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BOOK OF ABSTRACTS

CHEMISTRY AND APPLICATION FIELDS

ESCORENA European System of Cooperative Research Networks in Agriculture

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PL 1. BIOCATALYTIC ROUTES FOR HIGH VALUE CHEMICALS FROM RENEWABLE RESOURCES

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In the transition to a biobased economy as a consequence of fuel depletion, the development of new technologies for conversion of biomass into high-volume chemicals is a must and a challenge. High volume chemicals include most organic compounds, polymers, and plastics. Therefore, the design and production of new or existing monomers from renewable resources with application in polymer synthesis is needed. This study reports the development and/or optimization of novel biotechnological routes for the production of selected building blocks derived from carbohydrates.

PL 2. CHARACTERISATION OF FOLATE-BASED NANODEVICES

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The formulation of nanodevices should have in attention that the final product has the characteristics that makes it prone for use in theranostics. Some of the main characteristics of the nanodevices are referring to the nanoparticle size, surface charge and permeability, biodegradability, biocompatibility, toxicity, drug solubility and stability, design of the drug release and antigenicity of the final product.

In our study, we present several methods used for the characterization of the obtained folate-based nanodevices.

Acknowledgements: The study has been supported by European Commission through European Regional Fund project number 621/2014.

PL 3. VOLATILE ORGANIC COMPOUNDS EMITTED BY PLANTS DETERMINATION USING NEW GAS CHROMATOGRAPHY MASS-SPECTROMETRY METHODS

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In the nature, plants emit numerous volatile organic compounds. Common plant volatiles include various green leaves volatiles, terpenes, phenylpropanoids and/or benzenoids.

The presentation will characterize thermal desorption (TD) and solid space microextraction methods (SPME) for simultaneous determination of green leaves volatiles (GLVs), various mono- and sesquiterpenes in headspace of plants.

The first method is based on preconcentration of VOCs on solid absorbents coupled with the gas chromatograpy mass-spectrometry coupled with thermal desorption system (GCMS-MTD). For trapping the volatile organic compounds (VOC) we used a multibead tube filled with solid sorbents (Carbotrap© and Carbopack©). Different types of solid sorbents have been tested and characterised.

The second method is based on adsorption of different volatile compounds on the fibres followed by GC-MS analyses. The fibres trapped and released volatile organic compounds with different numbers of carbons atoms.

Both methods have been used for volatile organic compounds emitted by plants from *Betulaceae* family.

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OP 1. SPECTRAL CHARACTERIZATION AND DETERMINATION OF TOTAL ANTIOXIDANT CAPACITY OF BURDOCK EXTRACTS USING CHEMILUMINESCENCE TECHNIQUE

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Due to this the large number of antioxidant compounds in plant tissues, in recent years have been developed various methods for calculating the total antioxidant activity of biological samples, by testing the different extraction media. Most often alcoholic extractions were shown to be more effective than the aqueous extracts.

Measurement of total antioxidant capacity helps understanding the functional properties of food and is expressed in various ways, according to various reference standards.

To determine the total antioxidant capacity of the extracts of burdock root (*Bardanae radix*) we applied the method based on chemiluminescence, used luminol as fluorescent substance.

The techniques used for characterization of plant extracts and their components are spectral absorption techniques, IR spectroscopy and UV-VIS spectroscopy, used quercetin and rutin as standards.

OP 2. EVALUATION OF HEMP SHIVES USAGE FOR BIOREMEDIATION OF SALINITY SOILS

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Brassica napus L plants grown on salty soils have been used to test the effectiveness of hemp shives as bioremediators of soils affected by high salinity. Two different plots have been seeded with *Brassica napus* L but at one the soil has been treated with hemp shives while the second one has been let as control.

The soil analysis have been shown a downward trend in the conductivity of soils treated with hemp shives and a decrease in the values of Na and K ions On the other way, it have been notice a drastic drop in more than half of the cadmium ions, which shows a major influence of bioremediators on the metal ions.

Net assimilation rate and stomatal conductance is reduced by more than 6 times for plants grown on salinity soil compared with the control group. The treatment with bioremediators (hemp shives) determined an improvement of all parameters but still not up to the level of control plants.

Chlorophylls content is lower for plants grown on saline soil compared with the control plants. Bioremediators improved the pigments content in leaves.

Acknowledgements: The study has been supported by European Commission through European Regional Fund project number 621/2014.

OP 3. VOLATILE ORGANIC COMPOUND EMISSIONS FROM PEDUNCULATE OAK UNDER ABIOTIC AND BIOTIC STRESS

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Plants are very sensitive to environmental stimuli and can undergo changes in physiology and development in order to acclimate to their surroundings. In the nature plants are under a multitude of different stress factors. Since plants cannot flee from the stressful environment, they have to develop strategies to adapt or defend themselves. One strategy which is used in response to biotic or/and abiotic stress by plants is to elicit a variety of volatile organic compounds (VOC). One major foliar disease of pedunculate oak *(Quercus robur)* in Europe is powdery mildew, which is caused by *Erysiphe alphitoides*. Both young and old trees can be infected. More susceptible to the infection are young trees, and in combination with other environmental stress factors, the disease can lead to tree decline.

In the present work we study the emission of volatile organic compounds from *Quercus robur* under biotic stress *(Erysiphe alphitoides)* combined with abiotic stress (temperature). In order to investigate the relationship between both type of stress factors applied and the emission of volatile organic compounds, the percentage of the total area infected leaf was calculated and correlated with VOC emission. Isoprene, GLV and monoterpenes emission have been measured using a GC-MS method. The data obtained have been shown a cumulative effect of abiotic stress (temperature) and biotic stress.

It has been demonstrated that VOC emissions are quantitatively related to the stress dose. We noticed a change of the "Breaking Point" in the emission of VOC. Lower temperatures have been determined for trees infected compared to control.

The results have been show that the infection with *Erysiphe alphitoides* combined with high temperature induced a high emission of GLV and monoterpenes, and a decrease in emission of isoprene.

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OP 4. ATOMIC FORCE MICROSCOPY

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Nanotechnology is an emerging field of research that has been widely applied in different fundamental science and engineering areas. Atomic force microscope is a nano-based device used to reconstruct at a nanometric scale resolution the 3D morphology of a wide variety of samples. Therefore, due to its versatility, sensitivity and unique capability to reveal the nanoscale structure of the samples, atomic force microscopy (AFM) produced, in the last years, a vast increase of reports of its use to determine the topography, electric properties, nanomechanics and even nanomanipulations of various samples in the fields of materials science, chemistry, physics, biology, microbiology, medicine, engineering, food products, forensic, etc. The application of this technique for revealing the 2D and 3D structure of textile, paper, and biologic samples is discussed.

Acknowledgements: The study has been supported by European Commission through European Regional Fund project number 621/2014.

P 1. ANALYSING THE USAGE DEGREE OF ECO-LABELED LOCAL DETERGENTS

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Eco-labeling is an activity which aims to establish a voluntary system for the award of the eco-label for products with minimal impact on human health and the environment throughout the entire life cycle of the product. The eco-label is to promote products that have a low environmental impact, eco-labelling as it is voluntary.

P 2. THE YELLOW WATERMELON WITH HORNS (*CUCUMIS METULIFERUS*) – FOOD AND THERAPEUTIC SPECIES WITH ADAPTATION POSSIBILITIES IN ARAD AGROECOLOGICAL AREA

Lucian HĂLMĂGEAN, Mihaela MEŞTER, Monica ZDREMŢAN, Maria BALINT, Daniela DIACONESCU, Virgil CIUTINA

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In Arad agroecological area, the characteristic area for the west side of the country, starting with 2012 were undertaken a series of research regarding the cultivation technology of yellow watermelon with horns. Beeing a recent species introduced in Romania, but not studied in the west part of the country, our research were oriented for the aclimatization of this species, the development of specific cultivation technology for protected areas or field, as like the improvement of this species towards obtaining new species with superior phenotypic characters. The studied species can be successfully grown in Arad agroecological area, both in protected areas as in field, directly. The fruits are valuable from nutritional viewpoint, containing a several beneficial substances in food and medicine domain (doesn't contain cholesterol).

P 3. RESEARCHES CONCERNING EXTRACTION AND DOSAGE TECHNOLOGY OF PYRIDOXAMINE AND THIAMINE BY USING SOME GARDEN SOME PLANTS OF THE *FABACEAE FAMILY*

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Among species belonging to *Fabaceae family*, there are cultivated for pods and green beans: pea, garden bean and horse bean. Experimental researches had been carried out during 2010-2012 period in Munar locality, Arad County, a favorable area for pea cultivation from pedoclimatical viewpoint. Vitamin B_1 (thiamin), thiaminpirophosphate (TPP) likeness, is the coenzyme of *pyruvate decarboxylase*, *α-cetoglutarat dehydrogenase complex* and some *transacetolases*. All these experiments are characterized by the fact that, together with *fertilization* factor it had been also had in view the usage of fixed nitrogen from atmosphere by means of nitrogen fixing bacterium (*bacterization)*. Used bacterial product for seeds treatment was **Biotrofin** biofertilizer (10 l/ha). The surface of experimental field (115 m^2) was reckoned by taking into consideration the producer's specifications.

Concerning **2010**, the highest quantities of thiamin, riboflavin and pyridoxine were registered at samples of peas proceeded from plots number 6, fertilized with *Ferticare I* in doses of 180 kg/ha for 3 times. Significant increases were obtained for both years 2011 and 2012.

For **2011**, by applying *Ferticare I* fertilizer, in peas can be observed an increasing of thiamin quantity for 1,2-1,5 times, riboflavin quantity for 1,3-1,5 times and pyridoxine quantity for 2,5-3,5 times.

P 4. CHANGES IN PHYSICAL PROPERTIES OF SOME FRUITS AFTER VACUUM IMPREGNATION TREATMENT

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Vegetal products are generally characterized through a high level of sensitivity due to environmental factors and to the operations they are submitted to during their preparation. This leads to meaningful changes regarding vegetal products nutritional and sensorial characteristics. The prevention of such drawbacks can be made by introducing active compounds in their structure in order to protect them from unwanted alterations. The introduction of compounds can be achieved through classical infusion, through the immersion of the products in hypertonic solutions of the respective compound, or through a new technology, vacuum impregnation. We also point out the data regarding the impregnation with sucrose of some fruit, depending on the concentration of sugar solution, the duration of the processing and the vacuum pressure.

P 5. NANOELECTROSPRAY QUADRUPOLE TIME-OF-FLIGHT TANDEM MASS SPECTROMETRIC ANALYSIS OF LONG CHAIN POLYSACCHARIDES

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Structural analysis by electrospray ionization (ESI) mass spectrometry (MS) of long chain polysaccharides is challenging since this class of molecules does not contain readily ionizable groups. The mass spectrum is dominated by singly charged ions, limiting the detection of high molecular weight species. To enhance the ionization, different derivatization techniques were employed for ESI-MS of long chain polysaccharides. The major downside of derivatization is the subsequent purification with loss of analyte, resulting in lower experiment sensitivity. To overcome these, we propose a method based on nanoESI-MS and MS/MS by collision induced dissociation (CID) for underivatized long chain polysaccharides. The feasibility of our simple procedure was tested on underivatized polydisperse dextrans (average molecular weight 4,000) which could be characterized at 2.6 kV ESI voltage and CID MS/MS at energies in the range of 30-60 eV. Under these conditions, we have detected 113 ions corresponding to species from Glc_2 to Glc_{35}. By MS/MS, the ions at *m/z* 1,409.48, 1,107.35 and 1,438.47 assigned to $[G_{17}+2Na]^{2+}$,$[G_{20}+H+Na+K]^{3+}$ and $[G_{35}+2H+Na+K]^{4+}$ were sequenced and reliably characterized. The native molecular component containing 35 Glc repeats represents so far the longest polysaccharide chain detected and structurally analyzed by ESI-MS and MS/MS, without derivatization and/or separation prior to MS.

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P 6. FULLY AUTOMATED CHIP-BASED NANOELECTROSPRAY MASS SPECTROMETRY OF FRUCTOOLIGOSACCHARIDES SYNTHESIZED BY LSCA FROM SUCROSE

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Levansucrases of Pseudomonas syringae pv. tomato DC3000 (Lsc3) and Pseudomonas chlororaphis subsp. aurantiaca (LscA) have 73% identity of protein sequences, similar substrate specificity and kinetic properties. Both enzymes produce levan and fructooligosaccharides (FOS) of varied length from sucrose, raffinose and sugar beet molasses. The most interesting outcome of this work we emphasize the ability of Lsc3 and LscA to transfructosylate various nonconventional acceptors producing heterooligofructans. The products can have novel or enhanced physiological effects and thereby applications of their own, but they can also serve as starting material for the synthesis of new oligosaccharidic products. The ability of d-sorbitol, xylobiose, d-galacturonic acid, d-mannitol, xylitol and methyl-d-glucopyranoside to serve as fructosyl acceptors for levansucrases is shown for the first time. Fully automated chip-based nanoelectrospray mass spectrometry was performed on a NanoMate 400 robot (Advion BioSciences, NY, USA) coupled with a high-capacity ion trap mass spectrometer (HCT MS) from Bruker Daltonics (Bremen, Germany). A novel high-throughput chip-based nanoelectrospray mass spectrometric method was applied to screen alternative fructosyl acceptors for levansucrases.

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P 7. STUDY OF L-GLUTAMIC ACID INFLUENCE ON THE THERMAL BEHAVIOR OF NATIVE WHEAT STARCH

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By processing the mixtures of native wheat starch and L-glutamic acid, in dry roasting conditions, esterified dextrins are formed, which can be used as ingredients in functional foods, having the role of dietary fibers.

This work presents the influence of L-glutamic acid additions in different proportions, on the thermal stability and on the oxidative decomposition of native wheat starch, using TG/DTG and DTA analysis. Samples of native wheat starch, L-glutamic acid and a series of five mixtures of these two have been taken under work. The thermal studies were conducted in dry roasting conditions, in dynamic regime, in the range of 35-500^{o}C, in an open system, in air atmosphere, at a β =10°C/min heating rate. Changes in the chemical structure of the samples, after heat treatment up to 225^{o}C, were highlighted by FTIR analysis in the 600 - 4000 cm^{-1} domain.

The results of the study show that, under dry roasting conditions, in the presence of L-glutamic acid, the thermal stability of the wheat starch decreases due to changes in the architecture of the granules. These changes were assigned to the action of the water formed during the L-glutamic acid transformation into pyroglutamic acid, respectively from the esterification of the latter with the dextrin formed from the starch.

The data of this study has applications in practice for establishing some processing parameters of wheat starch and L-glutamic acid mixtures, to obtain dextrins with functional properties characteristic to dietary fibers.

P 8. THE INFLUENCE OF TEMPERATURE STRESS ON THE EMISSINON OF BIOGENIC VOLATILE ORGANIC COMPOUNDS AND PHOTOSYNTHETIC PARAMETERS OF *QUERCUS ROBUR* TREES

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Biogenic volatile organic compounds are implicated in atmospheric chemical reactions and play a major role in tropospheric chemistry.

In the nature, the different stress conditions that affect plants determine decreases in their photosynthetic parameters and water relations at cellular, at whole leaf and plant levels, resulting in a variety of stress responses and activating local and systemic stress response pathways.

The stress factors that affect the plants are light, humidity and temperature. The most common stress which determine a wide spectrum of biogenic volatile organic compounds (BVOCs) that have been produced by plants during and after stress is temperature

Pedunculate oak (*Quercus robur*), one of the most common deciduous tree in Romanian, is known to be monoterpene emitters.

In the present work, we have tested the influences of temperature exposure of *Q. robur* leaves to 45 ^{o}C for 6 hours. The results have shown that photosynthetic parameters decreased drastically after first 30 minutes of exposure while green leaves volatile emissions are increased.

The monoterpene emission rates increased after 1 hours of exposure until a maximum of 0.2 nmol m^{-2} s^{-1} for most of the terpenes. Isoprene emission rate is decreasing, after the first burst, due to isoprene synthetase decreasing activity. The thermotolerance role of the isoprene for *Q. robur* leaves is explained by the first outbreak in emission.

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P 9. VOLATILE ORGANIC COMPOUND EMISSIONS FROM OAK UNDER DROUGHT STRESS

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Biogenic Volatile Organic Compounds (BVOC) emitted by terrestrial ecosystems into the atmosphere play an important role in formation of atmospheric constituents including the oxidants and aerosols that determine air quality and climate. Terrestrial ecosystems produce and emit many biogenic volatile organic compounds (BVOC's) into the air where they influence the chemistry and composition of the atmosphere including aerosols and oxidants.

In our study, we have been focused on the response of oak (*Quercus Robur)* to drought stress.

The emission of green leaf volatiles (C_6 aldehydes and ketones byproducts of oxilypin metabolic pathway) signals the presence of a stress induced on the plant. Under the drought stress, *Q. robur* plants starts to emmit GLV after the soil water content have been decresing at 20%.

Acknowledgements: This work was supported by a grant of the Romanian National Authority for Scientific Research, CNCS – UEFISCDI, project number PN-II-RU-TE-2011-3-0022.

P 10. THE EVOLUTION OF PHENOLIC COMPOUNDS DURING TECHNOLOGICAL PROCESS AT SUPERIORS RED WINES FROM MINIŞ VINEYARD

Claudia MUREŞAN, Virgiliu CIUTINA, Sergiu PALCU, Claudiu URSACHI

The determinations that were done in this study regarded the evolution of phenolic compounds during the technological process that took place in rotating metallic tanks of red grapes variety. It was shown of that the must colour and tint intensity variation and partial fermented must fractions, with addition of different sulphur dioxide concentration.

P 11. PRELIMINARY STUDIES TO ASSESS THE ABILITY OF *BOTRYTIS ACLADA* FUNGUS TO PRODUCE LACCASES

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In this study, the preliminary steps to determine the capacity of *Botrytis cinerea fungus* to produce laccases have been performed. The interest for the laccase production it is due to the large fields of applications of these enzymes, like food and textile industries.

The biosynthesis at laboratory stage was monitored during two weeks. Glutamic acid was evaluated as a possible inducer for the enzyme synthesis.

The results obtained shown that the fermentation process is faster than for other *fungi*. It should be stop after 10 day from the beginnig of the process and the purifying process started.

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P 12. FLAX SEEDS - A SOURCE OF BIOMEDICAL PRODUCTS AND FUNCTIONAL FOODS

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Around the world flax is a very important fibrous bast plant, not only as valuable raw material for textile and composites (fibers and shives), but also as important source of phytoestrogens, proteins and dietary fibers in folk medicine and functional food ingredients.

Flax seeds are rich sources of valuable fatty acids, amino-acids, phytoestrogens, cyclolinopeptides, lecithin, waxes, lignin, pectin, mucilage and other agro fine chemicals. This plant is one of the most abundant plant sources of polyunsaturated fatty acids (PUFA) from ω-3 and ω-6 family, and very seldom stearidonic acid (with 4 double bonds), which are significantly effective for prevention of cardiovascular and heart diseases (CHD).

Flaxseed oil have a healthy balance of fatty acids with low level of saturated fatty acids and high content of both n-6 and n-3 fatty acids, free from trans fatty acids.

Lignans from flaxseed, class of phytoestrogens which have a potential beneficial impact on the treatment of several hormone dependent diseases in humans, have been investigated for their potential anticancer, antibacterial and antioxidant properties.

Extracted from selected flaxseed cultivars, cyclolinopeptides are effective promising components for the treatment following organ transplantation because they act as immunosuppressant. Cyclolinopeptides can also be used in formulation of special ointments with therapeutic properties.

Mucilage from flaxseeds is recommended as covering substances in the treatment of gastrointestinal tract, throat and skin diseases due to it's protective, laxative and emollient properties.

The composition of essential amino-acids, unsaturated fatty acids and mucilage of flax seeds positively affect growth and glossiness of hair and nails. They are valuable ingredients of many kinds of cosmetics, nutraceutical (like Bioflax^{R}) and functional foods.

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