry. Development of *in vitro* micropropagation is important for plant biotechnology research and agricultural applications. *In vitro* environment imposes unfavorable conditions that lead to imbalance of plant physiological equilibrium and induction of oxidative stress, which occurs via production and accumulation of reactive oxygen (ROS) species. ROS cause lipid peroxidation leading to membrane injury, enzyme inactivation and DNA damage. It has been demonstrated that endophytic microorganisms play important role in plant acclimation and stress response. However, capacity of endophytes to modulate plant stress responce under *in vitro* conditions is largerly unexplored. Therefore the aim of this study was to assess effect of two endophytic *Bacillus* sp. bacteria strains (Da4 and Oa4) on ROS production and gene expression in apple cell suspension and stress reducing properties in shoot culture *in vitro*. Our study revealed that the two endophytic bacteria strains associated to apple cv. Gala cells in suspension (Fig. 1), and demonstrated different intracellular ROS production regulating properties (Fig. 2). Protein expression analysis using DIGE revealed that incubation of the cells with ROS production inhibiting strain Oa4 resulted in highly increased abundance of 29 proteoforms involved in defense response, metabolic and oxidation – reduction processes (Fig. 3). Meanwhile 12 and 25 proteins of increased or decreased abundance, respectively, were detected after incubation with either of the endophytic strains. In apple cv. Gala shoot culture, ROS production was mostly detectable in leaf and injured tissues (Fig. 4). Lipid peroxidation analysis established that oxidative damage was the most prominent during first week after replanting and during onset of senescence of the culture (Fig. 5). Both endophytic *Bacillus* sp. strains reduced the shoot lipid injury level approx. 2.2 fold after one week of co-cultivation. Further, contrasting effect on the apple shoot morphological traits was observed after three weeks of co-cultivation. As compared to control, shoots inoculated with the strain Da4 formed 2.2 and 1.8 fold larger biomass and adventitious shoot number, respectively. Meanwhile, strain Oa4 had inhibitory effect. The results suggested that the two endophytic strains exploited different interactions with plant cells and had different plant oxidative stress regulating properties under *in vitro* conditions.

Keywords: endophytic bacteria, domestic apple, plant stress, gene expression.

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Poster presentation

Potential uses of quince (*Chaenomeles japonica* (Thunb.) Lindl. ex Spach) by-products after industrial processing

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Abstract

By-products of quince fruit processing – press cake and seeds constitute a high proportion of processed raw material. The amount of quince by-products also depends on the processing technology. The by-products can be recycled in order to obtain various valuable products. Quince seeds, in the food industry, are usually discarded. Further use of the quince seeds creates additional value and opens possibilities for no waste processing. The aims of the present study are (1) to check the possibility of obtaining cold-pressed quince seed oil from their by-products left after industrial processing, (2) to analyse the possibility to use quince seed oil in the food and cosmetic industry, (3) to determine the physicochemical properties of cold-pressed quince seed oils: acidity value, peroxide value, fatty acid composition, color. The by-products was left after three different processing: by-products after industrial quince juice processing (WJP), by-products left after quince puree production (WPP), by-products obtained after manual coring of fruits for production of candied fruit, (WSP). The seeds from different by-products (WJP, WPP and WSP) were separated using water (applying sedimentation principle). Separated seeds were dried at 45±2ºC with active ventilation. Quince seeds in the by-products comprised from 29.8 to 38.3%. *The oil content* of dried *seeds ranged* from 4.7 to 7.1%. The cold-pressed quince seed oil had very high omega-6/omega-3 ratio (109/1) and high content of linoleic acid (47.1 – 38.5 %) which suggest that the oil is more suitable for cosmetics industry than for food uses.

Keywords: Japanese quince, by-products, seed oil, fatty acids.

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Poster presentation

The functional sports beverages with biologically active substances of plant origin

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Abstract

Sports beverages are designed to help delay the onset of fatigue during exercise and help rehydrate athletes after training or competition by replenishing carbohydrates, electrolytes and other nutrients. A nutritional composition of functional drinks taken during exercise for enhancing hydration with biologically active compounds, especially from plant original are recommended for the athletes nutrition. Beetroots are a rich source of biologically active substances, including betalains, nitrate, ascorbic acid, phenolic compounds, carotenoids (Clifford et al., 2015) and micronutrients such as potassium, sodium, phosphorus, magnesium, and etc. (Ormsbee et al., 2013). Sea buckthorn has recently gained worldwide attention mainly for its nutritional and medicinal value as the berries contain different kinds of nutrients and bioactive compounds including vitamins, fatty acids, free amino acids and elemental components (Bal et al., 2011). Fifteen mineral elements were analyzed in the birch sap. Ca, Mg, P, Mn and Zn were the most abundant in the sap, their concentrations exceeding 1 mg L^{-1} (Harju and Huldén, 1990).

The aim of the study was to develop sports beverages with biologically active fractions from plant materials and evaluate their chemical composition and organoleptic properties. During the development stage of functional drinks active ingredients and their combinations were selected and tested in the laboratory. A range of products containing different proportions of birch sap, biologically active extracts from beet root juice (cvs. *'Bordo' and 'Joniai'*), apple juice (cv. *'Auksis'*), sea buckthorn (cv. *'Almiai'*) juice, other ingredients were prepared and the best combinations were selected by evaluating taste, odour and colour. The pH, the total soluble solids content, CIELab colour coordinates, antioxidant activity as ferric reducing antioxidant power (FRAP) and content of total betalains in beverages were evaluated. The betacyanins concentration was found to range between 58-65% and betaxanthins between 35-42% of the total betalains content in the drinks. The antioxidant activity of functional beverages varied from 6.3 to 32.3 μgTE mL^{-1}. The functional sport beverage made from 41.2% birch sap, beetroot juice fraction 33.5% and biologically active fraction from sea buckthorn and apple juice had the greatest acceptance (94% of the panelists). Growing consumer interest in recent years for more natural food and beverage products generally and those made without artificial colors, flavors and other additives extends to sports drinks and supplements market.

Keywords: sport, functional drinks, beet root, birch sap

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Poster presentation

Surface Plasmon Resonance Based Dosimeter

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Abstract

Various types of surface plasmon resonance based sensor can be found in different areas of science and industry. Although primarily dedicated for biosciences these sensor can be applied for more exotic applications like dosimetry. Not applicable on its own, surface plasmon resonance phenomena greatly increases the sensitivity of other sensing methods. For application as a dosimeter, surface plasmon resonance compatible diffraction grating was used in conjunction with a dosimetric gel. Dosimetric gels have a unique properties in terms of biological tissue equivalency in radiation fields. On the other hand current methods of dosimetric gel readout has limited sensitivity. Because of this, surface plasmon resonance based dosimetric gel readout method is of great benefit. Proposed dosimetric method could be applied for evaluating small ionizing radiation doses in medical and scientific applications.

In this research different aspects of such dosimetric method was evaluated. These include diffraction grating properties, forming parameters, dosimetric gel layer thickness. All of the measurements associated with these results were made with an in-house developed measurement system, which is described as well.

Keywords: Surface plasmon resonance, dosimetry, polymeric gels, polymerization, optical measurements

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Poster presentation

Geochemical Modeling for the Estimation of Impact of Dissolved Organic Carbon on Bentonite Sorption Capacity for Selected Radionuclides

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Abstract

In natural aqueous systems, adsorption is regarded as possible metal sequestration mechanism. Bentonite is generally been chosen as buffer and backfill material for construction of engineered barrier of disposal system because of its high swelling capacity, low permeability, micro-porous structure and good sorption properties. In Lithuania, densely compacted bentonite clay is under consideration to be used as engineered component of proposed radioactive waste repository concept. Development of disposal concepts and safety assessment models require many system related data (e.g. definition of material composition, backfill, groundwater composition, etc.). Critical point is to assess how each of the disposal system component (engineered and natural) will affect total disposal system performance and how they will evolve during their interaction. Natural waters contain dissolved organic carbon (DOC) which is an integral part of many different compounds forming complexes with metals as well as radionuclides. The radionuclide-organic matter complexes can be more mobile than the corresponding complex with inorganic ligands. In this paper sorption models presented are developed in order to understand and predict mobility of various valency states radionuclides (Cs(I), Ni(II), Eu(III)) as a function of pH in a presence of DOC using bentonite as substrate. Ion exchange and surface complexation models (SPNE/CE) and computer program PHREEQC (USA) were applied for the modelling of the interaction within the radionuclide/water/bentonite system.

Keywords: radionuclide, geochemical modeling, DOC

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Poster presentation

Composts influence the growth of spring barley

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Abstract
Composting is biological degradation of organic compounds in waste under aerobic or anaerobic conditions [1]. During composting the content of phytotoxic substances as well as greenhouse gas emissions are reduced [2].
Pot trial experiments were conducted with the aim of determining organic matter and other agrochemical indicators of different types of composts. The plants were grown in 6 l vegetative pots. Compost with soil were mixed by the following volume – 10, 20, 30 and 40%. Spring barley was grown for two years – in 2015 and 2016. This work investigated four types of compost - green waste and food waste, sewage sludge, biogas production waste.
The largest amounts of organic matter, organic and total carbon, and total nitrogen were found in the biogas production waste compost. The minimum contents of organic matter and other nutrients were estimated in the green waste compost.
The following biometric measurements on spring barley were taken: plant height, 1 000 grain weight and grain yield. The best growth of barley was in the substrate with biogas production waste in 2015 – plant height 43.7–53.7 cm, 1 000 grain weight 45.6–49.2 g, grain yield per pot 19.1–23.0 g, and the minimum contents were in the green waste substrate . In 2016, the best results were obtained in the substrates with green and food waste compost. The nitrogen content was determined in spring barley grain. In 2015, the total nitrogen content in plant grains was increased by the substrate of biogas production waste, and in 2016 it was increased by the substrate of food waste, sewage sludge and biogas production waste.

Keywords: composts, organic matter, spring barley

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Poster presentation

Influence Of Iron Ions On The Fluorescence Of Calcein And Calcein Blue

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Abstract

Cell electroporation – a temporal increase of the cell membrane permeability occurring due to the action of the pulses of strong electric field (up to 300 kV/cm) – is widely used in cell biology, biotechnology, and medicine. When a high–voltage is applied to the electrolyte solution, besides other electrolysis reactions, the oxidation of the metal ions of the anode occurs. As a result of this, the dissolution of the anode takes place.

The metal ions, which are released from the electrodes, can react with fluorescent molecules and decrease the intensity of their fluorescence. One of the most popular materials utilized for electrodes, which are used to electroporate the cells, is stainless–steel. In such a case, iron ions (Fe^{2+} and Fe^{3+}) are released from the anode under the action of high–voltage electric pulses.

In the present work, the effects of iron ions on the fluorescence of calcein and calcein blue in three different media – distilled water, 0.9% NaCl, and Dulbecco's Modified Eagle Medium (DMEM) – have been studied. The fluorescence was found to be the most suppressed in 0.9% NaCl media and the least suppresed in DMEM media. For example, in 0.9% NaCl media only 0.1 mM of Fe^{2+}/Fe^{3+} was required to fully suppress the fluorescence of calcein, while in the case of calcein blue, much higher concentrations of iron ions – 1 mM - was required to get the same effect. The results of this work can be useful when estimating the efficiency of cell electropermeabilization.

Keywords: electroporation, electrochemical phenomenon, fluorescence quenching.

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Poster presentation

Investigation On The Influence Of Clear Cutting On The Phenolic And Flavonoid Composition Of *Vaccinium Vitis – Idaea* L.

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Abstract

Vaccinium vitis-idaea L., family *Ericaceae* (cowberry) is a small evergreen shrub for which several pharmacological activities have been documented for, which include counteracting urinary and digestive-tract infections. For this research, sixteen cowberry shrub samples were selected, all of them obtained from a clear-cut area, where all the trees in the area were uniformly cut down. Eight of the samples were made up from the shrubs above ground part (leaves, branches) and the other eight – below ground part (roots). Control samples were cut down in 2015, while the clear cut ones in 2017, after the clear cutting of the forest. The aim of this research was to perform a quantitative analysis of various cowberry samples phenolic and flavonoid composition and to evaluate the influence that varying clear cutting had on the results. The above ground part in both phenolics and flavonoids depicted a higher concentration than the control samples while the below ground part control samples depicted a higher phenolic concentration then the clear cut samples. The concentration of total flavonoid compounds was lower compared to the total phenolic compounds in above and below ground parts, therefore a large part of phenolic compounds in the upper part consisted of phenolic compounds other than flavonoids. No significant amount of flavonoid compounds were found in the below ground part using the current raw material amount. Radical scavenging activity and the influence of varying vegation period effects on the results will be evaluated for future research.

Keywords: Phenolics, flavonoids, cowberry.

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