

ISOLATION AND HIGH-THROUGHPUT SCREENING METHODS OF LEVANSUCRASE MUTANTS OF A PLANT PATHOGEN *Pseudomonas syringae* DC3000

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We optimized methods for mutagenesis and selection of levansucrase mutants. The gene encoding Lsc3 protein of *Pseudomonas syringae* DC3000 was randomly mutated and clones with changed activity and polymerization properties were selected using solid media-based as well as microplate-format approaches. Several mutations affecting levansucrase function were detected and assigned to protein structure.

AVENUES OF THE CONTEMPORARY GLYCO-SCIENCE: FROM GLYCOMIC TECHNOLOGIES TO DRUGS THAT ARE SWEET INSIDE AS WELL AS AT THE SURFACE

Invited lecture

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Introduction. Changes in cell surface glycosylation accompanies diseases such as inflammation, rheumatoid arthritis, and malignant transformations. These changes are supposed to be monitored by carbohydrate receptors of lectin type on the surface of cells of the immune system. However, the exact nature of these receptors orchestrating such reactions remains elusive.

Methods. We used a panel of recombinant lectin-like receptors of killer lymphocytes, bioaffinity techniques, oligosaccharide arrays, and mass spectrometry to analyze the complete oligosaccharide profiles responsible for sensitivity of tumor cells for natural killing and apoptosis.

Results. Highly branched *N*-linked oligosaccharides recognized by NKR-P1 and NKG2D receptors were linked to sensitivity to natural killing. On the other hand, clustered *O*-linked oligosaccharides cross-linking CD69 receptors were able to cause the apoptotic death of the activated killer lymphocytes.

Conclusions. We were able to identify classes of surface oligosaccharides responsible for natural killing of tumor cells as well as for the ability of tumors to eliminate

the killer lymphocytes.

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THE STUDY OF ANTIOXIDANT PROPERTIES OF YEAST GLYCOPROTEINS

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This work was aimed at monitoring the impact of different culture conditions (heavy metals, light/dark, chemical growth modulators) on the production of cellular glycoproteins biosynthesized by yeast strains *Rhodotorula glutinis* CCY 20-2-26, and on change in their composition and antioxidant properties. Generally, addition of growth modulators (biotin, pantothenic acid, hydrogen peroxide, ethanol) did not significantly effect on total amount and properties of glycoproteins. From the view of tested metals, the best antioxidant properties were detected in glycoproteins isolated from cells grown in media supplemented with copper and iron ions. It is noteworthy that cultivation under light induced antioxidant activity of cell glycoproteins detected by ABTS (suitable for proton-donating measurements) while antioxidant properties of cellular glycoproteins analyzed by FRAP method (appropriate for electron donating experiments) were stimulated under multiply shifting light/dark conditions.

The work was supported by grant VEGA No. 1/0747/08 from the Grant Agency of Slovak Ministry of Education.

THE INFLUENCE OF ENZYMATIC HYDROLYSIS ON MOLECULAR MASS OF WATER SOLUBLE ARABINOXYLANS

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The aim of this research was to study the influence of enzymatic hydrolysis on water soluble arabinoxylans.

Rye grain of variety Amilo was used as a material for

arabinoxylan isolation. Isolation was performed as described previously.

Preparation was modified by xylanase (*Thermomyces lanuginosus* strain) treatment. After hydrolysis molecular properties of both preparation unmodified and hydrolysed were determined by means of SEC analysis and intrinsic viscosity measurements and compared. In order to obtain more detailed information about molecular structure of arabinoxylan magnetic resonance ¹H-NMR was used.

The studies showed that the molecular mass of arabinoxylan dramatically decreased during hydrolysis. Moreover arabinoxylan particles of less than 5×10^4 g/mol, underwent the easiest hydrolysis. Obtained results showed that after enzymatic hydrolysis of arabinoxylan its solubility in water significantly increased.

This study was supported by Ministry of Science and Informatization grant N N312 440837.

CHROMATOGRAPHIC ANALYSIS OF MODIFIED WATER SOLUBLE PENTOSANS

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Rye flour contains water soluble fraction which is composed mainly of water soluble arabinoxylans.

The aim of this study was to investigate changes in molecular properties of arabinoxylan preparation after its modification and to compare those properties with unmodified arabinoxylan.

The structure of arabinoxylans was modified by enzymatic hydrolysis and following crosslinking induced by peroxidase – H₂O₂ treatment.

Used modification changed molecular properties of arabinoxylan preparation dramatically. Molecular mass decreased significantly over modification process what was confirmed by SEC analysis and intrinsic viscosity measurements. Moreover modified preparation was better soluble in water what is promising considering application of this preparation in bakery.

This study was supported by Ministry of Science and Informatization grant N N312 440837.

THE INFLUENCE OF OXIDATION ON MOLECULAR MASS OF WATER SOLUBLE ARABINOXYLANS

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Due to ferulic acid presence in arabinoxylans it is possible to crosslink the molecules what leads to increase in molecular mass and viscosity of water solution of arabinoxylans.

The aim of this research work was to investigate of molecular mass changes caused by cross-linking of water soluble arabinoxylans.

Preparation of water extractable arabinoxylans was isolated from rye whole grain flour as described previously. Basic chemical composition of obtained preparation was determined. Crosslinking was done using peroxidase (*Horseradish*) and H₂O₂ system. Analysis of unmodified and the modified preparation was performed and its molecular properties were compared.

It was concluded, that the isolation procedure which has been applied, allowed to obtain a preparation containing 50,3 % of arabinoxylans. Cross-linked preparation of water-soluble arabinoxylans was characterized by a higher molecular mass, compared to unmodified preparation. The increase in molecular mass of arabinoxylans caused by cross-linking ranged from 20 % (determined by chromatography) to 14 % (identified on the basis of viscosity measurements) for not subjected to modification arabinoxylans.

This study was supported by Ministry of Science and Informatization grant N N312 440837.

ANTITUSSIVE AND BRONCHODILATORY EFFECTS OF *OPILIA* POLYSACCHARIDE

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A pectin polysaccharide with high arabinose and uronic acid contents has been isolated from the leaves of *Opilia celtidifolia* by boiled water extraction¹. *Opilia* polysaccharide showed significant antitussive and bronchodilatory effects on chemically induced cough reflex and reactivity of airways smooth muscle *in vitro* and *in vivo* conditions in guinea pigs test system. Tests confirmed the dose-dependent cough suppressive effect of *Opilia* polysaccharide comparable with activity of narcotic codeine.

This work was supported by the VEGA Grant Nos. 2/0155/08 and 1/0073/08, and APVV Grant No. 0030/07.

REFERENCE

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BIODISTRIBUTION OF RADIOLABELED HIGH-MOLECULAR-WEIGHT HYALURONAN AFTER INTRAVENOUS AND ORAL ADMINISTRATION TO RATS

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The clinical use of hyaluronan (HA) in the treatment of joint diseases has led to an increased interest in exogenously administered HA. The current study was designed to compare procedures for labeling HA with radionuclides ¹²⁵I and ¹⁴C, and to determine the difference in the biodistribution pathways of radiolabeled HA in a rat model. The results of animal studies have shown, that orally administered high-molecular-weight hyaluronan is not distributed to connective tissues.

STUDY OF RESISTANT STARCH CONTENT IN PEAS AFTER HARVESTING TREATMENT

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Peas, garden peas especially (with high amylose content), is very good source of resistant starch (RS). Among selected 20 cultivars, significant differences of resistant starch content in seeds were not found. Content of RS varied between 7,04–7,48 % DM. Changes in resistant starch (RS) content were monitored in different terms of technological harvest in three productive pods. Values after lyophilization and drying (120–140 °C) of seeds differed statistically significantly and fluctuated in the range from 4,39 to 4,08 % in DM.

HYBRID STRUCTURES BASED ON MONTMORILLONITE/MODIFIED STARCH INTERCALATE

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Intercalates based on several commercial cationized starches with degree of substitution $D = 0.04–0.17$, and sodium montmorillonite were prepared. The XRD analyses of resulting organic/inorganic hybrids proved that modification in the starch structure leads to embedding the polycation into montmorillonite clay gallery. Lower degree of starch cationization results in a bigger enlargement of the interlayer space in the hybrid structure.

The authors wish to thank the Ministry of Industry and Trade of the Czech Republic (project TIP No. FR - TII/566) and the Academy of Sciences of the Czech Republic (project No. IAX08240901) for financial support.

CHARACTERISATION OF WHEAT VARIETIES FOR PURPOSES OF BREAD-MAKING UTILISATION

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The work was focused to determine the content of wheat grain components in different varieties, which are of dominant significance as regards nutritional and technological quality. Besides proteins, as well as gluten, we aimed to determine the content of the total starch, resistant

starch, amylose, amylopectin, and dietary fibre, which are the components with healthful properties. Part of work is devoted to sensory evaluation of the organoleptic characteristics of bread bake from selected species of wheat.

The obtained results suggest that the genotypes of Hybred and Torysa are particularly suitable for the production of bread-making product.

VARIABILITY OF NON-STARCH POLYSACCHARIDE CONTENT IN GRAIN OF SPRING BARLEY

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This work deals with the determination of non-starch polysaccharides content and evaluation of the variability in selected lines and varieties of spring barley produced in the years 2007 and 2008 on the school farm Žabčice. The assay set contained hulled malting varieties Amulet, Bojos, Tolar, Sebastian, Prestige, Jersey, Malz, hull-less lines KM 2084, KM 2283, KM 1057 and non-malting hull-less variety AF Lucius (CZ) and Merlin (Canada). Grain samples evaluation was based on the content of two major non-starch compounds: beta-glucans and arabinoxylans. For determination of beta-glucan content FIA (Flow Injection Analysis) method was used, for determination of arabinoxylans was used method by Douglas.

Highest content of beta-glucan was determined in the Merlin variety (6.08 %), the lowest content was determined in the Bojos variety (3.31 %), what proves this variety suitable for production of the Czech Beer, which requires low amount of beta-glucan in the malt. The Merlin variety due to its higher beta-glucan content could be recommended for production of food with higher content of dietary fiber. The KM 1057 line contained the highest amount of arabinoxylans (5.46 %) in the assay set, the lowest amount was found in the AF Lucius variety (3.67 %) and in the Merlin variety (3.66 %).

Statistically significant differences in the arabinoxylan and beta-glucan content were between the varieties and lines found, therefore by choosing the right variety/line could be achieved desired amount of certain non-starch polysaccharides for different purposes of processing.

The study was supported by the Ministry of Education, Youth and Sports of the Czech Republic, Project CR No. 1M0570.

ADDITION OF DIETARY FIBRE, RESISTANT STARCH AND β -D-GLUCAN TO WHEAT FLOUR AND THEIR EFFECT ON TECHNOLOGICAL QUALITY, BAKING PROPERTIES OF WHEAT DOUGHS AND BREAD QUALITY

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The aim of our experimental work was to evaluate the effect of dietary fibre (oat – HF 401, apple – AFE 400), resistant starch (Hi-maizeTM 260, Hylon[®] VII) and β -D-glucan (BarlivTM barley betafiber) addition (all at the level 5 %) on the technological quality of wheat flour, rheological properties of wheat dough and bread quality including the sensory evaluation. The overall acceptable were breads with oat dietary fibre and both resistant starches addition.

The work was supported by Slovak Research and Development Agency under the contract No. VMSP-P-0047-09 and by the National Project of Research and Development “Biological and functional diversity of plant genetic resources for an increase of adding value of agricultural production” from Ministry of Agriculture, Slovak Republic.

CORN STARCH AS A PORE-FORMING AGENT AND MICROSTRUCTURAL CHARACTERIZATION OF POROUS CERAMICS BY IMAGE ANALYSIS

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Corn starch is used for producing porous oxide ceramics (composite ceramics from the alumina-zirconia system) by traditional slip casting and starch consolidation casting. In these processes starch acts as a pore-forming agent that burns out during firing. Image analysis is performed on starch-based porous microstructures using different techniques, and the differences are compared with respect to porosity, pore size and pore shape.

EFFECT OF MINERAL NUTRITION ON THE CONTENT OF β -D-GLUCAN IN OAT GRAIN**ANDREA HLINKOVÁ^{a,b,*}, MICHAELA HAVRLETOVÁ^a, DANIELA DVONČOVÁ^a, and ALŽBETA ŽOFAJOVÁ^a**^a Plant Production Research Centre Piešťany, Bratislavská cesta 122, SK-921 68 Piešťany, Slovak Republic;^b University of SS. Cyril and Methodius in Trnava, Faculty of Natural Sciences, Department of Biotechnologies, Námestie J. Herdu 2, SK-917 01 Trnava, Slovak Republic
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We evaluated the influence of year and various nitrogen and selenium amounts, respectively on β -D-glucan content in oat seeding. Our results showed the considerable influence of year on β -D-glucan content. Nitrogen with selenium variants increased β -D-glucan content only in two consecutive years. We found out significant interactions year x genotype and year x nutrition x genotyp.

The work was supported by the National Project of Research and Development "Biological and functional diversity of plant genetic resources for an increase of adding value of agricultural production" from Ministry of Agriculture, Slovak Republic.

MALTING QUALITY AND GRAIN YIELD OF SPRING BARLEY GENOTYPES**MICHAELA HAVRLETOVÁ^{a,*}, KLÁRA KRIŽANOVÁ^b, ALŽBETA ŽOFAJOVÁ^a, and JOZEF GUBIŠ^a**^a Plant Production Research Centre Piešťany, Bratislavská cesta 122, 921 68 Piešťany, Slovak Republic,^b HORDEUM Ltd, Nový Dvor 1052, 925 21 Sládkovičovo, Slovak Republic
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With the aim to evaluate grain yield and malting quality of 17 newly bred spring barley genotypes, field experiments were established in 2 different localities in SR in 2009. Significant effects of genotype, locality and their interaction were found in all traits (grain yield, protein, extract, β -D-glucan, and starch contents). The highest variability was found in β -D-glucan. The genotypes with high grain yield and good malting quality were detected.

The work was supported by Slovak Research and Development Agency under the contract No. VMSP-P-0047-09.

 β -GLUCAN FILMS SUBJECTED TO LOADING/ UNLOADING TESTS IN TWO CYCLES**ANNA HEJLOVÁ and JIŘÍ BLAHOVEC**Czech University of Life Sciences, 165 21 Praha 6, Czech Republic
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$\beta(1-3),(1-6)$ -D-glucan films of microbial origin conditioned at different temperature and humidity levels were subjected to loading/unloading tensile tests. The tests were performed on an INSTRON testing machine (R33 4464) by constant rate 1mm/min and controlled by strain level. Mechanical parameters Young's modulus of elasticity, stress level, degree of elasticity, hysteresis losses and inelastic deformation obtained in two successive cycles were compared.

The paper was supported by the Grant Agency of Czech Republic project No. 525/09/1133.

AN ACCURATE DETERMINATION OF HYALURONAN MOLAR MASS AND POLYDISPERSITY**MARTINA HERMANNOVA*, TEREZA EHLOVA, VERONIKA LEIEROVA, LUCIE TROJTLEROVA, and VLADIMIR VELEBNY**Contipro C a.s., Dolni Dobrouc 401, 561 02 Dolni Dobrouc, Czech Republic
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Physical and chemical properties of hyaluronan are closely related to the molar mass and its distribution. Multi-angle light scattering coupled to size-exclusion chromatography (SEC-MALS) requires knowledge of the specific refractive index increment (dn/dc) which has been evaluated under the same conditions as SEC-MALS sample analysis because only in this way very low deviations in Mw determinations are guaranteed. In addition, various SEC column systems have been investigated for hyaluronan separation to achieve an accurate determination of the biopolymer polydispersity.

ANALYSIS AND FRACTIONATION OF WHEAT GROATS FOR FERMENTATIVE ETHANOL PRODUCTION**KATARÍNA TOMŠÍKOVÁ, VIERA HORVÁTHOVÁ*, VLADIMÍR ONDÁŠ, ERNEST ŠTURDÍK**University of SS. Cyril and Methodius, Faculty of Natural Sciences, Department of Biotechnologies, Námestie J. Herdu 2, 917 01 Trnava, Slovak Republic
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Analysis and fractionation of 5 wheat cultivars were carried out in order to seek possibilities of making bioethanol production more efficient. In all experiments was also studied the impact of the amylose content. We found that the lowered amylose content in tested starches leads to their deeper hydrolysis and higher ethanol yield. The highest ethanol yield was obtained by the simultaneous saccharification and fermentation of non-fractionated wheat groats.

We gratefully acknowledge Slovak Research and Development Agency for supporting within the Project APVV LPP-0251-07.

FORMATION AND ISOLATION OF ACCIDENTAL DEGRADATION PRODUCTS OF HYALURONAN ACID HYDROLYSIS

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Several degradation fragments are formed during the acid hydrolysis of hyaluronan, which are not demanded in applications of low molecular weight hyaluronan. The current study was designed to compare some of the chromatographic techniques for the separation and isolation of this fragments, and also to develop simple procedure for removing of undesirable compounds from the final products. In addition, main four HPLC fractions were isolated in order to achieve the cytotoxicity testing, LC-MS characterization and ¹H NMR study.

ISOLATION AND CHARACTERISATION OF POLYSACCHARIDES FROM THE SPELT GRAIN

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The scope of this work was to isolate and characterize the non-cellulosic components of secondary plant sources (bran, chaff) of the spelt (*Triticum spelta* L.) and evaluate the sequential extractions with respect to the yield, chemical composition and antioxidant activity of the obtained polysaccharide fractions isolated from the bran in comparison to those isolated from the chaff.

This work was financially supported by the EEA grant No. SAV-FM-EHP-2008-03-05, the Slovak Grant Agency VEGA, grant No. 2/0062/09 and COST FP0901.

COMMERCIAL WHEAT ROLLS QUALITY MONITORING

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Quality of common wheat rolls bought in food supermarket was monitored in 3-week period. In total, five acquisitions were performed for quality assessment through one and three weeks. Specific volume was measured by the standard rapeseed displacement method, and crumb appearance by image analysis. Measured volumes ranged from 215 to 270 ml/100 g, mean cell area from 1.58 to 4.02 mm² at 7–23 cells/cm². Quality oscillation was higher during 3 weeks as presumed.

WHEAT/RICE COMPOSITE FLOUR FOR BREAD AND BISCUIT

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Changes of technological quality of wheat flour were studied in relation to partial replacement by white rice (WR) (0–30 % with step of 5 %). WR lowered water absorption up to 10 %, but multiplied dough stability in dependence on the level added. Probably due to smaller starch particles of WR in comparison to wheat one, amylo-graph maxima increased significantly. Worsen of cakes with WR was found commonly, but at the substitution of 5 % level specific volume increased about ca 10 %.

DEVELOPMENT OF NEW WINTER WHEAT LINES WITH STARCH WITHOUT AMYLOSE BY USE OF PCR-BASED MARKERS

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The aim of our study was to create new Slovak winter wheat lines with high starch content without amylose using PCR-based markers (MAS) in a classic hybridization - incorporation of null waxy alleles (loci *Wx-A1*, *Wx-B1* and *Wx-D1*) from two American lines NX04Y2107 and NX03Y2395 (coming from variety Kanto 107 and Bai-Huo) to Slovak wheat Veldava. We obtained 10 full waxy lines (homozygous in all 3 null alleles) from these cross-breeding.

This research was supported from Ministry of Agriculture of the Slovak Republic by project No. 100-004 Agrobiotechnology and molecular diagnostic of economically important crops' diseases.

EXPERIMENTS WITH GROWING *Phellinus* spp.

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Tens species of *Phellinus* are reported as medicinal mushrooms. Over thousands of years they have been utilized as traditional medicine in East Asia and they represent an essential part of traditional Chinese medicines. Polysaccharides and proteoglycans are most cited medicinal metabolites from *Phellinus* spp. being reported to have antitumor activities.

We cultivated *Phellinus igniarius*, *P. vaninii*, *P. punctatus*, *P. linteus*, *P. alni* and *P. chrysoloma* on beech and spruce sawdust as well as on wheat straw pellets. The substrates were filled into glass jars and lineal growth of mycelia was recorded. *Pleurotus ostreatus* strain 22 was used as a control. Best mycelial growth was observed both on sawdust and straw pellet substrates with *P. igniarius* and *P. vaninii*. The growth of other *Phellinus* spp. mycelia was substantially slower.

In the next experiment we followed primordia formation? and fructification of *Phellinus* species on different mixtures of sterilized, wetted and supplemented sawdust and straw pellet substrates. 2500 g blocks of the substrate colonized with mycelia were put into conditions of optimal temperature and relative humidity. However, no fruit bodies appeared on the blocks. Only a special form of mycelia (mycelial crust) appeared on surface of some blocks.

To compare some kind of chemical treatment as alternative to heat sterilization we cultivated 8 *Phellinus* species on beech logs. One part of the logs was wrapped into plastic bags, sterilized in autoclave and aseptically inoculated with mycelia. Other part of logs was dipped into 1% borax (sodium tetraborate) solution for 24 hours and holes were drilled into the dry logs.. Then the holes were

filled with plug spawn. Both treatments were compared after 11 months of wood colonization. Sterilized wood was much better colonized than the chemically treated one. Only of *Phellinus vaninii*, *P. punctatus* and *P. linteus* developed but only on sterilized wood.

This work was supported by NAZV Agency (Project QH 82173).

RESISTANT STARCH AND ITS HEALTH BENEFITS

Invited lecture

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An overview of resistant starch (RS), including Type 5 starch-lipid complex, will be presented. Recent advances on formation, production, structures, and properties of Types 2 and Type 5 RS will be reported, and effects of starch structures on the enzyme hydrolysis will be discussed. Health benefits of the RS on glycemic and insulin responses of human subjects and reduction in colon-cancer precursor developments of animals will be reported and discussed.

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CHEMOMETRIC EVALUATION OF WHEAT QUALITY FOR BIOFUEL PRODUCTION

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The paper deals with examining the possibilities of selected wheat cultivars (*Triticum aestivum* L.) for the production of fuel ethanol. In the wheat samples, the content of starch, amylose, amylopectin and total protein was determined. From the multivariate data analysis techniques used in this thesis especially the principal component analysis (PCA), cluster analysis (CA), correlation analysis (CCA) were applied.

This research was supported by the Slovak research and development agency in project APVV LPP – 025107.

THERMAL AND RHEOLOGICAL PROPERTIES OF STARCHES OBTAINED FROM POLISH WHEAT VARIETIES

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The aim of the present work was to study the thermal and rheological properties of starches obtained from Polish wheat varieties. The DSC gelatinization temperatures (T_O , T_P , T_E) and enthalpy (ΔH) varied between 52.6–58.7, 61.1–66.7, 66.9–71.3 °C and 6.81–8.58 J g⁻¹, respectively. The intrinsic viscosities were in the range of 163–228 cm³ g⁻¹. All investigated starch pastes behave as a non-Newtonian fluid with tendency to yield stress. The starch gels were characterized by viscoelastic properties with domination of storage modulus (G').

RHEOLOGICAL PROPERTIES OF HIGH-METHOXY PECTIN GELS WITH MODIFIED POTATO STARCH

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The rheological properties of high-methoxy pectin gels (0.5 wt%) with sucrose (45 wt%) and modified potato starch (acetylated distarch phosphate; 2.5, 3.5, 4.5 wt%) were studied. The flow behaviour and viscoelastic properties of the gels were determined by steady-shear and oscillatory rheometry, respectively. The higher the starch concentration was, the more shear thinning behaviour the system showed. The presence of starch in the system modified also viscoelastic properties of the gels.

LEVAN PRODUCTION BY *Halomonas* sp.

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As a linear $\beta(2-6)$ -linked fructose polymer, levan is a water soluble, strongly adhesive and film-forming biopolymer with many valuable properties distinguishing it from other polysaccharides. However due to its high cost, levan has only been available in small quantities. Therefore, levan producing microbial systems have great industrial importance. Recently, *Halomonas* sp. has been reported as a high level levan-producer for the first time by our research group. Besides sucrose-based chemical media, high production yields were achieved when various agroindustrial wastes were used as fermentation substrate. Ongoing studies are focused on potential applications of levan as a bioflocculant and emulsifier agent, as an encapsulating agent in controlled drug release and DNA delivery systems, as a functional biofilm coating material. Moreover, by a systems-based approach, a genome-scale metabolic network was reconstructed and the *in silico* model is currently being used to improve the biopolymer yields and to elucidate the mechanism of levan synthesis in *Halomonas* sp.

Financial support for this research is provided by TUBITAK through project 108M193.

ISOLATION, STRUCTURE AND PROPERTIES OF PECTIC POLYSACCHARIDES FROM THE PUMPKIN (*Cucurbita pepo* L. var *Styriaca*) Invited lecture

ZUZANA KOŠŤÁLOVÁ*, ZDENKA HROMÁDKOVÁ, ANNA EBRINGEROVÁ, GABRIELA NOSÁĽOVÁ, and EUBICA PRISENŽŇÁKOVÁ

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A variety of extraction methods offered novel information on the extractability and properties of the non-cellulosic polysaccharides of the pumpkin biomass. The fractions were rich in pectic polysaccharides including partially esterified homogalacturonan and highly branched rhamnogalacturonan regions. The fractions were contami-

nated with protein and phenolic components and some of them exhibited antitussive and antioxidant activities.

This work was financially supported by the EEA grant No. SAV-FM-EHP-2008-03-05, the Slovak Grant Agency VEGA, grant No. 2/0062/09 and COST FP0901.

LC-MS CHARACTERIZATION AND IDENTIFICATION OF COMPOUNDS ORIGINATING IN AN ACID HYALURONAN HYDROLYSIS

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Tandem mass spectrometry was utilized in identification and structural characterization of undesirable products causing coloration of hyaluronic acid in the course of acid degradation. Main four abundant isolated fractions with molecular weight less than 2 kDa were closely analyzed in order to elucidate elemental compositions. Fragmentation spectra were acquired to design anticipated chemical structures supported by theoretical models, reaction schemes and NMR spectra.

RESISTANT STARCH INTAKE IN CZECH REPUBLIC

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The aim of this study was to estimate the intake of the resistant starch (RS) in the Czech population by analysis of RS in a range of typical foods representing the main sources of starch intake. Food consumption data were based on published results of the Czech Statistical Office. From the results, the estimated average intake of RS in Czech population was found to be 4.2 g/day. Main sources of RS were potatoes, legumes and pasta.

This work was supported by Ministry of Education, Youth and Sports of the Czech Republic (Project No. MSM 6046137305).

DISCRIMINATION OF BARLEY VARIETES BY SPECTROSCOPIC AND STATISTICAL METHODS

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The presented results confirm that barleys of different genetic origin can be quickly and reliably distinguished by multivariate analysis of vibration spectra of milled barley grains. A group of samples containing small amounts of β -glucan and relatively high amounts of pentosans was separated by FT-IR and FT-NIR combined with PCA and HCA. Using PLC algorithm calibration models were prepared for quantitative FT-IR and FT-NIR determination of “HTS”, starch, N-substances, β -glucans and pentosans. These models were confirmed by cross validation.

This study was supported by the project Nutrkval No: QH91053 (Ministry of Agriculture).

HASE TRANSITIONS OF MAIZE STARCHES OF DIFFERENT AMYLOSE/AMYLOPECTIN RATIOS IN GLYCEROL-WATER SYSTEMS

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The phase transitions of maize starches of different amylose/amylopectin ratios were systematically studied by DSC with stainless steel high-pressure pan under temperature scanning up to 200 °C. The results showed that the distinct pattern of multiphase transitions of maize starch was not only determined by the amylose content, but also by glycerol–water mixture content and glycerol/water ratio. High temperature and long time storage all favor the starch-glycerol reaction.

RELEVANCE OF POLYSACCHARIDES IN AYURVEDIC DRUGS

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Ayurveda (“knowledge about life”) – the traditional Indian medicine – recommends a number of plants, known as Ayurvedic Rasayana. Most of the Ayurvedic rasayana plants are found to be rich in specific polymer carbohydrates depending on their species, origin and appliance. The different carbohydrate populations might serve the purpose of being a medicinal agent themselves or as a biological carrier for the active secondary plant metabolites such as saponins, alkylamides etc. The lecture will present some of these effective polymer carbohydrates and their characterization.

EFFECT OF PALMITOYLCHITOSAN ON CHOLESTEROL HOMEOSTASIS IN RATS

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Female rats (6 per group) were fed diets supplemented with cholesterol at 10 g/kg for 4 weeks to evaluate the effect of chitosan and palmitoylchitosan at 20 g/kg on cholesterol homeostasis. Palmitoylchitosan significantly decreased concentration of cholesterol in serum and liver, and increased faecal output of neutral sterols and (to a lesser extent) also bile acids. Effects of chitosan were less pronounced.

SOIL POLYSACCHARIDES AND THEIR RELATIONSHIP TO OTHER FORMS OF SOIL CARBON

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This work presents a comparison of the relationship between polysaccharide content and soil organic carbon and the results of fractionation of soil organic matter – the commonly used parameters for assessment of soil types. It also made comparisons with the carbon content in the extracts with hot water and 1% potassium sulphate (in both prevail carbohydrates).

The results of analytical determinations were processed by regression analysis.

EXTRACTION, PURIFICATION AND PHYSICO- CHEMICAL CHARACTERIZATION OF POLYSAC- CHARIDES OF GREEN ALGAE (*Ulva* sp. AND *Enteromorpha* sp.)

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The excessive growth of some species of green algae such as *Ulva* sp. and *Enteromorpha* sp. is responsible for the formation of actual green tides and the imbalance in the marine ecosystem. Typically green-tides are characterized by choking of waterways in the immediate area of the bloom and subsequent local wind and tide driven local deposition on the shore, and this can be destructive to coastal marine habitats and cause economic losses to marine industries.

The availability of this renewable biomass and its rich composition in polysaccharides are the main arguments in favor of its recovery. In this context, we have undertaken an investigation aiming at extracting, purifying and characterizing the major polysaccharide fractions namely ulvan and cellulose. The percentage of ulvan is respectively 14.67 % and 11.34 % for *Ulva* sp. and *Enteromorpha* sp. The rheological properties of ulvan hydrogels were studied using a dynamic rheometer of ARES type. This water-soluble fraction shows a thixotropic behavior and a high hydrophilicity.

The surface properties of several celluloses (Avicel pH 101, and cellulose extracted from *Ulva* sp and *Entero-*

morpha sp) were characterized by Scanning Electron Microscopy. It was found that celluloses extracted from seaweeds show a porous surface. BET surface area analysis was applied. The structure of the cellulose powders was characterized by X-ray diffraction. Moisture uptake was directly related to the cellulose crystallinity and pore volume. Celluloses extracted from *Ulva* sp. and *Enteromorpha* sp. showed an amorphous structure with crystallinity indexes respectively of 0.28 and 0.13 and specific areas of $5.74 \text{ m}^2 \text{ g}^{-1}$ and $8.34 \text{ m}^2 \text{ g}^{-1}$.

This work allowed characterizing of polysaccharides extracted from a renewable biomass. The structural rheological and hydration properties of these polysaccharides were found interesting enough to envisage their application in replacement of synthetic polymers.

CARRAGEENAN – LOCUST BEAN GUM COMPOSITE GELS

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Mixtures of hydrocolloids are commonly used to impart novel and improved rheological characteristics to food products. Kappa carrageenan and locust bean gum are known for their synergistic properties. Formation and rheological properties of mixed polysaccharide composites gels was studied. The composite gels obtained from mixture of κ -carrageenan with locust bean gum in a 4:1 in 0.1M NaCl ratio exhibited higher shear stress value at fracture in comparison to κ -carrageenan gel.

STRUCTURE REVERSIBILITY OF WHEY PROTEIN-I-CARRAGEENAN GELS

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Gelled structure is very important for food production. It shapes the product, prevents sedimentation or coalescence, extends new products spectrum. Shear forces destroy gel structure, which in some cases can be rebuilt. Research was focused on rehealing of the structure of the gels obtained from whey protein-i-carrageenan mixtures. Protein and carrageenan concentration were important factors for the extend of gel structure rebuilding.

β -GLUCAN COMPOSITION AND STRUCTURE – AN EVOLUTION OF VIEWS

Invited lecture

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Proper history of β -glucan as an immunomodulator goes back to the 40s of the last century when Pillemer and Ecker isolated an insoluble fraction from fresh yeast, zymosan, with β -glucan as an active component. Lately, β -glucan was also proved an active component of Asian medicinal fungi. From these times, the structure of β -glucan has been explored and its relationship to biological effects investigated. Due to a polymeric character and molecular size as well as the tertiary structure inhomogeneities, frequent discrepancies were reported and accurate description of these phenomena is insufficient in certain details till now.

The work was done with the support of the grant GAČR 525/09/1033.

LIPIDS CONTENT DECREASING FOR BETTER CORN STARCH UTILIZATION

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The work was focused on determination of corn lipids influence on the simultaneous saccharification and fermentation of waxy and standard corn cultivars. From the measured values we found that removal of lipids from corn groats resulted in a statistically significant ($\alpha=0.05$) increase in the glucose concentration after pre-saccharification. The concentration of ethanol was significantly affected only in the case of groats with waxy starch.

We gratefully acknowledge Slovak Research and Development Agency for supporting within the Project APVV LPP-0251-07.

CHARACTERIZATION OF WAXY WHEAT VARIETIES STORED IN GENE BANK**LUDMILA PAPOUŠKOVÁ, VÁCLAV DVOŘÁČEK, and LUCIE PAVLÁTOVÁ***Crop Research Institute, Drnovská 507, 161 06 Prague 6 - Ruzyně, Czech Republic
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The study shows first characteristics of, in the Czech Republic unique, set of 4 waxy spring wheat varieties (Kanto 107, WQL6K107-BHWX2-2a, WQL6K107-BHWX14-7 and Waxy Pen) in 2007–2009. Results imply highly specific technology – rheological quality (including of Mixolab determination). High similarity among varieties owing to their common genetic origin was confirmed in case of polymorphism of storage proteins.

Supported by The Ministry of Agriculture of the Czech Republic, Project No. 0002700604.

THE INFLUENCE OF DEGREE OF OXIDATION OF CORN STARCH ON ITS PHYSICOCHEMICAL PROPERTIES**SŁAWOMIR PIETRZYK*, PAULINA PAJAŁ, TERESA FORTUNA, LESŁAW JUSZCZAK, and CIEMNIEWSKA ANNA***Department of Analysis and Evaluation of Food Quality, University of Agriculture, Balicka Street 122, 30-149 Krakow, Poland
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The aim of this work was to obtain the oxidised corn starch modified with four different levels of sodium chlorate(I), and to compare their physicochemical properties to the properties of the native starch. The native and modified starches were analysed in respect of amylose, carboxyl and carbonyl groups content, susceptibility to retrogradation and water binding capacity and solubility of starch in water at different temperatures. Thermodynamic characteristic of starch gelatinization was also determined. The oxidised starches had different physicochemical properties.

EFFECT OF MINERAL ELEMENTS ON RHEOLOGICAL PARAMETERS OF STARCH**TERESA FORTUNA, SŁAWOMIR PIETRZYK*, IZABELA PRZETACZEK-ROŻNOWSKA, JACEK ROŻNOWSKI, DOROTA GAŁKOWSKA, and KATARZYNA JANIEC***Department of Analysis and Evaluation of Food Quality, University of Agriculture, Balicka Street 122, 30-149 Krakow, Poland
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The aim of this work was to determine the effect of metal ions on the rheological properties of produced modified starches and to compare the properties with these of native starches. The materials were potato, corn and spelt wheat starches with incorporated metal ions (potassium, magnesium and iron). The measurements of the rheological properties of these starches comprised of determination of flow and viscosity-time curves. The studied starches were characterised by different rheological parameters depending on the type of starch modification.

THERMODYNAMIC PASTING CHARACTERISTIC AND SUSCEPTIBILITY TO RETROGRADATION OF STARCHES MODIFIED BY INCORPORATION OF MINERAL ELEMENTS**MALGORZATA BĄCZKOWICZ, SŁAWOMIR PIETRZYK*, DOROTA GAŁKOWSKA, JACEK ROŻNOWSKI ILONA TARTANUS, and KAROLINA SZKABAR***Department of Analysis and Evaluation of Food Quality, University of Agriculture, Balicka Street 122, 30-149 Krakow, Poland
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The aim this work was to determine the effect of mineral elements on the thermodynamic pasting characteristic and susceptibility to retrogradation of modified starches. The materials used were potato, corn and spelt wheat starches modified with using of mineral elements (K, Mg, Fe). Analysis of the modified starches comprised of the determination of thermodynamic pasting characteristic and retrogradation by using DSC. The susceptibility to retrogradation was also determined by turbidimetric method. Modifications of starches had effect on changes in the determined parameters of starch.

PHYSICO-CHEMICAL AND RHEOLOGICAL PROPERTIES OF COMMERCIAL MODIFIED STARCHES

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The objective of the paper was to evaluate some physicochemical and rheological properties of selected commercial modified starches. The swelling power and solubility in water, as well as the pasting profile were determined. Rheological properties were measured using rotational rheometer with concentric cylinders geometry. Based on the investigations accomplished, it was concluded that the starches differed in their physicochemical and rheological properties.

MOLECULAR MASS OF WATER/ALKALI SOLUBLE POLYSACCHARIDES FROM MUSHROOMS APPLIED IN TMC

Invited lecture

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The ‘Traditional Chinese Medicine’ (TCM) applies mushrooms against diseases and for healthy effects. These effects are based partly on the prebiotic properties of the including polysaccharides. Analyses of glycans have shown mainly β-glucan with small amounts of heteropolysaccharids. Calibrated SEC-analysis delivered detailed information about molecular mass distribution and average molecular values. Results from different mushroom, grown on the trunk of birch, will be presented and discussed.

PREPARATION AND CHARACTERIZATION OF INCLUSION COMPLEX FORMATION BETWEEN CHLORHEXIDINE AND β-CYCLODEXTRIN DERIVATIVES

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Cyclodextrins are cyclic oligomers of glucose that can constitute a host:guest conformation with drugs. This conformation may prevent side effects as observed for chlorhexidine, an antiseptic agent that causes teeth staining, chemical incompatibility and has a bitter taste. The inclusion complexes were prepared by simple methods and their formation was evidenced by XRPD and DSC. Moreover inhibition effect against *C. albicans* and *S. mutans* was confirmed in vitro.

*Acknowledgement: this investigation was supported by
CAPES.*

APPLICATION OF WHEAT B-STARCH AS FILLER FOR ADHESIVES

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Food application of B-starch as a result of lower quality is problematic. The study focused on preparation of polymer adhesives with various additions of dried B-starch, kaolin or dried carbonation lime. The viscosities of adhesive samples using a rotary viscometer and strengths of the adhesive bond with paperboard on the TIRAtest 26005 were measured. B-starch as a filler or partial polymer substitute had a positive influence on physical and price properties.

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tion Theoretical Fundamentals of Food and Biochemical
Technologies of MSM CR, No. MSM 6046137305.*

EFFECT OF REACTION TIME ON THE ACETYLATION OF WHEAT B-STARCH AND CHARACTERIZATION OF THE PRODUCT

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Wheat B-starch in native or pre-gelatinized form was acetylated at various reaction times for temperatures in the range of 115–128 °C. The following parameters of the dried and grinded product were studied: particle size measured by image analysis and laser diffraction, degree of substitution by measurement of ¹H NMR spectra and FT-IR spectra, crystalline structure by X-ray diffraction pattern, temperature and enthalpy of gelatinization.

This research was supported by the Research Grant “Biodegradable composites based on B-starch for agriculture applications” GAČR 525/09/0607 and by the Research Intention MSM 6046137305 Theoretical Fundamentals of Food and Biochemical Technologies of MSMT CR.

CASSAVA AS AN EXOTIC SOURCE OF STARCH

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Cassava roots as a starch source were obtained from Vietnam. The ratio total starch/dry substance ranged from 61.4 to 82.2 %. The content of lipids, fiber and K, Ca, Mg, N and P was found 0.18 %, 3.61 %, 1.43 g/kg, 0.33 g/kg, 0.52 g/kg, < 0.1 % and < 0.5 %, respectively. Extractable carbohydrate content was determined using HPAC – PAD, system Dionex, the highest value was found for fructose and sucrose (0.536 % and 0.503 %, respectively). The total sum of extractable carbohydrates was 1.50 %, this comprised 0.97 % of reducing sugars.

This research was supported by the Research Intention Theoretical Fundamentals of Food and Biochemical Technologies of MSMT CR, No. MSM 6046137305.

ADSORPTION OF METAL CATIONS FROM AQUEOUS SOLUTIONS ONTO STARCH GRAFTED COPOLYMERS

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Adsorption of Cu⁺² and Fe⁺³ cations from aqueous solutions onto starch graft copolymers have been investigated. Starch-g-poly(acrylamide-co-acrylic acid) copolymers were manufactured by reactive extrusion. Efficiency of cations sequestration has been evaluated using simple and sensitive UV-VIS spectrophotometric method. The starch graft copolymers can effectively remove metal cations from aqueous solutions.

POLYSACCHARIDES BASED NANOPARTICLES: DEVELOPMENT AND CHARACTERIZATION

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KAREN TAVARES, LEONARDO CINELLI,
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Pharmaceutical sciences and biochemistry researchers exhibited a lot of interest to polysaccharides as biopolymers for nanoparticles production and anticoagulant effects. The aim of this study was produce and characterize nanoparticles combining chondroitin sulfate, sulfated fucan, and chitosan. Nanoparticles showed regular shapes (mean diameter between 140 and 181 nm) and anticoagulant properties.

Acknowledgement: this investigation was supported by CAPES.

β-GLUCANS IN FOOD SUPPLEMENTS

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The polysaccharides β-glucans occur as an important component of the cellular walls in some microorganisms,

such as yeast and mushrooms. There are several isolates and supplements available commercially that contain β -glucans. These polysaccharides stimulate the immune system, modulating humoral and cellular immunity. A set of isolates and food supplements was evaluated based on the content of β -glucans determined with Megazyme kit K-YBGL. The purity of the products was verified with the aid of spectrometric methods

This study was supported by the Ministry of Education, Youth and Sport (project 6046137305) and the Czech Science Foundation (project No 525/09/1133).

EXTRUDED THERMOPLASTIC STARCH-BASED (NANO)MATERIALS FOR TECHNICAL PURPOSES

Invited lecture

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Two types of starch-based materials are presented: (i) extruded thermoplastic starch modified with montmorillonites (pristine and organophilized), and (ii) starch grafted acrylic copolymers synthesized via reactive extrusion. Physicochemical characterization of the both obtained modified starches as well as mechanical properties of the first group materials, and metal cation binding, flocculation or water sorption features of the second, are considered.

THE ROLE OF CARBOHYDRATES IN THE STRUCTURE FORMATION OF THE SOY PROTEIN CONCENTRATE DURING THE EXTRUSION PROCESS

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An attempt has been made to investigate the effect of endogenous carbohydrates occurring in the soy cotyledons for the structure formation of extrudates obtained from soy protein concentrate. Therefore, the solubility of extrudates in the solvents, which are capable to loose the bonds of a different type, has been examined. It has been found that the polysaccharide fractions diminish the importance of intermolecular non-covalent interactions in texture formation, and at the same time oligosaccharides increase the role of ionic and disulphide bonds. As a result of extrusion, the polysaccharides become partially bonded into the protein matrix.

The author wishes to thank prof. Ricardo Villota for providing financial assistance for this project.

SEPARATION, THICKENING, CLASSIFICATION AND WASHING OF WHEAT STARCH WITH HYDROCYCLONES

Invited lecture

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The paper reviews the ways of boosting the performance of hydrocyclones by using series connections and recycles, with particular reference to wheat starch. Different applications, alternative arrangements and applicable design rules are discussed, with quotes of specific case studies encountered in industry. Aimed at practitioners such as chemists, process engineers or plant operators, as well as students and academics.

AMYLOSE AND PHOSPHORUS CONTENT IN STARCH OF INDUSTRIAL POTATO VARIETIES

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The study is focused on the evaluation of results regarding amylose (enzymatic determination by Megazyme kit) and phosphorus content (spectrophotometric determination) in starch samples from potato varieties grown for industrial purpose. Dependences of determined parameters (amylose, phosphorus) are evaluated in relation to potato varieties and localities in the Czech Republic.

The study was supported by the project of Ministry of Agriculture of the Czech Republic, National Agency for Agricultural Research No. IG57056.

A NOVEL APPROACH FOR PREPARATION OF AMIDE DERIVATES OF HYALURONAN

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A novel approach of activation of hyaluronan carboxyl group involving ethylchloroformate was found to produce highly substituted hyaluronan. The amide derivatives were prepared within minutes after the addition of primary amines to the activated hyaluronan solution. A complete structural elucidation was obtained by a combination of 1D and 2D NMR techniques, including DOSY, COSY, TOCSY, HSQC and HMBC experiment. The amide derivatives prepared in this way can undergo crosslinking to produce stable and biocompatible hydrogels.

HYDROLYSIS AND DERIVATIZATION OF OXIDIZED CELLULOSE

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Microwave assisted hydrolysis of water soluble sodium salt of oxidized cellulose was carried out at 100 °C and power output 150 W. The distribution of the molecular weight of products was in the range from 8 000 to 30 000 g mol⁻¹. As methylester of oxidized cellulose is more reactive polymer than previous one the highly methylated oxidized cellulose was amidated with five amines under anhydrous conditions. Maximal values were obtained for ethanolamide and minimal for octylamide. The degree of derivatization was confirmed by FTIR and elementary organic analysis.

This work was supported by the Ministry of Industry and Trade (project 2A-ITP1/041) and by the Ministry of Education, Youth and Sport (project 6046137305).

CHARAKTERIZATION OF CELLULOSE AND ITS DERIVATIVES BY THERMAL ANALYSIS AND FT-IR

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The thermal properties of cellulose and its organic (carboxymethyl and methyl 2-hydroxyethyl), inorganic (sulfate) as well as their hybrid organic–inorganic derivatives (carboxymethyl-sulfate and methyl 2-hydroxyethyl-sulfate) were investigated in the temperature range 20–500 °C in order to find possible differences in their fingerprints. Thermal analysis revealed information concerning their thermal stability and decomposition.

This work was supported by the VEGA Grant No. 2/0155/08 and APVV Grant No. 0030/07.

EFFECT OF GENOTYPE ON VARIABILITY IN THE CONTENT OF NON-STARCH POLYSACCHARIDES IN BARLEY GRAIN

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The effect of a different grain type (hulled vs. hullless) and starch (standard vs. waxy with a reduced amylose/amylopectin ratio) on the variability in the content of important nutrients (non-starch polysaccharides: β-glucans and pentosans; N-substances and starch) was studied in a set of 21 cultivars and 80 new lines of spring barley, grown at two locations (Kromeriz and Zabcice) in the years 2008–2009. In hullless materials, production of β-glucans was on average 36.3 % higher and that of pentosans 14.4 % lower than in hulled genotypes with standard starch. New lines with high (KM 2619.413.4.03) or low (progenies of KM 1057) contents of β-glucans and pentosans, suitable for food and feed use, were selected.

Financial support from the Ministry of Agriculture and Ministry of Education, Youth and Sports, Czech Republic, under projects QH91053, 1M0570 and MSM2532885901 is gratefully acknowledged.

PERSPECTIVES IN CANCER TREATMENT BY A GLYCOBIOLOGICAL APPROACH: RESULTS IN EXPERIMENTAL TUMOR MODELS *IN VIVO*
Invited lecture

L. VANNUCCI, A. FISEROVA, P. ROSSMANN, V. KREN, P. KRIST, K. BEZOUSKA, M. SAIEH, V. ULLMANOVA-BENSON, K. KLIMESOVA, V. GROBAROVA, J. KRIZAN, and V. SASEK

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Glycosylated structures of proteins and lipids are functionally important in cell-cell interactions as well as in immune recognition. Aberrant glycosylation products due to a carcinogenetic process can be targeted by lectin-like receptors on natural immunity cells. We report our experience with synthetic glycoconjugates and beta-glucans in the modulation of cancer recognition and anticancer responses.

EFFECT OF MODIFIED STARCHES ON RHEOLOGICAL PROPERTIES OF GLUTEN-FREE DOUGH

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Selected rheological properties of gluten-free dough with addition of modified starch were investigated with the use of rheometer equipped with a system of parallel plates. Mechanical spectra were measured in the range of linear viscoelasticity, at constant strain amplitude. Creep and recovery tests were performed at constant shear stress. The investigations have shown a significant influence of starch type upon rheological properties of the dough.

THE CONTENT OF DEXTRAN IN RAW CANE SUGAR AND ITS DECREASING DURING THE REFINING PROCESS

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The material for the analysis consisted of: raw and refined cane sugar samples and by-products of the refining process. The obtained results show that the content of dextran in raw cane sugars was from 86 to about 320 mg/kg. Dextran present in cane raw sugar is partially eliminated during the process of refining; in our experiment its content in refined cane sugar was from 50 to about 120 mg/kg.

The study was supported by the research grant No. NN312 165934 form the Polish Ministry of Science and Higher Education.

STARCH-BASED COMPOSITIONS AND FILMS MODIFIED WITH SEMIHYDROPHILIC ORGANOMONTMORILLONITES

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Biopolymeric compositions and films prepared via solution casting of gelatinized starch with water/glycerol slurries of organophilized montmorillonites (OMMT) have been obtained and characterized. Effectiveness of OMMT dispersion in starch compositions (indirectly by viscosity measurements) and rheological properties of the systems were evaluated and compared. The degree of OMMT dispersion in starch film was determined by XRD.

THE EFFECT OF FLOUR SORT ON THE CARBOHYDRATE PROFILE OF FLOUR AND PASTRY

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This work aimed at determination of carbohydrate profiles of flours originating from various sources and their mixtures as well as estimation of their impact on carbohydrate composition of the pastry such as short crust cakes. The carbohydrate profiles of cakes were different from the profiles of flours. The analyses showed that the richest in glucose, fructose and sucrose were cakes derived from spelt flour type 630. The lowest content of these sugars was found in cakes obtained from the mixture containing 25% Amaranthus flour. Comparison of quantities of the aforementioned sugars in the tested flours and cakes revealed that all of them were decreased by baking. Baking caused hydrolysis of starch. Its quantities in the cakes were by approximately 58% lower compared to flours and their mixtures. Our study revealed a decrease in sucrose content by approximately 60% on average compared to flours and their mixtures.

DIFFERENCES IN CHEMICAL COMPOSITION OF STARCH SURFACE GRANULES AND PHYSICO-CHEMICAL PROPERTIES OF GLUCOSE HYDROLYSATES IN DEPENDENCE OF WHEAT KERNEL HARDNESS

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The aim of the study was to characterize the relationship between endosperm texture (wheat kernel class) and the involvement of polar lipids in the association of friabilin to starch granule surface. Our research showed, that starch from soft classes contain higher quantities of proteins and lipids on starch granule surface then from hard cultivars. We also confirmed, that starches isolated from hard wheat do not include surface proteins from friabilin family (puroindoline) on the contrary to starches from soft

wheats. It was demonstrated that puroindolines form complexes with bound polar lipids present on starch granule surface. Obtained results showed, that starches from hard wheat varieties contain higher amount of amylase-lipid complex, in spite the total amount of surface lipids was lower in starches from hard varieties then from soft wheats. wheat hardness class determined the physico-chemical properties of obtained glucose syrups. Hydrolysates received from soft wheat starches characterized higher DE and two-times shorter filtration time than syrups from hard varieties starches. On the contrary syrups obtained from hard wheat starches had a better transparency index.

This work is financially support by the Ministry of Science and High Education Project No. NN312 314337.

CHANGES OF AMYLOSE-LIPID COMPLEX POLYMORPHIC FORM AND ITS INFLUENCE ON PHYSICO-CHEMICAL PROPERTIES OF ENZYMATIC HYDROLYSATES FROM WHEAT STARCH

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The aim of the study was to determine changes of AML complex in native starch and in starch after removing surface protein in dependence of extracting solvent during process of enzymatic hydrolysis. We also examined the impact of AML changes and extraction processes on the physico-chemical properties of obtained hydrolysates. Thermal analysis showed dissimilarities in the susceptibility of starch to gelatinization process what indicates differences in amounts of AML complex in dependence of wheat starch source. Extraction of surface proteins with different solutions caused changes in the AML – complex susceptibility to hydrolysis with alpha-amylase. It was also concluded that amount of AML complex and its polymorphic form influence the physico-chemical properties of hydrolysates obtained from wheat starch.

This work is financially support by the Ministry of Science and High Education Project No. NN312 314337.

EFFECT OF ACETYLATION ON SOME PHYSICO-CHEMICAL PROPERTIES OF CASSAVA STARCH**LEŚLAW JUSZCZAK^{a,*}, TOMASZ ZIEBA^b, ARTUR GRYSZKIN^b, SŁAWOMIR PIETRZYK^a, and TERESA FORTUNA^a**

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The aim of the present work was to study the effect of acetylation on some physicochemical properties of cassava starch. Stabilization of starch structure by acetyl groups increased paste clarity, water binding capacity and solubility. Whereas acetylation process decreased gelatinization temperatures, paste viscosity and tendency to retrogradation. On the grounds of obtained results, important correlation between acetyl content and some physicochemical properties were observed.

POLYPHENOLIC-POLYSACCHARIDE CONJUGATES WITH ANTICOAGULANT ACTIVITY FROM *AGRIMONIA EUPATORIA* (L.): CHEMICAL CHARACTERIZATION OF THE COMPOUNDS SEPARATED WITH ANION-EXCHANGE CHROMATOGRAPHY**MARTA TSIRIGOTIS-WOŁOSZCZAK^a, IZABELA PAWLACZYK^{a,b}, WITOLD PILECKI^{b,c}, and ROMAN GANCARZ^{a,b}**

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Polyphenolic-polysaccharide conjugates from *Agri-monia eupatoria* L. were analyzed with anion-exchange chromatography, DEAE type, by step-wise elution, with NaCl solutions at different concentrations (0.05–1.2 M). The *in vitro* anticoagulant activities of the separated fractions were tested on human blood plasma by aPTT, PT and TT tests. The chemical characterization of the separated compounds was done with different colorimetric methods.

This work is supported by European Regional Development Fund and the Polish Government (Operational Programme Innovative Economy 2007-2013) under the grant “WROVASC – Integrated Cardiovascular Centre”.

INFLUENCE OF SUGAR BEET PECTIN ON EMULSIFYING PROPERTIES OF WHEY PROTEINS**RENÁTA KOVÁČOVÁ^{*}, MIROSLAVA MIHULOVA, MARCELA ŠIRMEROVÁ, and JIŘÍ ŠTĚTINA**

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Whey proteins are being used in many colloidal food products to increase viscosity, to form gels, to stabilise emulsions or foams, or as water-binding agents, however, they are susceptible to aggregate under acid condition and heat treatment. Pectin is able to stabilise dairy proteins at these conditions, but stabilisation is strongly influenced by pectin structure. Sugar beet pectin can be interesting for application because it has different structure in comparison with citrus and apple pectin. In this study, the influence of medium pH and temperature on sugar beet pectin-whey protein complex was evaluated by measurement of hydrodynamic diameter and surface electrical potential of complex particles. It was observed, that sugar beet pectin prevent both pure β -lactoglobulin and whey sample aggregation successfully at these conditions. Further, influence of beet pectin on emulsifying properties of whey protein was evaluated. The model oil-in-water emulsions (10% w/w oil content) from reconstituted whey at pH 3 and pH 7 with and without pectin addition were prepared. It was observed that addition of beet pectin slightly increased size of oil droplets (from 7.9 to 12.2 μ m), but significantly improved emulsion stability. However, pectin addition significantly impaired emulsion ability of whey proteins at pH 3, because of significant increasing of oil droplet size (from 8.9 to 37.6 μ m).

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