PREPARATION AND CHARACTERIZATION OF CERAMIC AND PHARMACEUTICAL POWDER COMPACTS WITH POLYSACCHARIDES AS PRESSING ADDITIVES AND PORE FORMERS

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Powder compacts have been prepared from ceramic and pharmaceutical powders (alumina, hydroxyapatite, kaolin-mullite mixtures, ibuprofenum) by uniaxial pressing with different starch types (rice, corn, potato) and with a cellulose product (blend of microcrystalline cellulose and sodium carbomethylcellulose). After pressing or firing the compacts have been studied by density measurements, microscopy and diametral compression (Brazilian tests).

This work is part of the project P108/12/1170 "Porous ceramics with tailored elasticity and thermal conductivity" (GAČR) and specific university research (MŠMT No. 20/2013).

ISOLATION, STRUCTURE AND COMPOSITION OF POLYSACCHARIDES FROM WOOD-DECAY FUNGI

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Polysaccharide fractions were isolated from fruiting bodies of wild wood-decay fungi (*Phellinus ribis*, *Phellinus tuberculosis, Phellinus chrysoloma, Laetiporus sulphurous and Piptoporus betulinus*) by sequential extraction with cold and hot water and with 1 M NaOH. With the exception of *Phellinus ribis*, the polysaccharides extracted were mainly insoluble in cold water. Structure and composition of the obtained polysaccharides were analysed by spectroscopic and chromatographic methods. After dialysis, and according to sugar analysis, the polysaccharides described are mainly composed of glucose. Some fractions contain also galactose, mannose, glucosamine and/or other sugars. After methylation analysis the major glycosidic linkages are 1,3 Glc; 1,4 Glc and 1,6 Glc, composing an insoluble fraction. A small soluble portion could also be found due to the presence of polysaccharides composed by 1,4 Glc; 1,6 Glc and 1,3,6 Glc or 1,4,6 Glc.

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THE ROLE OF ISOLATED RYE STARCH, PROTEIN AND ARABINOXYLAN IN BAKING OF MODEL RYE BREADS

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The aim of this study was to compose the model rye flour using: starch, arabinoxylans and protein isolated from rye wholemeal and to establish the conditions of fermentation and baking of model rye breads with application of direct (straight) dough mixing method.

As a result of the study optimal proportions of isolated starch, arabinoxylans and soluble protein were determined which allowed to obtain the product comparable to rye bread.

This study was supported by Ministry of Science and Informatization grant Iuventus Plus - IP2011 005571.

THE APLICATION OF GPC METHOD IN ANALYSIS OF MOLECULAR PROPERTIES OF FLOUR POLYSACCHARIDES

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The aim of this study was to develop the GPC method which allowed to simultaneously determine the content and molecular properties of polysaccharides such as: starch (amylose and amylopectin), arabinoxylan, β-glucan and soluble proteins present in flour. The main innovation of the method is that information about the content and properties of polysaccharides and proteins was obtained by single analysis of appropriately dissolved flour sample.

DEVELOPMENT OF INNOVATIVE FOODS ENRICHED BY FERMENTED LOW-ENERGY MAIZE PRODUCT

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The fiber-protein fermented maize product was developed using cornmeal and milk bacteria of *Lactobacillus plantarum* S lac-11 and subsequently was added to foods. Solid portion of the product was used as an additive to yogurt and wheat-corn bread, liquid part was combined with the milk and the juice of apples, oranges, carrot respectively beetroot. From sensory evaluation of prepared food and beverages it is clear that all proposed products were acceptable for respondents. We expect that products could be accepted primarily by people having healthy eating habits.

THE EFFECT OF THE GENOTYPE AND ENVIRONMENT ON VARIABILITY OF ARABINOXYLAN AND BETA-GLUCAN CONTENTS IN SPRING BARLEY GRAIN

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Arabinoxylans and beta-glucans in malt negatively affect the brewhouse yield and production economy; therefore the lowest possible contents are desirable for brewing. Considering this aspect, beta-glucan and arabinoxylan contents were determined in grain samples in the set of seven malting hulled varieties, three hull-less lines and one hull-less spring barley variety grown in two localities in the period of 2009 to 2011. The effect of chemical treatment on the level of the studied non-starch polysaccharides was also considered.

The work was supported by the National Agency for Agricultural Research, project QI91B095 and QI111B044.

THE EFFECT OF STARTER CULTURE ON POLYSACCHARIDES CONTENT IN KEFIR MADE FROM GOAT'S AND COW'S MILK

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The aim of this study was to compare chemical composition and health benefits resulting from polysaccharides in kefirs prepared from milk of various animal species. In addition two methods of fermented milk production – traditional use of kefir grains (Biolacta's kefir grains) and use of freze-drying kefir starter culture (DVS inoculation) were tested. To determine influence of raw material on fermentation process physical and chemical properties as well as basic composition were analysed.

COMPARISON THE CONTENT OF PIGMENTS, VITAMIN C AND PROTEINS IN GREEN PLANTS

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This paper compares selected cultivated and wild plants in terms of their vitamin C content, protein, chlorophylls, carotenoids and dry matter. Plants were analyzed as fresh material, then traditionally dried and freeze-dried. In the dried plants was analyzed chlorophyll and vitamin C. The aim of this study was to select the most valuable plants in terms of chlorophyll content and a comparison of two methods of drying.

ANALYSIS OF WAXY AND PARTIAL WAXY GENOTYPES AND POSSIBILITIES OF THEIR UTILIZATION

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The aim of our study was to determine glutenin and gliadin composition of 35 common winter waxy and partial waxy wheat lines from classic hybridization – incorporation of null waxy alleles (loci Wx-A1, Wx-B1

and Wx-D1) from two American lines NX04Y2107 and NX03Y2395 to Slovak wheat Veldava. We obtained 10 full waxy lines and 25 partial waxy lines. The glutenin-based quality score and rye score ranged from 4 to maximum 10.

This work was supported by OP Research and Development: Development of new types of genetically modified plants with agricultural characters. No: ITMS 26220220027 from European Regional Development Fund.

PHYSICO-CHEMICAL PROPERTIES OF EXTRUDATES WITH ADDITION OF RESIDUAL OAT FLOUR

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Extrusion is an efficient, continuous technology, that could be used to process various raw materials including off-products. Residual oat flour (ROF) is a by-product formed during the isolation of beta-glucan concentrate (Betaven). Taking into account chemical composition of oat, and especially high level of phenolic compounds, it could be predicted that such a flour is reach in antioxidant components. This is why the trial was made to use it as an additive in the production of corn extrudates, at the level 20 and 40 %.

The samples were compared taking into account physical properties: expansion ratio, density, water binding capacity and solubility, as well as chemical characteristics: total polyphenols, antioxidant activity.

It was observed that the extrudate with 40 % of ROF contained more polyphenols and reveal higher antioxidant activity than control sample, while at 20 % addition level a decrease in polyphenols and antioxidant activity was observed in comparison to other samples. Neither expansion ratio nor density of samples with 20 % and 40 % of ROF was not statistically different from control. The applied addition levels (20 and 40 %) did not cause a change in water binding capacity of whole extrudates in comparison to control. On the other hand, ground extrudates with the addition of 20 % ROF had highest water absorption among analyzed samples. Moreover it was observed that in parallel to the addition level of ROF the solubility of extrudates significantly decreased in comparison to control.

Summarizing, the above data indicate that ROF could be added to cornmeal in the production of cereal snacks, and in this way improve the level of polyphenols and antioxidant activity in the case of 40 % addition of ROF. Physical properties of such products are not deteriorated by this addition, and the observed increase in water absorption, especially at 20 % addition level, could be favorable.

The work was financially supported by the research project of National Science Centre (Polish – Narodowe Centrum Nauki, abbr. NCN) No: NN 312331640.

THE INFLUENCE OF RYE SOURDOUGH ON QUALITY OF WHEAT – OATS BREAD

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The conventional methods of producing food can be observed in recent years. This also applies to the bakery, as evidenced by even more often found on the label information of bread – "bread made using traditional methods". There is observed increasing interest in rye bread. Consumers appreciate its distinct taste, and above all, the value of health. Microbial are potential risks in bakery, which cause the spoilage of products and reduce their shelf life. Baking of bread does not ensure the microbiological stability of the product. An alternative method of extending the life of bread is the use of starter, which, among other advantages, also act as a brake on the development of infective microflora through antagonistic activity of lactic acid bacteria, active in its environment.

According to that the main goal of this study was to apply rye sourdough produced by a single phase method, with the use of LV2 starter cultures in baking of mixed wheat and oats bread. Sourdough was produced by a single -phase short method (20 hours) in a laboratory sourdough fermenter. Oats flour used for baking was either commercial or residual (remaining after production of the fibre preparation Betaven), while wheat flour was of type 650. The share of oats flour in breads accounted for 30 % or 50 % by weight of flour. Acidity of sourdough, semi-products and final bread crumb was evaluated. The assessment of bread quality was done after baking and during the three days of storage, and involved texture analysis by texture meter TAXT Plus.

The obtained results clearly show that used single-phase – short method of making sourdough starter cultures using LV2, has enabled the production of yeast with parameters very similar to those produced by spontaneous 3–4 fermentation phase. The 10% share of yeast in baking bread wheat and oats turned out right, to get bread for satisfactory appearance and flavor qualities. Breads wheat-

oats, with a higher proportion of oat flour (50 %) were characterized by a significantly lower volume than breads with a lower share (30 %) of the flour, but a larger volume of loaves was obtained using residual oat flour. Larger amount of residual oat flour (50 %) not had a negative impact on the sensory evaluation of these loaves. All test breads involving both oat commercial and residual flour did not differ significantly in crumb moisture, both during the day of baking and during 3 days storage. Breads baked with sourdough and residual oat flour were characterized by better parameters i.e. texture of crumb than the breads baked with yeast and commercial oat flour, i.e. lower hardness and chewiness of the crumb during the day of baking and storage period.

It was concluded that oats flour can be recommended for baking, both in amount of 30 % and 50 % by weight of wheat flour.

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THE POTENCIAL OF (1-3)(1-4)-β-D-GLUCAN IN OAT GRAIN

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Oat (*Avena sativa* L.) is a good source of (1-3)(1-4)-β-D-glucan and its content in the grain is influenced by genetic and environmental factors. Different oat species were evaluated for their quality of seeds. Variability in the range 1.24 (*A. murphyi*) – 6.94 % (*A. sativa* var. *nuda*) was detected in the content of β-D-glucan. Hot dry weather, nitrogen and selenium fertilization and pathogen pressure increased the content of this polysaccharide. Relations between β-D-glucan content and other qualitative parameters (lipids, proteins, starch) were observed.

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THE COMPARISON OF POLYSACCHARIDE PROFILE OF CZECH AND GERMAN BARLEYS

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The aim of this work was to characterize the different type of cereal polysaccharides in Czech and German barley cultivars. The content and properties of β-glucans (BG), arabinoxylans (AX), total dietary fibre and starch were compared. The content of BG was 2.5–13.4 % and 2.0–9.3 % in Czech waxy and normal barley milling streams, respectively. The content of AX was 3.4–6.7 % and 2.7–8.6 % in Czech waxy and normal barley milling streams, respectively.

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THE COMPARISON OF β-GLUCAN CONTENT AND MOLAR MASS IN CZECH AND GERMAN BARLEY WAXY VARIETIES

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The aim of this work was to characterize the total and extractable β-glucans in Czech and German waxy barley cultivars. The extractable β-glucans were isolated using distilled water at temperature 55 °C, time 120 min and pH 7.0. The mean molar mass (M_w) of extractable β-glucans in waxy barley cultivars was determined by GPC and ranged from $4 \cdot 10^3$ to $1 \cdot 10^6$ g/mol in Czech barley and from $10 \cdot 10^3$ to $10 \cdot 10^6$ g/mol in German barley.

This work was supported by project New Food No QI111B053 and project No RO0211. The authors are grateful for the technical support from MRI Detmold and Agrotest Fyto, Ltd.

DEVELOPMENT NEW FERMENTED LOW-ENERGY PRODUCT FROM CORNMEAL FOR FOOD USE

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New fermented low-energy product, which is suitable for production of functional foods and beverages, was prepared by hydrolysis and fermentation of cornmeal suspensions. We prepared 2000 mL suspension containing 1,5, 2.0 or 2.5 % of starch from cornmeal, hydrolysis was carried out enzymatically, DE was 96.88–99.62 %. Then hydrolysate was fermented by lactic acid bacteria *Lactobacillus plantarum* S lac-11. The pH was 3.3 and concentration of lactic acid 0.12 % after 48 hours of fermentation. Fermented product was separated into liquid and solid portion and subsequently their nutritional and microbiological analysis and stability was made. This product was used for preparation of beverages and foods.

WHEAT/BARLEY/HEMP COMPOSITE – STARCH AND BREAD CHARACTERISTICS

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Influence of two hemp form K4 and K5 in addition 5–10 % on changes of the wheat/barley mixture gelatinization was evaluated. The impacts of these components were described according to standard methods for starch behavior testing (SRC, Falling Number, amylograph test). Decrease of bread volume from the baking test by means of barley flour was improved by K4 obtained from the dehulled hemp seed in 10% addition. Comparing composites with 30 % and 50 % of barley flour, similar effect of hemp addition was observed.

This research was supported by the project QI 111 B053 (Ministry of Agriculture).

RHEOLOGICAL PROPERTIES OF CHEMICALLY MODIFIED POTATO STARCHES IN PRESENCE OF MILK AND SUCROSE

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The aim of this work was to study the effect of milk and sucrose on the rheological behavior of chemically modified potato starches. The materials used were acetylated (E 1420) and oxidized (E 1404) potato starches. Analyses comprised determination of pasting properties by RVA and rheological characteristic using creep and recovery test. Presence of milk and sugar increase pasting temperature, final viscosity and zero shear viscosity as well as decrease peak viscosity and creep compliance.

This study was carried out in the framework of research project no. NN 312 533440 funded by the National Science Centre in Poland.

VISCOELASTIC AND MECHANICAL PROPERTIES OF STARCH GELS OBTAINED FROM DIFFERENT WHEAT VARIETIES

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The aim of the present work was to study the mechanical properties of starch gels obtained from different Polish wheat varieties. In order to study the viscoelastic properties of the gels the stress relaxation method and Peleg model were used. Mechanical properties of the gels were measured by compression test. Young modulus were calculated from the compression curves. It was stated that the viscoelastic and mechanical properties of starch gels depended on the wheat cultivars.

PRODUCTS OF THERMAL MODIFICATION OF STARCH FOR FOOD AND HEALTH
Invited lecture

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The rapid expansion of research into nutrition, the ongoing changes in people's lifestyle, and the increased social awareness of how important the right diet is to human health have led to the development of technologies for producing food that is beneficial to the physical and mental well-being of the consumers. This kind of food is termed functional food and encompasses, among others, products containing dietary fibers and prebiotics. The process of developing new fibers formulations has resulted in increased interest in the products of physical (mainly thermal) and chemical modification of starch, which could be a source of type 4 resistant starch (RS4). The objective of the present study was: to produce starch preparations with a higher content of the fraction inaccessible to human digestive enzymes by the combination of two factors responsible for starch resistance (temperature and chemical modification), to examine the possible connections between the method of producing of starch preparations, their structure and their resistance to enzymatic digestion, to apply enzyme-resistant starch preparations as products with potential prebiotic properties, selectively stimulated growth and activity of beneficial bacteria, and not contributed to growth of undesirable intestinal microflora.

UNCONVENTIONAL METHOD FOR PREPARATION OF SOLUBLE FIBERS FROM STARCH

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The main objective of present study was to obtain a soluble dietary fibers from starch by the application a non-conventional source of energy – microwave radiation – to thermolysis of starch. The application of microwave heating for starch controlled depolymerization allowed to prepare soluble fibers in a shorter time. Effect of microwave heating with different exposure times and various radiation level on physical, chemical properties and total dietary fiber content in starch preparations has been studied.

SYNTHESIS, CHARACTERIZATION AND SURFACE-ACTIVE PROPERTIES OF HYDROPHOBICALLY MODIFIED XYLAN

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The cinnamate esters of 4-*O*-methylglucuronoxylan (MGX) with low degree of substitution were prepared by esterification of MGX with cinnamic acid through *in situ* activation of their carboxylic group with *N*,*N*'-dicyclohexylcarbodiimide or *N*,*N*'-carbonyl-diimidazole, at various reaction conditions. The structural properties of the synthesized derivatives were characterized by FT-IR and UV spectroscopy and their surface-active properties were evaluated.

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EFFECT OF CALCIUM IONS ON THE SELECTED RHEOLOGICAL PROPERTIES OF OCTENYL-SUCCINATE STARCH

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The aim of this study was to investigate the effect of calcium ions on the selected rheological properties of octenyl succinic anhydride (OSA) starch. Potato starch was esterified with OSA and enriched with calcium ions (OSA+Ca). The content of calcium ions, thermodynamic gelatinization characteristic, pasting properties and back extrusion test were determined on the starch samples. OSA+Ca starch was characterized by lower viscosity and values of parameters of thermodynamic gelatinization characteristic, as well as by weaker gel structure compared to non-modified starch.

(PANCREATIC AND GLUCOAMYLASE)-MIXTURE DEGRADATION OF SPELT STARCH MODIFIED BY INCORPORATION OF MINERAL ELEMENTS

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The aim of this work was to determine the effect of mineral compounds on (pancreatic and glucoamylase)-mix degradations of spelt starch during 24 h. The method consisted of measuring the quantity of glucose resulting from the hydrolysis of starch by reaction with 3,5-dinitrosalicylic acid. Starch modification by incorporated mineral elements influenced on hydrolysis. Speed of enzyme-mixture digestibility was observed especially during first period.

TRANSFORMATION OF STARCH DURING FROZEN STORAGE OF BREAD

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The transformation of starch in frozen wheat bread were studied during eleven weeks of storage. Analysis of chemical composition were performed on the fresh product. Changes of the crumb moisture, acidity, amount of resistant starch content by an enzymatic method, and the polymorphic forms of resistant starch by DSC were determined. Bread was also evaluated organoleptically. Studies have shown that changes in humidity and acidity of bread during storage were insignificant. It was observed that the amount of the resistant starch fraction grew during storage, and its polymorphic form changed. It was found that the temperature applied during storage limited quantities of RS increase to the same extent. Studies have shown that the bread loses its eating quality after 10 weeks of storage at a temperature of –12 °C. Bread stored at –20 °C remained acceptable even after 11 weeks. It follows that the maximum storage period of freezing bread is 9 weeks.

COMPLEXES OF LUPINE (*Lupinus luteus L.*) PROTEINS WITH ANIONIC POLYSACCHARIDES

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An attempt was made to obtain protein-polysaccharide complexes from lupine protein isolate and xanthan gum as well as low methylated pectin. Electrocomplexes were analyzed in terms of proximate composition and selected functional properties. The current flow during the process of elelctrosynthesis, yield of the process and product's structure depended on both the kind of the polysaccharide applied and the ratio of constituents in initial mixture.

FAECAL OUTPUT OF STEROLS AND FAT IN RATS FED AMIDATED CELLULOSE

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Female rats were fed diets with cholesterol (10 g/kg) supplemented with amidated cellulose (60 g/kg) and palm fat. Modified celluloses were prepared by amidation of oxidized cellulose (OX) or carboxymethyl cellulose (CM). Cholesterol supplementation increased faecal output of neutral sterols and bile acids. Effect of amidated celluloses on faecal output of sterols was small, however, both OX and CM amidated cellulose greatly increased faecal output of fat.

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APPLICATION OF STATISTIC METHODS IN EVALUATION OF CONFECTIONERY JELLY

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Infrared spectroscopy coupled with (FTIR and NIR spectroscopy) multivariate exploratory techniques has many benefits in analysis of food raw materials and products. Not only the authenticity of foodstuffs can be verified but also the composition can be assessed as well.

The infrared spectra in near and mid infrared region were exploited to identification of hydrocolloids in confectionery jelly and to determination of glucose, fructose, sucrose and maltose and moisture. Sugars were determined by liquid chromatography and dry matter by oven drying. The matrix of data was processed by three mathematical methods Matlab, Statistica 7 a TQ Analyst. Therefore it was possible to confirm the presence of polysaccharides or gelatine as a gelling agent in confectionery jelly and predict its sugar and moisture composition.

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PHYSICO-CHEMICAL CHARACTERISATION OF SUGAR BEET PECTIN USING MULTI-DETECTOR SIZE EXCLUSION CHROMATOGRAPHY

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Sugar beet pectin was found to be heterogeneous in composition with neutral sugar-rich fractions of both high and low hydrodynamic radii. A neutral sugar-poor fraction was found at intermediate hydrodynamic radii. In this paper we demonstrate using both conformation zoning and the global analysis method that fractions of sugar beet pectin rich in neutral sugar side chains (RG-I regions) are less flexible than those rich in galacturonic acid (HG regions).

CHARACTERIZATION OF ALUMINA-MULLITE-STARCH COMPOSITES MADE BY STARCH CONSOLIDATION CASTING

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Porous high-alumina ceramics can be made using starch consolidation casting, i.e. casting of starch-containing alumina-mullite suspensions, followed by starch burnout and firing. This work describes the preparation of alumina-mullite-starch composites (the precursors for these porous ceramics) with corn and potato starch and the dependence of the bulk density, flexural strength and Young's modulus on the mullite content and the type and amount of starch.

This work is part of the project P108/12/1170 "Porous ceramics with tailored elasticity and thermal conductivity" (GAČR) and specific university research (MŠMT No. 20/2013).

MALIC ACID AS PLASTICIZER FOR THERMOPLASTIC STARCH

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Retrogradation of amorphous thermoplastic starch (TPS) films obtained by compression molding of spray dried potato starch was investigated. The aim was to investigate the influence of plasticizers with similar molecular weight but different functionality, i.e. isoleucine, asparagine and malic acid, on the performance of powder and TPS films. Combinations of malic acid with glycerol, urea, and maltodextrin were also evaluated. Except for isoleucine formulated starch, all samples were obtained as amorphous powders and films. Malic acid was identified as a strong retrogradation agent as it inhibited recrystallization of starch over the full range of humidity levels. Malic acid was also found to inhibit the retrogradation of formulations containing urea, glycerol and maltodextrin. The converse of the strong inhibition implied strong moisture absorption and high strain at break values, and low tensile strengths. Malic acid was also identified as a potential cross-linking agent to control swelling of starch-based products.

MODIFICATION OF WHEAT AND SPELT STARCHES

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Starches from spelt wheat and common wheat were illuminated by UV and linearly polarized visible light (> 500 nm) for 5, 15, 25 and 50 hours. Then starches were modified with acid hydrolysis with hydrochloric acid in aqueous solution. Hydrolysis extent were determined with UV-VIS spectra. Molecular weight M_w and radii of gyration R_g of starch polysaccharide molecules were measured by HPSEC-MALLS-RI. Additionally XRD patterns and DSC of native and hydrolyzed starches were examined.

THE INFLUENCE OF GLYCEROL CONTENT ON THE PHYSICAL PROPERTIES OF STARCH-BASED EDIBLE FILMS

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The aim of this study was to investigate the effect of glycerol as a plasticiser, in order to evaluate physical properties of starch-based edible films. Starch/glycerol films were formulated from commercial chemically modified potato starches. Films were characterized by measuring of the thickness, water activity, solubility in water and optical properties. It was found that increasing glycerol content led to increase in film thickness and films solubility in water, as well as causes a slight decrease in films lightness.

The scientific research was realized within a framework of grant nr BM-4742/KAiOJŻ/2013 financed from budget of University of Agriculture in Krakow, Poland.

EFFECT OF MALTITOL AND SORBITOL ON RHEOLOGICAL PROPERTIES OF MODIFIED STARCHES

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The aim of this study was to evaluate the effect of sorbitol and maltitol on pasting characteristics and flow properties of acetylated distarch phosphate (E 1414) and hydroxypropyl distarch phosphate (E 1442). Presence of the sucrose substitutes at concentration corresponding to 5 and 10 % of sucrose increased pasting temperature of the starches and decreased viscosity of the starch systems.

APPLICATION OF PEROXIDES FOR BIOETHANOL PRODUCTION FROM LIGNOCELLULOSIC MATERIALS

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In order to produce bioethanol from cellulosic biomass a pretreatment process is used to open up the structure of the cellulose component and allow enzymatic reactions to occur breaking down the cellulose to glucose. Peroxides can be used for partial depolymerisation of the lignin-carbohydrates complex. The present work investigates the peroxide and peracetic acid treatment of agricultural lignocellulosic pulp. The process was carried out after the steam explosion and prior the enzyme hydrolysis. The obtained glucose yield was increased and hydroxymethylfurfural removal made the peroxides suitable and effective agents for the bioethanol production.

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EFFECT OF STORAGE CONDITIONS ON RETROGRADATION OF MALTODEXTRINS SOLUTIONS

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The aim of the paper was to investigate the effect of concentration and temperature of storage on retrogradation of maltodextrins solutions. The experimental materials were commercial maltodextrins characterized by different dextrose equivalents (DE). The maltodextrins solutions were examined for retrogradation by Jacobson's method with modification. The samples were kept at 0, 4, 8 and 10 °C during 21 days.

CHARACTERISTIC OF SAME PHYSICOCHEMICAL PROPERTIES OF STARCH OBTAINED FROM DIFFERENT KINDS OF LENTILS

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The aim of the paper was to examine retrogradation, water binding capacity and water solubility of starch isolated from four kinds of lentil. The raw materials were red, black, green and brown seeds of lentils. The retrogradation was examined using Jacobson's method and the samples were stored at 4 °C during 21 days. The water binding capacity and solubility were investigated at 40 and 60 °C temperature by Richter`s method.

The authors gratefully acknowledge financing of the work from the grant No.BM-4741 awarded by the Rector University of Agriculture in Krakow.

THE RHEOLOGICAL AND SURFACTANTS PROPERTIES MALTODEXTRINS BASED CHEMICALLY MODIFIED STARCHES AND THEIR ROLE IN STABILIZING EMULSION O/W

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Maltodextrins are the products of partial hydrolysis of starch with a dextrose equivalent below 20. The aim of the study was characterization of selected rheological and surfactant properties of maltodextrins based on chemically modified starch. Analyzed maltodextrin had low values of intrinsic viscosity. In addition various surfactants properties and different emulsifiability are shown.

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EFFECT OF HERBS EXTRACTS ON SOME RHEOLOGICAL PROPERTIES OF WHEAT STARCH

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The aim of the paper was to investigate the effect of a few herbs extracts on RVA profile. The experimental materials were wheat starch and water extracts obtained from oregano, basil, marjoram and Provencal herbs. The extracts were obtained after 3, 5 and 10 min brewed in distill water. The profiles were carried out with Rapid Visco Analyzer.

CHARACTERIZATION OF HYDROLYSED LIGNOCELLULOSIC MATERIALS FOR ENERGY UTILIZATION

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The goal of present study is characterisation of various hydrolyzed lignocellulosic materials from monosaccharides production. The materials were obtained after acid and enzymatic hydrolysis of wheat straw and maize stalks, and from industry producing lignin from wood by technical hydrolysis. These energy products contain certain amount of polysaccharides resistant to hydrolysis. Chemical analysis, Py-GC-MS, DSC and calorific value determination were used for their characterization. The results from the analytical pyrolysis indicate the majority of aldehydes, ketones and sugars derivatives of carbohydrate related products.

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PRODUCTION OF WHEAT WITH ALTERED POLYSACCHARIDE CONTENT FOR HEALTHIER HUMAN CONSUMPTION

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Polysaccharide components of wheat kernels, especially dietary fibers, may have positive effects on human health after consumptions. The first possible way to increase their quantity in food is the use of special raw materials developed by breeding. Wheat lines with increased quantites of arabinoxylan or resistant starch were developed and the changes in flour composition was analysed and followed by molecular marker assisted selection at DNA level.

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THE INFLUENCE OF NON-STARCH POLYSACCHARIDES DEGRADATION ON PHYSICOCHEMICAL PROPERTIES OF ENZYMATIC GLUCOSE HYDROLYSATES FROM WHEAT STARCH

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Wheat starch granules beside amylose and amylopectin consist of non-starch and non-carbohydrate components, i.e. arabinoxylans (AX), proteins and lipids. These compounds have unbeneficial influence on the process of enzymatic starch hydrolysis as well as physicochemical properties of glucose hydrolysates. The influence of enzymatic degradation of AX and proteins in a temperature below gelatinization temperature of wheat starch and its influence of physicochemical properties of starch hydrolysates i.e. filtration ability and color, were studied.

It was proved that the type of xylanolytic enzyme, its concentration and the temperature in which initial starch degradation was performed have beneficial influence on the properties of glucose hydrolysates. Specific pattern of AX degradation in starch influences the characteristics of changes occurring on its surface, significantly shaping its properties, mainly susceptibility to gelatinization.

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MODEL STUDIES OF INTERACTIONS BETWEEN WHEAT STARCH FRIABILINS/PUROINDOLINS AND LIPIDS USING FLUORESCENCE METHOD

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During studies, as a model phospholipid bilayer, liposomes were used. Application of liposomes has a wide range of possible uses in studies regarding protein and lipid interactions because it comprises a convenient research model. For building liposome structures as model lipids (imitating the composition of lipids on the surface of starch granule) phospholipids and glycolipids were used, i.e. mainly PC, and in smaller amounts PS, SA, PI, MGDG and DGDG. Changes of fluorescence polarization of two probes TMA-DPH and NBD-PE and changes of fluorescence of tryptophan residues in a protein chain were measured.

Significant interactions between lipids and proteins from puroindolin group in model reactions with liposomes were observed. Regardless of the kind of lipid used for liposome preparation, proteins interacted with liposomes, which was observed due to changes in its conformation (Trp fluorescence). Explicit importance on puroline interactions with the surface of liposome has the net charge of this surface. Strong influence between protein and lipid takes place in a presence of a ligand with a negative charge.

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EFFECT OF CULTIVATION CONDITIONS ON EXOPOLYSACCHARIDES PRODUCTION BY *Cryptococcus laurentii*

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Cryptococcus laurentii is yeast microorganism, capable of abundant extracellular polysaccharides (EPS) production. *C. laurentii* EPS have a large potential for application in medicine, cosmetics and food industry. Effect of medium pH, cultivation temperature and aeration intensity on *C. laurentii* growth in submerged culture and EPS production was studied. Composition of EPS produced under different cultivation conditions was compared.

THE EFFECT OF PROCESS PARAMETERS ON SLOWLY DIGESTIBLE STARCH CONTENT IN EXTRUDATES

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Starch contained in food products can be classified by rate of digestion in the small intestine as rapidly digestible starch (RDS), slowly digestible starch (SDS) and resistant starch (RS). Slowly digestible starch has beneficial physiological effect on the reduction of post-prandial glycemic responses. Laboratory single-screw extruder KE 19/25 (Brabender, Germany) was used for preparation of 37 samples, in which RDS, SDS and total starch (TS) were determined using Englyst method. Fine-grain corn grits, modified starch Moramyl ZB-H and pea flour were used as raw materials. The input mixtures differed in composition and water addition (5, 10, 20 % wt.). Additionally dosing rate, speed of screw, barrel temperatures, compression ratio and diameter of die were changed for influencing RDS and SDS in extrudates.

This research was supported by the "Wheat with specific starch composition and features for food and non-food purposes" QJ1310219 research grant of Ministry of Agriculture.

ANALYSIS OF EXOPOLYSACCHARIDES PRODUCED BY BIFIDOBACTERIA

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Bifidobacteria are probiotic organisms which provide potential health benefits. Exopolysaccharides generated by these organisms contribute to their biological activity. Our work is focused on characterising the exopolysaccharides from Bifidobacteria. NMR spectroscopy, size exclusion chromatography, HPAEC analysis, monomer and linkage analysis have been used to analyse the EPS structure of different friendly strains of Bifidobacteria and these will be presented.

PROTEIN-POLYSACCHARIDE INTERACTIONS AND THEIR PRACTICAL APPLICATIONS
Invited lecture

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Interactions between proteins and polysaccharides can lead to complexes having enhanced functional properties in comparison to the starting macromolecules. The work discusses substrate requirements and treatment conditions necessary to form such interactions, and characterizes parameters required for thermodynamic incompatibility of protein-polysaccharide solutions. It also presents practical implications of those interactions and demonstrates their potential industrial applications in food technology and other areas.

CHANGES OF RESISTANT STARCH DURING EXTRUSION PROCESS

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The aim of the paper was seeking suitable conditions of extrusion cooking to save nutritional properties of the final product compared with incoming corn grits, and mixtures with added pea flour or chemically modified starch. The highest ratio output/input for resistant starch was found when pea flour was added to corn grits using 10 % water – 45.8 % (abs. 3.1 % DM). On the other hand, the lowest ratio was registered for pure corn grits using 20 % water – 2.1 % (abs. 0.08% DM). Application of 20 % cross-linked starch Moramyl ZBH (E 1412) using 10 % water resulted 1.1 % DM.

This research was supported by the "Wheat with specific starch composition and features for food and non-food purposes" QJ1310219 research grant of Ministry of Agriculture.

QUALITY OF COMPOSITE WHEAT/BARLEY/ HEMP FLOUR EVALUATION

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Quality of composites with 5 % or 10 % of hemp flours K6 and K7 (blended with wheat/barley flour premixes 70:30 and 50:50, w:w) was characterized by analytical (protein content, Zeleny test, SRC) and rheological (farinograph, extensigraph) properties. Protein contents increased, but its quality worsened due to gluten net dilution. Dough handling properties was also changed negatively; extensibility increase and elasticity decrease was attributed mainly to barley flour.

This research was supported by the project QI 111 B053 (Ministry of Agriculture).

HYDROPHOBICALY MODIFIED CELLULOSES: PREPARATION, STRUCTURE AND APPLICATION

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Cellulose has been used for preparing of various derivatives of medicinal importance. Among them, oxidized monocarboxy cellulose (MCC) and carboxymethylcellulose (CMC) have many applications including food, pharmacy, medicinal materials, cosmetics etc. Both MCC and CMC contain reactive carboxylic groups and thus may undergo further chemical modifications involving carboxyls to obtain novel perspective derivatives. This work is focused on amidation of MCC and CMC with *n*-alkylamines and other reagents. Substitution degree and purity of the reaction products were monitored by organic elemental analysis and spectroscopic methods. Analytical methods confirmed preparation of highly substituted highly or moderately substituted *N*-alkylamides, hydrazides and hydroxamic acids. Partially, hydrophobically modified cellulose derivatives containing long alkyl substituents have potential use in pharmacy as fat and cholesterol sorbents. The *in vitro* sorption experiments and *in vivo* feed testing on animals confirmed their benefits in fat and cholesterol lowering in comparison with cholestyramine, synthetic bile acid sorbent.

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POLYPHENOLIC GLYCOCONJUGATES WITH BIOLOGICAL ACIVITIES ON HUMAN BLOOD PLASMA ISOLATED FORM *Agrimonia eupatoria* L.

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The mixture of macromolecular polyphenolic glycoconjugates (M_w 9 100–2 100 000 Da) was isolated from medicinal plant *Agrimonia eupatoria* L. Its chemical character and structural composition using spectroscopic and chromatographic methods were determined. The anticoagulant activity and mechanisms of action, as well as the antioxidant activity of this mixture were assayed.

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 THE TYPE AND AMOUNT OF STARCH ON THE BIOLOGICAL FOAMING OF ALUMINA SUSPENSIONS

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Ceramic foams have been prepared by biological foaming of alumina suspensions using the yeast *Saccharomyces cerevisiae* (fermentable sugar → carbon dioxide + ethanol). The influence of the starch type used (potato, corn, rice) and its amount in the suspension (0–40 vol. %) on the foam stabilization was studied. After firing, the foam porosity was determined (up to 87 %), and the microstructure was studied by optical and electron microscopy.

This work is part of the project P108/12/1170 "Porous ceramics with tailored elasticity and thermal conductivity" (GAČR) and specific university research (MŠMT No. 20/2013).

ISOLATION AND CHARACTERIZATION OF ARABINOXYLANS FROM WHEAT BRAN

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In this study a small technical process in a scale up to 10 kg wheat bran was developed. The process parameters necessary for an economic production of arabinoxylans (AX) were determined. After aqueous or alkaline/oxidative extraction the AX were separated by centrifugation, ultra- and diafiltration, ethanolic precipitation and drying. The molar mass varied in the range of M_W=11.000 to 220.000 g/mol and the purity was 47.3–69.8 % AX in dry matter.

THE MECHANISM OF ANTICOAGULANT ACTION OF POLYPHENOLIC-POLYSACCHARIDE GLYCOCONJUGATE ISOLATED FROM POPULAR POLISH MEDICINAL PLANTS

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The aim of our research was to study the mechanism of anticoagulant activity of glycoconjugates isolated from medicinal plants. The analysis of interactions between glycoconjugates and the selected proteins of coagulation cascade immobilized on biosensors was performed. Next, the ability of the plant compounds to inactivate thrombin and factor Xa by complex formation with antithrombin or heparin cofactor II was studied.

Studies are a part of the project supported by European Regional Development Fund and the Polish Government (Operational Programme - Innovative Economy) Grant WROVASC (Integrated Cardiovascular Centre, 2007-2013).

THE INFLUENCE OF FERTILIZATION ON BREAD-BAKING PARAMETERS OF WINTER WHEAT

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The statistically higher wet gluten content was found out in the variant with mineral fertilization and straw and organic fertiliser Veget incorporation (29.53 %) compared to in the variant with mineral fertilization only (24.94 %) and in the variant with mineral fertilization and straw incorporation (26.18 %). The backing attribute was determined according Slovak norm STN 46 1100-2. According to this norm on the ground of values of wet gluten content the winter wheat grain was integrated into the elite class in the variant with mineral fertilization and straw and organic fertiliser Veget incorporation, into the class A in the variant with mineral fertilization and straw incorporation and into the class B in the variant with mineral fertilization only.

PHYSICAL CHARACTERISTICS OF INULIN IMPROVED BISCUITS

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The increasing use of inulin as a healthy food ingredient has led to investigate new ways to apply this innovative polysaccharide. In previous studies, inulin has been used mostly to stabilize water in the products of a creamy, foam or mousse consistency. However, it seems that due to its stable rheological properties, inulin gels can also be included in food products with a solid consistency. Their use could allow to develop innovative products with healthy properties. Therefore, the aim of this work was to substitute fat in biscuits with inulin gels and analyze the impact of this substitution on the physical properties of the products, especially their fracture profiles. Analyses were performed on the day of baking, as well as after 1 and 2 months of storage.

Products containing inulin did not differ from controls in terms of appearance and kept either geometric features

and color typical for this type of confectionery. Cookies without addition of inulin (standard) revealed the lowest maximum force during puncture either immediately after baking and during the entire period of storage compared to samples with inulin. The hardness of biscuits during storage decreased. The fat replacement with inulin resulted in a fracture profiles changes.

An increase of the hardness of biscuits, with various amount of inulin, in comparison to the control was observed. The most significant differences were observed after storage. Cookies with the highest amount of inulin, after two months of storage, were 60 % harder than products based on the standard formula. Although the introduction of inulin to the recipe caused an increase in the biscuits fracturability throughout the period, the changes in this parameter associated with the storage did not have a unitary character. Samples with the highest addition of inulin turned out to be the hardest at the end of the storage, while the remaining biscuits (with lower levels of inulin) showed the largest increase in hardness after one month.

It can be concluded that the use of inulin in confectionery products manufactured on an industrial scale seems entirely possible. The observed increase in hardness associated with the addition of inulin to the biscuits recipe is not a beneficial phenomenon. However, levels of used additives does not worsen the quality of the products to the extent unacceptable by consumers. It seems possible to reduce the negative effect of the inulin addition on the texture of biscuits by optimizing the recipe composition, especially the level of sugar.

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STUDY OF STARCH PROPERTIES USED IN THE PHARMACEUTICAL INDUSTRY BY IGC TECHNIQUE

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The starch is very important excipient used in pharmaceutical industry. Many aspect of its structure can be detected by one or more characterization methods. Properties such as sample bulk and tapped density, solubility, swelling, ratio of amylose to amylopectin of several pregelatinized starch samples from commercial manufacturers were studied and compared to the surface energy and acid-base properties determined by inverse gas chromatography (IGC).

NOVEL TRENDS IN PRODUCTION OF BIOFUELS FROM VARIOUS POLYSACCHARIDES

Invited lecture

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Current state of accessible oil deposits have led to an increased effort to substitute part of energy used in transportation by energy derived from renewable resources, one approach is represented by use of ethanol or butanol petrol blends. Most of bioethanol is currently produced from starch or sugar feedstock, but cellulose can be also exploited for biofuel production. Butanol, which might be better fuel substitute than ethanol, could be produced from polysaccharides by several species of bacterial genus *Clostridium*.

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DECORATION OF NOBLE METAL NANOPARTICLES BY APTAMERS AND OLIGOSACCHARIDES

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Present contribution deals with the prepartion the gold nanoparticles (AuNPs) with the size much below 100 nm controlled by the ratio between the reducing/stabilizing agents (the trisodium citrate and citric acid) and the hydrogen/sodium tetrachloroaurate (III)). This method is used to loose shell of citrates on the particle-surfaces replaced by other ligands (thiolated DNA and saccharides) with valuable function (N.L. Rosi, C.A. Mirkin, Chem. Rev. 105 (2005) 1547).

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CHARACTERIZATION OF HEMICELLULOSES OBTAINED BY DIFFERENT EXTRACTION PROCEDURES FROM INDUSTRIAL GRASS

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Alternative procedures using H_2O_2 and ultrasound during the alkaline extraction step were applied for the isolation of hemicelluloses from lignified tissues of the industrial grass "Szarvasi-1". The effectiveness of the methods was evaluated by the yield and purity of the isolated hemicelluloses in comparison to classical extraction methods (acidic sodium chlorite delignification, flowed by extraction with 10% KOH). From the ecological and economical point of view, the ultrasound-assisted extraction (100 W) was the most efficient.

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DOUBLE-CROSSLINK STABILIZATION OF OXIDIZED HYALURONATE FIBERS BY ACETAL AND HYDRAZONE BONDS

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Fibers based on oxidized hyaluronic acid (OXHA) represent a valuable biocompatible and biodegradable material within medicine. By a comparison with fibers from a native HA, they show slightly increased stability at wet conditions due to intermolecular stabilization by acetal bonds and furthermore can be double cross-linked by stable hydrazone bonds. The study shows results of numerous reactions performed at OXHA fibers and their impact on the fiber properties. Complex studies were summarized showing mechanical, physico-chemical and biological data.

Autorský rejstřík