18th Conference of Young Researchers Section of Polish Society of Food Technologist 2nd International Session

Poznań, 14th – 16th May 2013

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Plenary lectures

Professor Jan Gawęcki, Ph.D.

Department of Human Nutrition and Hygiene

Poznań University of Life Sciences

DZIŚ I JUTRO NAUKI O ŻYWIENIU

Naukę o żywieniu najczęściej definiuje się jako naukę badającą związki między pożywieniem człowieka a jego rozwojem, dobrostanem i zdrowiem na poziomie komórkowym, ustrojowym i populacyjnym.

W niniejszym referacie zostaną przedstawione najważniejsze problemy i kierunki badawcze rozwijane aktualnie w nauce o żywieniu na każdym z wymienionych poziomów oraz przewidywania, co do przyszłego rozwoju tej nauki.

NUTRITION SCIENCE - TODAY AND TOMORROW

As a science, nutrition is most often defined as researching relationships between food and human development, well-being and health on cell, organism or population levels.

The paper sheds light on most important problems and research directions currently carried out in nutrition science on every level mentioned. It also touches prospects of the future.

Professor Roman Przybylski

University of Lethbridge

Lethbridge Alberta Canada

NUTRITIONAL OILS AND FATS:

WHERE HAVE WE BEEN? WHERE ARE WE GOING?

Lipids are one of the nutrient providing our body with energy mainly. Practically every consumed food contains different types of lipid components. Many of lipid components are the essential nutrients and have to be provided in our diet. Fats and oils beyond condensed energy also play very important physiological functions in our body. Needs for different lipid components where developed during human evolution and were instigated by availability in consumed foods for centuries. For millennia humans consumed foods which was collected from environment where they live, it means that they bodies were supplied with nutrients from products offered by the nature. These sources of nutrients were very diverse and well balanced, however supply was not equal for every season of the year. During summer and fall food was in abundance whereas during winter and spring usually in shortage. Human physiology embraced those changes in food supply by storing energy in the form of fat during food abundance, and this source of energy was used when food was more difficult to obtain.

Until XIX century food industry as we perceive it today was not existent and food preservation was utilized sparsely. During industrial revolution, when cities grow in population, appeared a problem of supplying food at high amounts and food industry start to develop. At that time the main issue for food industry was a fat which

could replace butter to provide supply for people and military. During that time margarine was developed utilizing animal fats such as tallow and lard. Advancement in food chemistry directed to development of hydrogenation process. Due to the shortage of animal fats, hydrogenated vegetable oils were used for production of margarine, baking and frying fats. At that time fat and oil industry developed variety of fats and oils for any type of food formulation and preparation. The main properties of all these fats and oils were: (1) to provide excellent storage stability by elimination of unsaturated fatty acids; (2) to provide excellent processing performance; (3) to provide extremely stable frying fats; (4) fats and oils were loaded with saturated and *trans* fatty acids. All these fats and oils lack nutritional qualities and industry dictated based on the economic reasons only, what fats and oils will be used in food formulation and preparation.

Advent of developments in nutritional sciences exhibited that saturated, *trans* and omega-6 fatty acids have multiple negative effects on human metabolism and are leading into array of civilization health problems. Finally in 2006, on the North American continent, earlier in Europe, industry was forced to declare *trans* fatty acids amount on the packaged foods. This event changed completely direction of new oils and fats development. New directions are leading into functional oils and fats and directing back into the type as “Mother nature” offered us at the beginning, it means to confirm to our metabolic needs established millennia ago. Developed functional lipids today contain all required essential lipids in proper amounts, eliminating negatively affecting compounds while keeping performance and nutritional quality during processing and frying.

Didier Montet, Ph.D.

UMR Qualisud, CIRAD Montpellier, France

THE MICROBIOLOGICAL QUALITY OF FOOD IN DEVELOPING COUNTRIES, COMPARISON WITH THE EUROPEAN SYSTEM

Food safety varies from one country to another. The richest countries are implementing regulatory systems such as in Europe with the Regulation 178/2002 forcing food manufacturers to provide safe food to the public. Most developing countries cannot afford this type of expensive system despite an increased awareness of governments on food safety. Trade within developing countries is generally undemanding in food safety. These countries usually have no national regulations or it is poorly enforced because of lack of resources or political will. In some of the poorest countries, access to drinking water is extremely limited. There are three types of countries, those whose food safety status is not mastered, those where food safety status is mastered by the population (overheating food) and those whose food safety status is mastered by regulation. To all this are added the countries suffering war or climate.

In safety terms, the main problem is the abundance of pathogenic microorganisms for the digestive system. Sanitary markers (*E.coli*) are often present

in high quantities. More serious illnesses like cholera occasionally affect the poorest countries (*Vibriocholerae*). Other hazards could affect people without food safety surveillance such as mycotoxins, carcinogenic molecules, difficult and expensive to analyze or antibiotic resistance... In addition, countries without regulation or performed analytical system are seen to confront of denial export, sometimes simply due to a break in the cold chain or a lack of traceability. In most developing countries, the expertise exists but is rarely used.

Hocquette Jean-François, Ph.D.

French National Institute for Agricultural Research, France

Botreau R.[1], Capel C.[2], Cassar-Malek I.[1], Legrand I.[2], Pethick D.W.[3], Picard B.[1], Polkinghorne R.[3], Renand G.[1]

[1] INRA, France;[2] Institut de l'Elevage, France; [3] Beef CRC, Australia

THE CHALLENGE OF THE BEEF INDUSTRY:

MOVING FROM CARCASS GRADING SYSTEMS

TO THE PREDICTION OF BEEF QUALITY FOR CONSUMERS AND CITIZENS

Beef quality consists of expected and experienced quality dimensions. The match or mismatch between expectations and experience leads to consumer satisfaction or dissatisfaction, and thus willingness to purchase beef again in the future. Despite efforts, there is still a high level of variability in palatability even for expensive cuts, which is one reason for consumer dissatisfaction. In Europe, there is still no reliable tool to predict beef quality and deliver consistent quality beef to consumers, who now find beef too expensive. Therefore, predicting eating quality (such as tenderness and flavour) at the consumer level is of paramount importance for the industry in order to remain competitive in the market. In addition, the relative

importance of the different quality traits varies according to the country, with also a general trend towards an increasing contribution of healthiness, safety and extrinsic quality traits such as productions systems, environmental issues and animal welfare.

Early grading systems only described carcasses with various traits such as carcass weight, age or maturity of the animal, sex, fatness, fat colour, carcass conformation and sometimes marbling and lean colour and eventually saleable meat yield usually predicted by measurements of fatness and/or muscling. In North American and Asian countries, emphasis has been put on maturity and marbling. The European system to describe carcasses (the EUROP grid) is mainly based on yield estimation. Its declared objective is to pay producers, but it does not predict eating quality at the consumer level. A consumer driven modelling tool was developed in Australia: the Meat Standards Australia (MSA) grading scheme predicts beef quality for each individual muscle × specific cooking method combination using various information on the corresponding animal and post-slaughter processing factors. The MSA system proved to be effective in predicting beef palatability not only in Australia but also in many other countries. The results of the work conducted within the ProSafeBeef project indicate that it would be possible to manage a grading system in Europe similar to the MSA system.

Some genetic markers are available to improve beef quality. In addition, gene and protein expression profiling of the bovine muscle revealed that the expression level of many genes and the abundance of many proteins may be potential indicators of muscle mass, tenderness, flavour or marbling of meat. These markers are related to the heat shock protein family, muscle fiber characteristics, metabolic enzymes,

connective tissue or proteases involved in ageing of beef. However, these markers are often specific to muscle type, animal type, livestock practices or environmental conditions. Despite these limitations, predictive tests of beef quality based on genomic tools are currently in development.

The combination of the different modelling approaches (namely muscle biochemistry, genomic results and a MSA-like meat grading system adapted to the European market) is a proven area of research to improve the prediction of beef quality. We also speculate that the combination of indicators related to sensory and nutritional quality, social and environmental considerations (carbon footprint, animal welfare, biodiversity of pasture, rural development, etc.) and economic efficiency (incomes of farmers and of other players along the supply chain, etc.) will provide an assessment of the overall quality of beef not only for the mass market but also to support official quality labels of niche markets which are so far mainly associated with the geographical origins of the products.

Professor Henryk Jeleń, Ph.D.

Faculty of Food Science and Nutrition,

Poznań University of Life Sciences, Wojska Polskiego 31, 60-624 Poznań,

Poland

henrykj@up.poznan.pl, www.up.poznan.pl

QUO VADIS CHROMATOGRAPHY? QUO VADIS FOOD ANALYSIS?

Food quality is one of fundamental issues in food supply and production chain as well as in human nutrition. Due to the complexity of food as a matrix, food analysis is a challenging task. Besides main food constituents, there are hundreds or even thousands of compounds: food minor compounds, interaction products, xenobiotics, food additives and contaminants, to name main groups, which became important considering developments in food chemistry, biochemistry, nutrition and toxicology.

Separation techniques, mainly chromatography became a basic tool in food analysis especially in the last 30 years. Hyphenation of chromatographic techniques with mass spectrometry or other identification techniques was a giant leap in food analysis providing a powerful tool for both researchers and control laboratories.

Lecture will focus on the developments in chromatographic and hyphenated techniques applied to the analysis of foods. The historical perspective, developments

of novel techniques and their application in solving analytical challenges in food area will be provided. Perspectives and trends for the future will be also pointed out.

Oral presentations

Competition session

Determination of glycidyl esters of fatty acids in vegetable oils by LC–MS

Magda Aniołowska, Agnieszka Kita

Wrocław University of Environmental and Life Sciences
Department of Food Storage and Technology, Wrocław, Poland
Contact e-mail: magda.aniolowska@wnoz.up.wroc.pl

INTRODUCTION

Recently, the presence of glycidyl esters of fatty acids (GEs), was confirmed while investigating the occurrence of fatty acid esters of 3-monochloro-1,2-propanediol (3-MCPD) in food. The main source of those compounds are refined oils as formation of esters occurring mostly during deodorization step. Glycidyl fatty acid esters could in theory be hydrolysed by lipases to the parent glycidol (a substance potentially cancerogenous for human beings, group 2A) in the gastrointestinal tract. During the derivatization step chloride ions present in the mixture could partially react with free glycidol converting it to 3-MCPD.

AIM

The objective of this research was to find and use a fast, accurate and rugged screening method for glycidyl esters in edible, refined oils using minimal sample preparation and a single quadrupole mass spectrometer.

MATERIALS AND METHODS

Samples of edible, refined oils (rapeseed, sunflowers, palm) were collected from retail outlets in Wrocław. The concentrations of glycidyl esters (palmitate, stearate, oleate, linoleate and linolenate) in oil were quantified using an LC-MS technique based on Granvogl and Schieberle (2011). The analytical procedure was carried out according to Becalski (2012). Glycidyl esters extraction from oils was conducted using acetone and chloroform, then the samples were purified twice using SPE cardridges.
The glycidyl esters content was obtained by the use of LC/MS 1200 L (Varian, Walnut Creek, CA., USA) performed using an atmospheric-pressure chemical ionization (APCI). Separation was made by the use of Luna (150 × 2.0 mm) (Phenomenex, USA) column which was preceded by the pre-column SecurityGuard (4 × 2.0 mm) (Phenomenex, USA). For the selected ion monitoring (SIM) measurement each of the protonated molecular ions $[M+H]^+$ were used: *m/z* 313 for $C_{16:0}$-GE, *m/z* 341 for $C_{18:0}$-GE, *m/z* 339 for $C_{18:1}$-GE, *m/z* 337 for $C_{18:2}$-GE, *m/z* 335 for $C_{18:3}$-GE.

RESULTS

To quantify GEs in the oils, calibration lines were generated by the injection of standard GE solutions in the range between 5 and 1,000 ng/mL (5, 10, 30, 50, 100, 200, 300 and 1,000 ng/mL). The calibration curves were linear with r^2 higher than 0.998. Limit of detection (LOD) and limit of quantification (LOQ) were defined as signal to noise (S/N) = 3 and 10, based on a 10 µL injection of the standard GE solution at a concentration of 5 ng/mL.

CONCLUSIONS

Validation of the method conducted proved precision of the resulting data at the deviation below 5%. The method proved to be 92% replicable and it can be followed to assay of five target GEs in an oil matrix using the LC-MS technique.

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Becalski A., *Glycidyl fatty acid esters in food by LC-MS/MS: method development*, Anal. Bioanal. Chem, 2012, 403:2933-2942.

Projekt współfinansowany ze środków NCN w ramach projektu badawczego nr 2012/05/N/NZ9/01508

Key words: glycidyl esters, oil, LC-MS

Physical properties of starch-whey proteins films

Ewelina Basiak, Andrzej Lenart

Warsaw University of Life Sciences
Wydział Nauk o Żywności, Katedra Inżynierii Żywności i Organizacji Produkcji
Contact e-mail: ewelina_basiak@sggw.pl

INTRODUCTION

Every year the amount of produced trash increases, causing the landfills to increase. Aside from the fact that people throw away more things that they used to in the past the main reason of continued growth of landfills is the fact that large percentage of trash is made up of materials that are not biodegradable or take long time to decompose.
An excellent alternative to many of plastic materials would be to use edible films. They can reduce packaging waste associated with processed foods. In addition edible films are environmentally friendly materials, they can promote the quality and convenience of minimally processed foods. They can also be used to inhibit or regulate the migration of oxygen, moisture, carbon dioxide and other liquids.
One of the most abundantly occuring biopolymers in nature is a starch. It is inexpensive, widely available and biodegradable. Furthermore it is edible, tasteless, colourless and easy in a treatment technology.
Proteins are the functional components, used on wide scale in the food industry. They contain amino acids, essential for proper functioning of the human body that it cannot produce themselves. In addition, they are the easily absorbed by humans.

AIM

The objective of this study was to investigate physical properties of composite edible films based on wheat starch and whey protein isolate, including: composition, thickness, water solubility, water vapour permeability and microstructure of composite films prepared by casting wheat starch and whey-proteins isolate at proportions of 100-0%, 75-25%, 50-50%, 25-75%, 0-100%. Glycerol and water were used as plasticizers. Combination of both substances gave continuous and homogenous films. All of analysed films reached their state of equilibrium within 24 hours of adsorption time.

MATERIALS AND METHODS

Wheat starch was supplied by Hortimex (Konin, Poland), the whey protein isolate was obtained from Davisco Foods International Inc. (La Sueur, MN., USA). Anhydrous glycerol and silica gel were purchased from POCH S.A. (Gliwice, Poland). Saturated salt solution of sodium chloride (POCH, Gliwice, Poland) was used to control the water vapour humidity at 75.3% and 25°C to investigate water vapour permeability and water vapour sorption kinetics.

RESULTS

The thickness of all films ranged from 87 to 110 μm. Pure whey-proteins and starch films have similar values. Starch-whey films have significantly different values depending of proportions starch and whey-proteins. Water vapour permeability (WVP) results for starch, protein and their components are not the same. You can notice that when humidity decreases, water vapour permeability is lower. Starch films at relative humidity gradient (RHG) 0-30% are of the lowest values. When the protein content increases, values of WVP rise, too. In case of both RHG 30-75% and 30-100% obtained results are on the same level. SEM photographs were taken at different magnifications and they show that starch samples are more granular than other ones.

CONCLUSIONS

Pure starch, pure whey proteins and they combination gives continuous and homogenous edible films. Changing in composite of all kinds of films affected on thickness, water solubility, WVP and structure.

Key words: starch, whey proteins, films, physical properties

The changes of proteins and non-starch polysaccharides properties during processing of wheat dough enriched with wholegrain barley flours

Anna Czaja, Agata Wojciechowicz-Budzisz, Zygmunt Gil

Wrocław University of Environmental and Life Sciences
The Faculty of Food Science
Contact e-mail: anna.czaja@up.wroc.pl

INTRODUCTION

It is recommended to eat circa 30 grams of fiber per day. To meet these requirements more easily one may choose wholegrain products or consume products with confirmed high content of fiber. One of such products can be barley. Its hull-less varieties to allow avoiding pearling, which simplifies the processing. Additionally, naked barley besides its fiber content, is a source of β-glucans. That group of compounds might have beneficial influence on blood cholesterol. The addition of wholegrain barley flour to the wheat dough may improve its nutritional properties.

AIM

The goal of the present study was to compare two varieties of barley and determine quantity and quality of non-starch polysaccharides and proteins in dough during processing compared to pure wheat dough.

MATERIALS AND METHOD

Two hull-less barley varieties: Gawrosz (former STH 7809) and STH 4933 in the form of wholegrain flour were used to prepare yeast risen doughs. Their addition to the dough ranged from 20% to 40%. Total quantity of proteins, fiber, pentosans and β-glucan was measured. To understand the changes during formation and fermentation of doughs soluble and insoluble fractions of non-starch polysaccharides were determined for fiber and pentosanes. Pure wheat dough was prepared as a control group.

RESULTS

There are differences between two the varieties of barley. Gawrosz had highest protein, fiber and β-glucan content. Wheat dough had the smallest quantities of those compounds. The process of fermentation influenced only some protein fractions and solvated hydronium ions quantity in dough while potential acidity remained on the same level. Fermentation did not change neither fiber nor other non-starch polysaccharide quantities.

CONCLUSIONS

To obtain the dough richer in non-starch polysaccharides the usage of Gawrosz is recommended. The STH 4933 variety is characterized by smaller quantities of these compounds. During fermentation the quantity of total proteins grew. It has been proven that the preparation of yeast risen dough with wholegrain hull-less barley flour improves its nutritional value significantly.

Key words: barley, dough, non-starch polysaccharides, fiber

Differences in beef (M. longissimus dorsi) colour brightness/marbling from consumer point of view

Ewa Gil

Warsaw University of Life Sciences
Department of Nutrition and Consumer Sciences
Contact e-mail: ewa.gil@o2.pl

INTRODUCTION

Colour is generally the first quality characteristic which consumers experience. Colour and marbling are the characteristics that define sensory quality of beef and they has a critical influence on beef at the point of sale. They are of critical influence on beef purchase decision by consumers; this fact is of fundamental importance to the beef industry, which is trying to increase production of high quality beef for domestic and export markets.

AIM

The aim of this study was to investigate and to establish range of differences in beef *(M. longissimus dorsi)* colour and marbling obtained from various types of cattles, varied by gender, age and production system.

MATERIALS AND METHODS

58 beef cuts were examined and taken photograps in standarized lighting condition. The samples were divided into three groups of production system. Within each group visual differences in colour brightness and marbling were ranked by members of sensory panel experienced in beef evaluation. Paralelly L*a*b colour space of the same beef samples was measured.

RESULTS

16 beef cuts were chosen varying by colour brightness/marbling ratio, which consumer may meet on the market.

CONCLUSIONS

Understanding the differences in beef colour and marbling and their relation to consumer preferences is important because it offers the possibility of establishing appropriate guidelines for breeders and meet industry, to meet exactly needs and expectations of consumers.
This work is part of a larger initiative to improve the quality of Polish beef.

Key words: beef, colour, marbling

Cold plasma use in spice sterilization

Maciej Grabowski[1], Waldemar Dąbrowski[1], Krzysztof Kryża[2]

North Pomeranian University of Technology in Szczecin
Cathedral of Microbiology and Biotechnology[1]
Department of Dairy Technology and Storage of Food[2]
Contact e-mail: maciejgrabowski.mg@gmail.com

INTRODUCTION

Plasma is known as the fourth state of matter. It is neutral ionized gas, formed by the particles which are in constant interaction including: atoms, electrons, photons, non-excited and excited molecules, negative and positive ions and free radicals. Simply stated, the gas is subjected to a magnetic field (electromagnetic or electric) at high frequency in a vacuum chamber, which leads to gas ionization and the creation of plasma.

AIM

The aim of the research is the sterilization of spices with low temperature (cold), low pressure and non-equilibrium plasma.

MATERIALS AND METHODS

The material consists of spices available on the Polish market. The test methods include:
- plasma sterilizer
- microbiological tests
- chromatography

RESULTS

First of all, the level of microbiological contamination of black pepper was specified. Secondly, an attempt has been made to reduce the number of microorganisms by the use of plasma sterilization process. Next, the number of bacteria have been decreased from one to two orders of magnitude, depending on the type of microorganisms.

CONCLUSIONS

Low temperature, low pressure and non-equilibrium plasma is suitable for the sterilization of black pepper. Currently, attempts are being made to optimize the method in order to minimize the level of microbiological contamination to a value of zero.

Key words: plasma, black pepper

The effect of changes in food structure consumption and food intake regulation on selected anthropometric parameters in healthy female students

Paulina Nowaczyk[1], Jan Jeszka[1], Małgorzata Woźniewicz[1], Yoshiaki Sone[2], Tomoko Morinaka[2]

[1]Poznan University of Life Science, Department of Human Nutrition and Hygiene
[2]Osaka City University, Department of Interdisciplinary Studies for Advanced Aged Society
Contact e-mail: polinan@up.poznan.pl

INTRODUCTION

The process of broadly defined globalization seems to influence almost all areas of human life. The impact of the process is also seen in respect of food transport and food stuff availability. Simultaneously the relation between nutrition and health is getting more and more apparent, and popularity of alternative way of meeting nutritional needs is still growing. The phenomenon results in changes in structure of daily food rations composition and habitual nutrient intake transition.

AIM

The aim of the study was the evaluation of the effect of changes in the contribution of food groups to daily food rations and changes in macronutrient composition of diet, as well as introducing regular meal routine on selected anthropometric parameters.

MATERIALS AND METHODS

Thirty five healthy female students aged 20 – 25 years were enrolled into the study. The whole experiment included six weeks of investigation, in which the first week was observational period (OP), and the following five weeks were dietary intervention period (DIP). All of the participants were randomly assigned to experimental (EG, n=23) or control group (CG, n=12). During OP data on eating habits were collected. Throughout DIP, EG followed dietary plan in which two main meals were basing on the dishes typical for traditional Japanese cuisine. The whole day menu of CG consisted of meals typical for Polish cuisine only. Both dietary plans were determined to provide 2000 kcal per day, however they did differ in macronutrient composition and structure of food groups contribution. Day to day regular meals routine was introduced. At the beginning of DIP and at the end of each intervention week, the following measurements were taken: body weight, body composition analysis (FM, FFM, TBW) and waist and hips circumference. Physical activity level (PAL) was recorded during whole DIP.

RESULTS

The evaluation of eating habits showed the lack of regular eating routine and the existence of snacking habit in studied group. No significant baseline differences in any measured parameter between groups were found. During the five weeks of DIP the decrease in body weight, FM, waist and hips circumference was observed in both groups. Simultaneously an increase in FFM and TBW was found. At the endpoint, no significant differences in crude values of percentage of changes in any measured parameter between groups were identified, however week to week differences in the dynamic of changes in FM, FFM and TBW was observed. No significant changes in PAL between experimental weeks were noticed.

CONCLUSIONS

The introduction of regular eating routine rather than changes in composition of daily food rations had an impact on favorable changes in anthropometric parameters of young healthy female students.

Key words: anthropometric parameters, dietary intervention, female students, Japanese & Polish cuisine

The effect of fermentation of buttermilk beverages on their antigenic potential

Anna Ogrodowczyk, Joanna Dąbkowska, Anna Kaliszewska, Barbara Wróblewska

Institute of Animal Reproduction and Food Research of Polish Academy of Sciences
Department of Immunology and Food Microbiology
Contact e-mail: a.ogrodowczyk@pan.olsztyn.pl

INTRODUCTION

The buttermilk is a traditional, refreshing beverage based on milk that has broad therapeutic and nutritional properties. It is known as a by-product obtained during the technological process of churning butter out of cream. This term is also used for fermented dairy product that is produced from cows' milk with addition of lactic acid bacteria strains and dairy starter cultures. Due to their presence, the buttermilk reveals antitumor and anti-inflammatory activity. It also improves digestion and reduces constipation. Thanks to the low fat content with favorable proportion of fatty acids and high amount of lecithin the buttermilk decreases cholesterol level in serum and reveals anti-mutagenic activity. There are reports on antioxidant activities of buttermilk proteins and their enzymatic hydrolysates. Fermented buttermilk can also have health benefits in diet of lactose intolerant individuals. Unfortunately, the problem of increasing number of patients suffering from cows' milk protein allergy, remains unsolved. The presented study provides the information on immunological properties of buttermilk and the impact of fermentation on decreasing immunoreactivity of buttermilk beverages.

AIM

The formulation of fermented beverage based on buttermilk and strains of Lactic Acid Bacteria (LAB) dedicated to patients suffering from cows' milk protein allergy.

MATERIALS AND METHODS

The fermentation processes of natural buttermilk were carried out with selected strains of LAB to decrease the antigenic potential of the product. The reference analyses of chemical composition of natural and fermented buttermilk were performed. Proteolytic activity of bacteria was determined by the OPA method during lactic acid fermentation. Products were submitted to in vitro analysis of their immnoreactivity both with immunized rabbit serum and with pooled humans' allergic serum (ELISA method). Polyclonal rabbit anti-α-casein, anti-β-casein, anti-κ-casein, anti-α-lactalbumin and anti-β-lactoglobulin IgG were applied.

RESULTS

Natural buttermilk is a rich and heterogeneous source of proteins (e.g. α-lactalbumin, β-lactoglobulin, α-casein, β- casein, κ- casein, lactoferrin, BSA). It is also a good source of lactose that is necessary for LAB viability and activity and it is perfect for dietetic beverages due to its naturally reduced content of fat (0,4%). During fermentation, milk proteins were hydrolysed by LAB peptidases and proteinases. The amount of free amino groups and peptides increased. *Lactobacillus plantarum* W42 and *Lactobacillus casei* LcY strains were the most effective within reduction of buttermilk allergic properties. During the ELISA test with humans allergic sera it was difficult to achieve the interchangeable estimation of products due to the individual predisposition of patients.

CONCLUSIONS

1. Buttermilk is a source of nutrients beneficial to human health and the fermentation can modify the nutritional components. 2. Lactic acid fermentation was effective for increasing proteolytic activity thus decreasing buttermilk immunoreactivity. 3. It is still necessary to search for the strains with properties directed into reduction of the antigenic potential of buttermilk proteins.

This investigation was supported by the European Union within the European Social Fund
And NSC project No. N N312 311939

KAPITAŁ LUDZKI
NARODOWA STRATEGIA SPÓJNOŚCI

UNIA EUROPEJSKA
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Keywords: buttermilk, fermentation, allergy, immunoreactivity, nutrition

Immunoreactivity of gluten-free oat beer

Paulina Pawłowska[1], Anna Diowksz[1], Edyta Kordialik-Bogacka[1], Joanna Leszczyńska[2]

Lodz University of Technology
[1] Institute of Fermentation Technology and Microbiology, [2] Institute of General Food Chemistry
Contact e-mail: paulina.pawlow@gmail.com

INTRODUCTION

Beer, traditionally made from barley, is forbidden in a gluten-free diet. Despite the fact that most proteins, including gluten, are removed during the brewing process, only beer obtained from the raw material naturally free from gluten can be considered as safe. Previously oats have been classified among the gluten containing cereals. In accordance with the latest research, confirmed by a number of publications, moderate amounts of oats can be safely consumed by celiacs. However, there are still many conflicting views on the safety of this raw material in the diet designed for people with celiac disease (CD).

AIM

The main aim of the research was to investigate the immunoreactivity of oats, used as unconventional raw material for brewing, as well as to determine the changes of immune response during the technological process of oat beer production. An evaluation of immunoreactivity of this innovative product would allow to confirm its suitability for people with celiac disease.

MATERIALS AND METHODS

Oats of Sławko variety and barley of Stratus vatiety (Plant Breeding Strzelce, harvest 2011) were used as the raw material for beer production. Grains were malted in micromalting machine in Maltings Soufflet (Poznań). The regular malts, as well as sour malts (with lactic acid bacteria) served for preparation of wort, subsequently fermented with top and bottom yeasts. Analyses were performed in: oats, barley, malts, worts after mashing process, beers and their blends with fruit juices. Immunoreactivity was determined using enzyme linked immunosorbent assay (ELISA) and sera with elevated antibody titres against gliadins, originating from CD patients from Polish Mother's Memorial Hospital - Research Institute in Łódź. The same method was used with rabbit anti-QQQPP, anti-QQQP and anti-PQQQ peptide antibodies, which are the most frequently occurring motifs in gluten sequence.

RESULTS

In general, the determined immunoreactivity differed significantly for every single serum used. It results from patient's individual sensitivity. For oat grain the values of immunoreactivity in relation to wheat flour amounted 20 - 62%, whereas for barley 38 – 83%. In most cases the immune response to malts was higher than to raw material by 2 to 7%. Oat worts showed immunoreactivity at the level of only 1 – 5%. After boiling with hops it further decreased to 0,9 – 3%. Results obtained for final products were found between 0,8 – 2,5% for oat beers and 0,3 – 1,4% for their blends with fruit juices. For barley beer these values ranged 2 to 4% and 1 to 2 %, respectively. Immunoreactivity of oat sour malts as well as beers produced from this raw material were lower than for regular malts in all trials.

CONCLUSIONS

Immunoreactivity of oats is much lower than that of wheat and barley grains. Brewing process has proved to be very effective in lowering the immune response. Oat beers and their blends with fruit juices showed only about 1% of immunoreactivity in relation to wheat flour. Therefore it can be concluded that oat beers could be tolerated by individuals suffering from celiac disease.

Study supported by research grant MNiSW, N N312 359539.

Key words: oats, immunoreactivity, gluten-free, celiac disease, beer

The number of diastase, polyphenols and water in natural bee honey from Podlasie Region

Anna Puścion-Jakubik, Renata Markiewicz-Żukowska, Katarzyna Socha, Justyna Horembała, Maria H. Borawska

Medical University in Bialystok, Mickiewicza 2D Street, 15-222 Bialystok
Department of Bromatology
Contact e-mail: bromatos@umb.edu.pl

INTRODUCTION

The value of diastase activity shows enzymatic activity of natural bee honey. Diastase below 8 and water content above 20% disqualifies honey from trade by the Regulation of the Minister of Agriculture and Rural Development from 3rd October 2003 regarding detailed requirements for commercial grade honey. The content of polyphenols is the factor determining many valuable properties of honey, which is what the consumer expects reaching for the traditional food like natural honey.

AIM

The aim of this study was to determine the number of diastase activity, water content and polyphenols in natural bee honey from Podlasie Region.

MATERIALS AND METHODS

The experimental material consisted of 19 natural bee honey samples derived from the Feast Honey from Tykocin in Podlasie Region in 2010, to promote bee honey and traditional food. Diastase tested the method recommended by the International Honey Commision (Schade method) and compared to standards specified in the Regulation. Water content was determined refractometrically, according to the Regulation of the Minister of Agriculture and Rural Development from 14th January 2009. The total polyphenol content was determined by Folin-Ciocalteu, using U-2001 Spectrophotometer Hitachi. For statistical analysis we used computer program Statistica 10 (StatSoft). The level of significance was $p<0.05$.

RESULTS

The highest average diastase was demonstrated in buckwheat honey (85.05 ± 7.5), while the lowest in puffball honey (28.76 ± 12.9). Water content ranged from 15.9 (nectar honey-dew) to 18.8 (linden honey). The highest content of polyphenols characterized buckwheat honey (182.60 ± 29.8), whereas the smallest was in lime (35.80 ± 6.8). All natural bee honeys fulfill the conditions specified by the Regulation of the Minister of Agriculture and Rural Development from 3rd October 2003 regarding detailed requirements for commercial grade honey.

CONCLUSIONS

Natural buckwheat honey from the Podlasie region was characterized by the highest diastase and polyphenol content. Water content in the varieties of natural bee honey was in normal range.

Key words: diastase, water, polyphenols, natural bee honey

Influence of ultrasound pre-treatment on the chemical composition and colour of microwave-convective dried basil

Magdalena Śledź, Dorota Witrowa-Rajchert

Warsaw University of Life Sciences
Department of Food Engineering and Process Management
Contact e-mail: magdalena_sledz@sggw.pl

INTRODUCTION

Ultrasound application as a treatment before drying process is a non-thermal method leading to increase water evaporation and thereby to decrease drying time and cost of the process. Higher intensity of the drying process after ultrasonic pre-treatment is resulted from the alternative compressions and rarefactions of the medium particles (called as "sponge effect"). Recently, in the scientific literature there is a lack of research concerning utilization of ultrasound as a pre-treatment before drying of herbal leaves and in particular pertains to microwave-convective drying.

AIM

The objective of this research was to evaluate influence of the high-intensity ultrasound pre-treatment at different frequencies and time of application on the chlorophyll and carotenoids content in microwave-convective dried basil. Based on the highest retention of the chemical components and colour of basil leaves, the best type of pre-treatment has been chosen.

MATERIALS AND METHODS

Basil leaves (*Ocimum basilicum*) were collected directly before the experiment and after that were packed. The ultrasonic pre-treatment was carried out at different time of application (20 and 30 min) in ultrasonic baths, providing different ultrasonic frequencies (21 and 35 kHz). Immediately after pre-treatment leaves were dried in microwave-convective laboratory dryer at microwave power level and air temperature of 200W and 30°C, respectively. The determination of chlorophyll and carotenoids content, as well as colour assessment were performed.

RESULTS

Type of ultrasonic pre-treatment significantly influenced the chlorophyll and carotenoids content, as well as colour of microwave-convective dried basil. The highest degradation of chemical components was observed when the ultrasound was applied for 20 min at frequency of 35kHz, however the drying time for that pre-treatment was the shortest. The highest retention of chemical components pertained to basil treated for 30 min at 35kHz and for 20 min at 21kHz. Time of drying process in these cases was similar.

CONCLUSIONS

Application of the ultrasound as a pre-treatment requires optimization of the frequency and time of its application for each product. In the case of basil leaves the highest retention of chemical compounds and good colour resistance were noted when ultrasound was generated for 30 min at 35kHz and for 20 min at 21kHz.

Key words: basil, microwave-convective drying, ultrasonic pre-treatment, chlorophyll, carotenoids

Influence of pulsed electric field on electric and thermal properties of apple tissue

Artur Wiktor[1], Tadeusz Chudoba[2], Dorota Witrowa-Rajchert[1]

[1] Warsaw University of Life Sciences, Department of Food Engineering and Process Management
[2] Polish Academy of Sciences, Institute of High Pressure
Contact e-mail: artur_wiktor@sggw.pl

INTRODUCTION

Pulsed electric field (PEF) is considered as a one of the promising non-thermal technology, capable to support or in some cases replace conventional methods of food processing. The principle of pulsed electric field treatment of food is grounded on the cell membrane disintegration phenomenon, called electroporation (or electropermeabilization). It appears as a formation or growth of native micropores in plasmolemma. Despite the pulsed electric field is a subject of interest of many research groups all over the world, still little is known about the thermal properties of such material – so important when designing the process conditions.

AIM

The aim of the study was to analyze the influence of pulsed electric field treatment on selected electric and thermal properties of apple tissue.

MATERIALS AND METHODS

Apples (*Malus domestica* "Idared") sliced parallel to the main axis of the fruit and cut into disks (diameter of 30 mm and thickness of 5 mm) were used in the investigation. Pulsed electric field treatment was carried out in a prototype PEF generator. The apparatus provided monopolar, exponential shaped pulses of average 10 μs width each. Interval between pulses was set at 2 s in order to minimize temperature increase during electric field application. After the treatment electric properties were determined with Agilent U1732C RLC meter and Elmetron conductivity meter equipped in a self-made probe. Simultaneously, thermal properties of PEF treated material were measured with KD2 Pro device. On the basis of obtained data, the damage degree and the cellular disintegration index were computed.

RESULTS

Pulsed electric field treatment of apple tissue alternated both, electric (impedance, resistance, capacitance, inductance and electric conductivity) and thermal (conductivity and volumetric specific heat) properties of apple tissue. For instance, electric conductivity of intact sample was 13.98±0.84 μS/cm when apples treated 100 pulses of electric field of 5 kV/cm exhibited a conductivity of 97.17±2.64 μS/cm. The impedance of PEF treated material decreased significantly – form 8 to almost 11 times. Thermal conductivity of PEF treated samples varied in ranges of 0.426-0.449 W/mK, while the same coefficient for the untreated samples was equal to 0.378 W/mK. However, the ANOVA procedure allowed to differentiate only the untreated and treated samples. The damage degree and the cellular disintegration index was 8.14-10.67 and 0.113-0.216, respectively. Statistic relevant ($p=0.029$) Pearson's correlation ($r=0.91$) has been proved between the mean values of thermal conductivity and the mean values of damage degree.

CONCLUSIONS

Pulsed electric field impacts both thermal and electric properties of plant tissue material. The first type of properties is very important when designing each process based on the heat transfer phenomenon. The latter type is important to describe the efficiency of pretreatment and to better understand the phenomena of electroporation.

Key words: pulsed electric field, thermal properties, electric properties, apple, electroporation

Effects of lactic acid, linalool and cinnamaldehyde against Campylobacter jejuni in vitro and chicken breast fillets

Gintarė Zakarienė, Mindaugas Malakauskas

Lithuanian University of Health Sciences, Veterinary Academy
Department of Food Safety and Quality
Contact e-mail: zakariene@lva.lt

INTRODUCTION:

Campylobacter jejuni is one of the leading causes of human gastroenteritis worldwide. *C. jejuni* contaminated poultry products are considered to be the main source of human campylobacteriosis (EFSA, 2012). Therefore, it is important to find natural compounds for effective decontamination purposes**.**

AIM

To determine the decontamination effect of lactic acid, linalool and cinnamaldehyde against *Campylobacter jejuni* in culture medium and on poultry breast fillets.

MATERIALS AND METHODS

To determine lactic acid, linalool and cinnamaldehyde effect against *C. jejuni* in culture medium, working *C. jejuni* culture of 10^7 CFU/ml was used for this experiment Bolton broth with *C. jejuni* was affected by lactic acid (0,125%; 0,25%; 0,5%; 1%; 2%), linalool (0,01%; 0,05%; 0,1%; 0,2%) and cinnamaldehyde (0,01%; 0,05%; 0,1%; 0,2%) for 10 min with successive centrifugation for 2 min at 10400 x g. After removal of supernatant, decimal dilutions were prepared and bacterial count was determined plating on Blood agar base No.2 plates after 48h.
The effect of lactic acid, linalool and cinnamaldehyde against *C. jejuni* on poultry meat was examined using chicken breast fillets with skin (4 x 10 g pieces per samples) inoculated with 10^8 CFU/ml *C. jejuni* bacteria in 50 ml for 2 min and left for 1 h at 4ºC temperature for attachment of bacteria. After 1 h samples were decontaminated for 2 min with 50 ml of lactic acid (3%, 4%, 5%), linalool (0,1%; 0,5%; 1%; 2%) and cinnamaldehyde (0,1%; 0,5%; 1%; 2%; 2,5%; 3%). After the treatment, decontamination solution was removed without any rinsing. Decimal dilutions of each sample were done immediately after decontamination, after 4, 24, and 96 hours of storage at 4ºC temperature to examine if prolonged residual treatment could reduce counts of *C. jejuni*. In parallel total bacterial counts were determined at 30 ºC incubation for 72 h with pour plate method using Plate count agar.

RESULTS

The concentrations needed to reduce *C. jejuni* numbers in culture medium were considerably lower compared to their application on chicken breast fillets with skin. The number of *C. jejuni* in culture medium was reduced by 5,52 $\log_{10}$ CFU/g ($p \leq 0,05$) by 0,5% of lactic acid, while in chicken breast fillets only 5% lactic acid reduced *C. jejuni* count by 0,56 $\log_{10}$ CFU/g initially after the treatment and the decontamination effect increased by 1,96 $\log_{10}$ CFU/g after 96 h of storage ($p \leq 0,05$). Likewise 0,2% of cinnamaldehyde considerably (5,67 $\log_{10}$ CFU/g, $p \leq 0,05$) lowered the amount of *C. jejuni* in culture medium, while 2% of cinnamaldehyde showed 0,5 $\log_{10}$ CFU/g reduction after decontamination and further 2,44 $\log_{10}$ CFU/g reduction after 96 h ($p \leq 0,05$). However, 0,2% of linalool did not have significant difference in reducing *C. jejuni* count in culture medium, while 2% of linalool reduced number of these pathogens by 0,52 $\log_{10}$ CFU/g initially on chicken breast fillets with no further effect after 96 h. Futhermore, the total bacterial count was also considerably (>2 $\log_{10}$ CFU/g) lowered by ≥2% of studied biological compounds ($p \leq 0,05$) 96 hours after the decontamination treatment.

CONCLUSIONS

Despite the significant reduction of *C. jejuni* counts in culture medium by lactic acid, linalool and cinnamaldehyde, these bioactive compounds had considerably lower effect on poultry product: *C. jejuni* count was reduced by 0,56 – 2,52 $\log_{10}$ CFU/g by 5% of lactic acid, 0,68 – 3,12 $\log_{10}$ CFU/g by 2% of cinnamaldehyde and 0,52 $\log_{10}$ CFU/g by 2% of linalool depending on test time, respectively.

This research was funded by a grant (No. SVE 05/2011) from the Research Council of Lithuania

Key words: *Campylobacter spp.*, lactic acid, linalool, cinnamaldehyde

Oral presentations

Regular session

Influence of sucrose and glycerol on textural parameters of pectin-whey proteins gels

Michał Antczak, Antoni Pluta

Warsaw University of Life Sciences, Faculty of Food Sciences
Department of Biotechnology, Microbiology and Food Evaluation
Division of Milk Biotechnology
Contact e-mail: michal_antczak@sggw.pl

INTRODUCTION

Whey proteins are a valuable source of amino acids and peptides which possess biological and particular importance functional properties in preserving the quality and stability of the food products. They are used to stabilize emulsions and foams, creating a spatial networks (gel), provide the building material for the body, positively influence the processes of nutrition.
Protein-polysaccharide connections may have desirable hydrating properties, rheological and surface depends mainly on the composition and pH, ionic strength, temperature, pressure treatment, the application of mechanical forces. The stability and physicochemical properties of gels are also affected by addition of other components (e.g., lipids, glycerol, mineral salts).

AIM

The aim of this study was to determine the effect of sucrose or glycerol on the selected textural parameters of protein-pectin gels.

MATERIALS AND METHODS

The material consisted of gels prepared by mixing solutions of whey protein concentrate (WPC 80) and the pectin such that concentration in the final solution was 6% and 1% respectively. Addition of sucrose was 10, 20, 30, 40 and 50% w/w glycerol and 1.2, 2.4, 3.6 and 6% w/w.
Textural parameters were determined using a Brookfield CT3 analyzer (Brookfield Engineering Laboratories, USA). Gel samples (in diameter 64 mm and 15 mm height) was evaluated using a double compression test. Probe in the shape of a cylinder with a diameter of 10 mm, the speed of the probe of 0.5 mm/s, the depth of compression of 40% of the amount of deformation of the sample. Determined the parameters of hardness, adhesiveness, gumminess, chewiness and springiness index. Performed two sets of 5 reps.

RESULTS

For gels containing added sucrose highest hardness were characterized by gels containing 40% sucrose. The highest hardness in the case of gels was observed with the addition of glycerol at 1.2% and 6% added glycerol. With the increase in the quantity of sugar gels decreased adhesiveness. Gels containing 10% sucrose showed the highest adhesiveness. In the case of gels which contain glycerol high adhesion was observed with the addition of 2.4 and 3.6%. With increasing amounts of sucrose springiness index decreases. In gels with the addition of glycerol an springiness index was maintained in the range 0.5 ÷ 0.7.

CONCLUSIONS

Addition of sucrose increased from 10 to 50% increases the hardness parameter of the gels. Addition of sucrose does not significantly affect the change of gumminess and chewiness. Characteristics of springiness index of the gels showed that gels with addition of sucrose have ductile characteric however gels with addition of glycerol are more flexible.

Key words: WPC, pectin, gels, texture, glycerol, sucrose

Alkylresorcinols in cereal food

Izabela Biskup, Izabela Fecka

Wroclaw Medical University
Chair and Department of Pharmacognosy
Contact e-mail: izabela.biskup@umed.wroc.pl

INTRODUCTION

Cereal food are highly important diet component among foods commonly consumed by humans. Epidemiologic studies have shown a relatively strong correlation between whole grain intake and reduced risk of heart disease. In addition to this, reduced risks of type 2 diabetes and certain cancers have also been reported.

One of the major compounds found in wholegrain foodstuffs are alkylresorcinols. 5-*n*-Alkylresorcinols (AR) are a amphiphillic group of phenolic compounds with alkyl chains ranging from 15 to 27 atoms of carbon. AR are present mainly among Poaceae family species, eg. rye (*Secale cereale* L.), wheat (*Triticum aestivum* L.), triticale (*Triticosecale* Wittm. ex A.Camus) and barley (*Hordeum vulgare* L.). Cereal alkylresorcinols are absorbed by humans. On average 60% of AR are taken up from or converted in the small intestine (ileal digestibility) [1]. AR have been acknowledged as marker for the presence of wholegrain wheat and rye and/or the bran fractions of these cereals. What is more, AR have been suggested as biomarkers of wholegrain wheat and rye intake. Results from human studies on plasma AR and their plasma and urinary metabolites strongly indicate these compounds as responsive to whole grain wheat and rye intake and correlated with various measures of AR consumption [2].

It is crucial to have a better understanding of the amount of ARs in human diet and the effects of processing on their content in foodstuffs.

AIM

Quantitation of alkylresorcinols in variety of cereal food products available on Polish market.

MATERIALS AND METHODS

Alkylresorcinol content was analyzed by high pressure liquid chromatography (HPLC). Method was optimized and validated by authors [3].

RESULTS

Cereal food products varied in AR content. The highest amount were reported for rye, then for spelt and wheat products.

CONCLUSIONS

The highest content was determined in products containing external parts of cereal grain.

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Key words: alkylresorcinol content, cereal food, biomarker

Influence of inulin addition on the textural properties of shortbread

Arleta Błońska, Agata Marzec, Anika Błaszczyk

Warsaw University of Life Science
Department of Food Engineering and Process Management
Contact e-mail: arleta_blonska@sggw.pl

INTRODUCTION

Shortbread is a popular group of food products, which is liked by consumers because of sensory qualities. Customer requirements for calories reduction as well as increase of nutritional values of this kind of products led to searching for ingredients that could perform such functions. A component of this type is inulin, which has a prebiotic effect. Texture is a very important quality attribute in shortbread. It can be determined using instrumental methods as well as sensory methods.

AIM

The aim of this study was to investigate how the addition of inulin influences the textural properties of shortbread, determined by instrumental and sensory analysis.

MATERIALS AND METHODS

The following ingredients were used: wheat flour, margarine, powdered sugar, sour cream, vanilla sugar, ammonium bicarbonate and short-chain inulin. The scope of this work included the analysis of mechanical and acoustic parameters determined by instrumental methods, based on the breaking test in a Zwick 1445 testing machine (Germany) at the rate of 20 mm/min while recording the acoustic emission with a 4381V sensor (Brüel&Kjaer, Denmark). The sound was analyzed in the frequency range from 1 to 18 kHz. Analysis of the following acoustic descriptors was performed: amplitude, duration of acoustic emission (AE) event, energy of one AE event, number of AE events, maximum energy of AE event. A sensory consumer study allowed us to determine the sensory properties of shortbread. Statistical analysis was performed by using analysis of variance for a normal distribution with repetitions at a significance level of $\alpha = 0.05$ or the Kruskal-Wallis test, which does not assume a normal distribution. Moreover, statistical analysis of results was conducted with principal components analysis (PCA).

RESULTS

Cookies containing 33.3% sugar and 1.9% inulin showed the largest amplitude, while cookies with 33.3% sugar and 3.7% inulin were characterized by the smallest amplitude. The energy of AE events achieved a similar tendency as the amplitude. Shortbread generated sounds in a frequency range of 0-2 and 15-16 kHz. There was a clear difference between the maximum force needed to break cookies with 37.0% sugar and 3.7% inulin and cookies containing 33.3% sugar and 3.7% inulin, for which the force took extreme values. The same situation occurred in the case of breaking work.
In cookies with 35.2% and 33.3% sugar, increased addition of inulin caused a decrease in hardness and volume of the shortbread, which were sensory attributes. The cookies with 1.9% inulin and 37.0% sugar obtained the highest score overall. Moreover, hardness and volume were positively correlated with two kinds of parameters: mechanical (maximum breaking force and breaking time) and acoustic (maximum energy of AE event and number of AE events). Crispness, in contrast, was found to be negatively correlated with the amplitude and the energy of AE events.

CONCLUSIONS

Texture of shortbread depends on the composition of the recipe. It has been proven that ingredients of shortbread affect the perception of sensory properties. Acoustic emission technique in combination with the mechanical method can be used for instrumental texture evaluation of shortbread.

Key words: shortbread, inulin, textural properties, acoustic emission, sensory properties

The effect of acid electrolyzed water solutions in inactivation of Yersinia enterocolitica and Staphylococcus aureus

Ewa Brychcy, Natalia Ulbin-Figlewicz, Dominika Kulig, Anna Zimoch, Andrzej Jarmoluk

Wrocław University of Environmental and Life Sciences
Department of Animal Products Technology and Quality Management
Contact e-mail: ewa.brychcy@gmail.com

INTRODUCTION

Acid electrolyzed (AE) or ionized water is a new generation sanitizer. Water and salt (sodium chloride) are needed in production process of AE water. AE water have many advantages such as: safety, effective disinfection, easy operation and it is inexpensive and non toxic. Acid electrolyzed water is not irritant to skin, mucous membrane, or organic material, despite the fact that is a strong acid, what is opposite to reaction of perchloric acid or hydrochloric acid. AE water is very effective in inactivation of *Escherichia coli O157:H7, Salmonella enteritidis*, and *Listeria monocytogenes* (Venkitanarayanan et al., 2002). Fresh vegetables contaminated with *Yersinia enterocolitica* cause of foodborne illness outbreaks. Surfaces of vegetables can become contaminated with pathogenic microorganisms through contact with soil, fertilizers, equipment, people and animals. *Staphylococcus aureus* may form biofilm on the area of food equipment, what is more difficult to eliminate. Possible option of prevention of microbial contaminated of fresh products and food equipment is to use sanitizers.

AIM

The aim of the research was to evaluate the effectiveness of acid electrolyzed water solutions in reducing *Yersinia enterocolitica* and *Staphylococcus aureus*.

MATERIALS AND METHODS

The impact of acid ionized water on inactivation of *Yersinia enterocolitica* and *Staphylococcus aureus* was tested. It was used 0.2% and 1% concentrations of ionized sodium chloride. The control samples were unionized sodium chloride solutions in the same concentrations. Microcultures with experimental water were analyzed in Bioscreen C growth analyzer. The optical density of cells growth was monitored at 405-600 nm in every 30 minutes in 25°C for 72 hours.

RESULTS

Effect of AEW solutions on growth of two tested bacteria was showed as: maximum speed of appropriate growth (μ_{max}) and maximal biomass yield (ΔOD_{max}). Variants ionized with 0.2% and 1% sodium chloride during 15 and 30 minutes were eliminated completely or reduced lag phase duration in *Staphylococcus aureus* growth curve. Maximal biomass yield (*S.aureus* growth curve) were reduced about 20% by tested 0.2% ionized sodium chloride variants. Samples without ionization were stimulated the growth of *Staphylococcus aureus* and *Yersinia enterocolitica.* The ionized 0.2% salt solutions had no effect on maximal biomass yield in *Yersinia enterocolitica* growth curve.

CONCLUSIONS

The ionized forms of sodium chloride have the impact on inactivation of *Staphylococcus aureus* by lowering the maximal biomass yield. Sodium chloride solutions have opposite effect and stimulate the growth of pathogens.

Key words: electrolyzed water, meat, ionization, *Staphylococcus aureus*, *Yersinia enterocolitica*

The effect of honey addition on the quality of liquors from petals of Rosa rugosa

Andrzej Cendrowski, Marta Mitek

Warsaw University of Life Sciences, Faculty of Food Sciences
Department of Food Technology, Division of Fruit and Vegetable Technology
Contact e-mail: andrzej_cendrowski@sggw.pl

INTRODUCTION

A great increase in the interest in liquor has been observed recently on the part of both the consumer and the manufacturers. The method of preparation of these products, as well as, the duration of their maturing depends on the type of the raw material. Liquors are the source of active substances contained in the raw materials that they were made from. Organoleptic features of the liquors are strongly related with the content of the phenolic compounds including anthocyanins that form color. During storage, it is possible to observe various reactions between liquor components that may lead to the change of color, to the decrease in the content of active substances and to the formation of undesirable compounds such as hydroxymethylfurfural (HMF).

AIM

The aim of the work was the evaluation of the changes in the content of anthocyanins and hydroxymethylfurfural, as well as, the determination of the stability of the color in liquors from petals of *Rosa rugosa* with and without honey addition during 150 days of maturing in the room temperature without access to the light.

MATERIALS AND METHODS

Liquors were made from petals of *Rosa rugosa* originated from the plantation of "Polska Róża" company situated in Kotlina Kłodzka (Kłodzko Valley). Liquors were prepared in four versions mixing petals and ethyl alcohol in a proportion of 1:10 with the alcohol strength of 65 and 40% respectively (1st and 2nd version). Liquors in the 3rd and 4th version were sweetened with honey after 18 days of extraction with alcohol to assumed soluble solids of 27%. In obtained liquors, the content of anthocyanins and hydroxymethylfurfural was determined using the pH differential method and high performance liquid chromatography (HPLC) with UV detection, respectively. The color measurement was performed with the use of colorimeter in CIELab system. The color itself was determined using illuminant D65 and the observer of 10^{o}. Measurements were carried out after 7 and 14 days of extraction, as well as 120 and 150 days of maturing of the liquors in the room temperature.

RESULTS

It has been stated that both, the presence of honey and the duration of storage had an impact on the content of determined components and color. After 150 days of storage, the greatest loss in anthocyanin dyes (c.a. 49%) was detected in 40% liquor sweetened with honey. The presence of HMF after 150 days of storage has been detected only in liquors containing honey (c.a. 0.1 mg/100 ml). In all tested versions, an increase in the brightness of color (L*), and b* parameter (yellow color) occurred. The greatest changes in color have been observed in liquors with the addition of honey, what is more, these liquors were characterized by the decrease in a* parameter (red color).

CONCLUSIONS

A great changeability of tested features has been observed during storage of liquors from petals of *Rosa rugosa*. It has been stated that liquors sweetened with honey demonstrate undesirable changes in color during storage, as well as the decrease in the content of active compounds, which, as a result had an impact on the reduction of their sensory qualities.

Key words: liquors, rose petals, honey, color, HMF

The influence of ultrasound pre-treatment on drying kinetics and selected properties of dried apple

Aleksandra Fijałkowska, Małgorzata Nowacka, Dorota Witrowa-Rajchert

Warsaw University of Life Sciences
Department of Food Engineering and Process Management
Contact e-mail: aleksandra_fijalkowska@sggw.pl

INTRODUCTION

Convective air-drying is a widely used method of food preserving. During drying mass and heat transfer take place but to improve the rate of this process is used pre-treatments for changing structure of the material. One of innovative method is application of ultrasound. Because of non-thermal character of ultrasound, this form of treatment can improve the quality of dried products.

AIM

The aim of this study was to investigate the effect of pre-treatment, using ultrasound, on the drying kinetics of apple tissue. The influence of ultrasound on the colour, rehydration and hygroscopic properties of dried apple slices were also examined.

MATERIALS AND METHODS

Apple tissue (var. *Idared*) was cut into slices with 30 mm in diameter and 5 mm in thickness. Afterwards, material was pre-treated in distilled water for 10, 20 and 30 minutes, using ultrasound with frequency 21 kHz. After pre-treatment, the samples were subjected to drying process at 70^{O}C and air velocity of 2 m/s. The colour was investigated using CIE L*a*b* system. Rehydration process was analysed at temperature 20^{O}C in a time range of 0-3 h. Hygroscopic properties was conducted in glass desiccator, contained saturated solution of sodium chloride with water activity of 0,75. Process was examined at 25^{O}C in a time range of 0-72 h.

RESULTS

Time required to dry untreated apple slices was 133 minutes. Apple tissue treated with ultrasound for 20 minutes needed 116 minutes to obtain 0.09 kg H_2O/ kg d.m. After 10 and 30 minutes of pre-treatment, drying time was reduced to 110 minutes.
Ultrasonic waves had significant influence on the colour of apple slices after 20 and 30 minutes of sonication. Pre-treatment caused reduction of L* parameter, which indicates lightness. L* factor decreased with increasing ultrasound treatment time. In case of parameter a*, which represents green or red colour and parameter b*, which shows participation of blue or yellow colour, increasing of these parameters was observed.
After 3 h of rehydration, weight of dried material increased four times and there were slight differences between samples with and without ultrasonic application. During rehydration, loss of dry matter content took placed as well. Pre-treatment caused reduction of dry matter loss in comparison to untreated sample, but these changes were not significant.
In case of hygroscopic properties, dried slices after 72 h above the sodium chloride solution absorbed 0.36-0.38 kg H_2O/kg d.m. Apple slices treated with ultrasound for 30 minutes by the lowest amount of absorbed water was characterized.

CONCLUSIONS

Achieved results showed that ultrasound pre-treatment with frequency of 21 kHz reduced time of drying process by 13-17% in comparison with untreated sample. Moreover ultrasonic waves caused changes in colour of apples tissue. However, ultrasonic pre-treatment did not cause any significant changes in kinetics of rehydration process. While for hygroscopic properties utrasonication had significant influence on adsorption kinetics, only in case of sample treated for 30 minutes.

Key words: ultrasound, drying, colour, rehydration, hygroscopic properties, apple

Stability of selected quality determinants of grain and flour from common wheat old variety *Warmińska Złota*

Ewelina Grabowska[1], Katarzyna Majewska[1], Józef Tyburski [2]

University of Warmia and Mazury in Olsztyn
[1] Faculty of Food Sciences, Chair of Food Plant Chemistry and Processing
[2] Faculty of Environmental Management and Agriculture, Department of Agriculture Systems
Contact e-mail: grabowskaewelinka@wp.pl

INTRODUCTION

Common wheat is the second largest cereal crop in the world, in Poland takes the first place. Different directions for its use require cultivation of varieties with diversified quality features. At present, dominate new varieties, very fertile and readily cultivated, because of selected during of breeding functional characteristics. However, in order to preserve biodiversity and protecting the old genotypes of cereals and also because of rapidly growing trend of organic agriculture, open the possibilities of using the old species and varieties of wheat in the production at wider scale. Directing attention on old species and varieties nowadays it has become important to check its suitability for cultivation and processing, including an assessment of the quality its grain and flour.

AIM

Taking above into consideration, the purpose of study was to evaluate selected physical properties and milling quality of grain and baking quality of flour from common wheat old variety *Warmińska Złota,* and also verify if these evaluated quality factors remain stable within the three years of harvest.

MATERIALS AND METHODS

The research material was grain of common wheat from the production of certified organic farm (crops from the years 2008, 2009, 2012), located in the region of Warmia and Mazury. During the tests were marked: the mass of 1000 grains, the grain density in a sip state and its uniformity, hardness of the individual grains - by the test of uniaxial compression (Instron), flour yield by the method of laboratory milling, the amount of total ash in grain and flour, grain and flour colour - by the spectrophotometry reflection method, the falling number, Zeleny sedimentation index, contents of total protein and gluten in flour. It were determined also amylografic parameters of flour, rheological properties of dough (Instron, OTMS chamber) and performed laboratory baking trials. The results were analyzed using the STATISTICA 10.

RESULTS

The mass of 1000 grains, grain density in a sip state and milling quality of common wheat grain of the old variety *Warmińska Złota*, were comparable to those which characterized the grain of new varieties of wheat. Grain of investigated wheat was soft, and its colour as well as the colour of the flour, stable and to a small extent dependent on the crop year, similarly as the compressive strength of the grain. Crop year had a significant impact on the falling number in the flour and evaluation parameters related with activity of amylolytic enzymes in the tested grain. These parameters were characterized by the lowest stability within the three years of harvest. Content of wet gluten in flour, Zeleny sedimentation index, compressive strength of the dough reached levels similar to those obtained in the evaluation of the quality of new wheat varieties, but also were not stable. The quality of baked bread from laboratory test dependent on the year of cultivation of grain from which the flour was obtained, this was particularly related with bread volume.

CONCLUSIONS

Analyzed quality determinants of grain and flour of common wheat variety *Warmińska Złota* reached the values comparable to those that obtain new varieties of good quality wheat. It should be noted however, that some of them (especially those associated with activity of amylolytic enzymes) are unstable in three years of harvest.

Key words: common wheat, old varieties, quality stability

Sensory evaluation of cooked and grilled meat from broiler chicken with DPM symptoms

Emilia Kupińska, Jacek Kijowski

Poznan University of Life Sciences
Department of Food Quality Management
Contact e-mail: kupinska@up.poznan.pl

INTRODUCTION

Deep Pectoral Myopathy of *musculus pectoralis minor* is an anomaly observed in gallinaceous poultry. This degeneration is found most frequently in genetic lines of chickens characterised by dynamic weigh increment in the rearing period as well as a considerable changes in the proportion of pectoral muscles. The anomaly is manifested in an abnormal appearance of breast muscles in broiler chickens, with changes in colour from pink to green as well as changes in texture of the muscle tissue.

AIM

The aim of the study was to determine the influence of the deep pectoral myopathy on quality of meat subjected to thermal processing.

MATERIAL AND METHODS

The material consisted of the major pectoral muscles originating from broiler chickens with DPM lesions. The DPM minor pectoral muscles with anomaly symptoms as condemned were subjected to waste utilization. The samples were subjected to cooking in a foil bag, as well as curing, smoking and grilling. Organoleptic evaluation was carried out using a sensory panel (8-12 people) through a 5-point scale to evaluate changes in taste, flavour, colour, tenderness, juiciness, overall desirability.

RESULTS

Muscles were subjected to cooking in a foil bag (internal temperature of 72±1°C). Mean values of sensory quality attributes of meat, i.e. taste, colour on the surface and overall desirability, were lower in case of *m. pectroralis major* corresponding to tenders with DPM symptoms of only the last stage (IV) of myopathy in comparison to the control. In case of these samples the sensory panel detected an extrinsic taste (haeme) and adverse changes in colour on the surface (hyperaemia). Moreover, samples were grilled for 15 min at 180°C. Mean scores for all analysed sensory quality attributes of meat (tenderness, juiciness, overall desirability) were lower in case of *m. pectoralis major* corresponding to *m. pectoralis minor* with symptoms of individual DPM stages in comparison to control samples. Juiciness of meat subjected to cooking and grilling is closely related to thermal drip resulting in its deterioration. Summing up, for overall desirability of meat with DPM symptoms it was found that it differs from the control in case of thermal processing in a plastic bag and on a grill. In turn, after more intensive processing procedures, i.e. corning and smoking, differences in quality of pectoralis major muscles accompanying minor muscles with DPM lesions are eliminated and do not influence the quality attributes evaluated by consumers.

CONCLUSIONS

It results from the conducted study that the meat originating from broiler chickens with deep pectoral myopathy, subjected to cooking and grilling, shows significant differences in sensory quality attributes. The *musculus pectoralis major* with DPM light symptoms can be used to produce cured and smoked breast fillets.

Key words: broiler chickens, deep pectoral myopathy, pectoral muscles, sensory quality attributes

Microbial production of 2,3-butanediol from sugar beet pulp

Mariusz Lesiecki, Adrian Czerniak, Tomasz Jankowski

Poznań University of Life Sciences
Department of Biotechnology and Food Microbiology
Contact e-mail: marles@up.poznan.pl

INTRODUCTION

In comparison with fermentations leading to ethanol or acetic acid, the conversion of sugars to 2,3-Butanediol (2,3-BD) has attracted less interest during the past few years. Nevertheless, 2,3-BD is an attractive chemical with a great potential for the industrial production of synthetic rubber, plastics and solvents. Several strains of bacteria and fungi are able to produce 2,3-BD; among them *Rauoultella planticola* can utilize also hydrolysates of lignocellulosic matherials for production of 2,3-BD.

AIM

The main project objective was to develop of an efficient fermentation process to produce the platform chemical 2,3-butanediol (2,3-BD) from low-cost, renewable feedstock (sugar beet pulp hydrolysate - SBH) and its further upgrading.

MATERIALS AND METHODS

Fermentation processes using SBH (for *R. planticola* CECT 843) was optimized by the Central Composition Design (CCD). Experiments were carried out in 5L bioreactors (Sartorius BIOSTAT B+). An intermittent feeding regime (IFR) has been applied as a strategy of carrying out of fed-batch fermentation. Sugars and other carbon compounds (organic acids, uronic acids, 2,3-BD, acetoin) concentration was determined preferably by HPLC and GC.

RESULTS

In the first step, fermentation parameters comprised: temperature (in range 30-36^{o}C), pH (6.0-7.0) and aeration rates (0-2 vvm). Statistical analysis showed that pH control had no impact on fermentation process, therefore the next experiments comprised the following factors: temperature (30-36^{o}C), aeration rates (0-2 vvm) and agitation speed (20-140 rpm). The highest production of 2,3-BD achieved 34 g/L and efficiency of production reached 0.42 g/g for the following fermentation conditions: 33^{o}C, aeration rate 1 vvm and agitation speed 80-140 rpm. In the fed-batch fermentation, the initial concentration of fermentable sugars was 80 g/L. Fermentation broth, based on SBH, was periodically (3 times, every 24h) supplemented with concentrated SBH (40g/L glucose, 20g/L arabinose, 15g/L xylose). The production of 2,3-BD achieved nearly 70 g/L and efficiency of production reached 0,28 g/g in 80h of cultivation. After this time the osmotic pressure increased to the level, which caused inhibition of production and growth of bacteria.

CONCLUSIONS

Under optimized conditions *Raoultella planticola* can convert all the sugars contained in lignocellulosic hydrolysates to 2,3-BD. The kinetics of 2,3-DB production from SBH have been examined. Butanediol concentrations as high as 70 g/L have been obtained with this organism.

This work was supported by ERA-IB EU-project called "Production and Upgrading of 2,3-Butanediol from Biomass" (ERA-NET-IB/03/2009)

Key words: enzymatic hydrolysis, sugar beet pulp, 2,3-butanediol, *Raoultella planticola* CECT 843

Acetylated oxidised starch E1451 as a functional additive in food emulsions

Zuzanna Małyszek[1], Piotr Kubiak[2], Grażyna Lewandowicz[2]

[1]prof. Wacław Dąbrowski Institute of Agricultural and Food Biotechnology, Department of Food Concentrates and Starch Products Starołęcka 40, 61-361 Poznań, Poland
[2]Department of Biotechnology and Food Microbiology, Poznań University of Life Sciences Wojska Polskiego 48, 60-627 Poznań, Poland
Contact e-mail: zzien@man.poznan.pl

INTRODUCTION

Different types of modified starch are common food additives, typically used as stabilizers and texture-forming agents. Low production costs and nutritional safety also determine their popularity. Oxidized acetylated starch E 1450 gained popularity only recently, at the end of the twentieth century. It is mainly used as a partial gelatine substitute in jelly candies because of its ability to form clear gels in acid - sugar compositions. Recently the emulsifying abilities of starch derivatives have been paid increasing attention. Acetylated oxidised starch, having both hydrophilic and hydrophobic groups, deserves special interest in this aspect.

AIM

The aim of this work was to evaluate the applicability of three types of modified starch E1451 for the formation of emulsions.

MATERIALS AND METHODS

Commercial oxidized starch - Budyniowa, Żelująca and Lubox additionally esterified with acetic anhydride, containing 2.5% acetyl groups were used. Rheological properties of starch solutions and stability of emulsions formed by mixing starch solutions and sunflower oils were determined. Each starch type was tested separately, and in compositions including two or three derivatives. The viscosity measurement was carried out using a HAAKE rheometer working in the CR mode at the shear rate range of γ: 0.01 - 600.00 1 / s. Emulsion stability was determined using of the ratio of the height of the cream layer formed after centrifugation in standard conditions to the height of the whole liquid column of the investigated emulsion. The oil droplet size was determined microscopically.

RESULTS

Acetylated Budyniowa starch, formed pastes of the highest viscosity in comparison with the other investigated starches as well as the most stable emulsions (emulsion stability index ES at the concentration of 6% was above 70%). Acetylated Żelująca and Lubox starch formed pastes of significantly lower viscosity and very low emulsion stability. Mixture of all the three investigated starches formed emulsions of excellent stability although viscosity of their pastes was lower than that of acetylated Budyniowa starch. Microscopic measurement proved that oil droplets in the emulsions formed by mixtures of the starches are smaller and more even than in the emulsion containing individual starches.

CONCLUSIONS

The results show that the stability of emulsions formed with E1451 starch decreases with increasing carboxyl group substitution. Furthermore, viscosity of the formed starch solution, among other factors,is significant for stable emulsification. It was also shown that more stable emulsions were formed using mixtures of different starch derivatives.

Key words: oxidized acetylated starch, emulsions, rheological properties

Effect of flow microwave heating system and storage on the sensory, microbiology and color quality of strawberry puree

Krystian Marszałek[1,2], Marta Mitek[1]

[1] Warsaw University of Life Science, Faculty of Food Science, Department of Food Technology, Division of Fruit and Vegetable Technology
[2] Institute of Agricultural and Food Biotechnology, Department of Fruit and Vegetable Product Technology, Division of Fruit and Vegetable Technology
Contact e-mail: krystian_marszalek@sggw.pl

INTRODUCTION

The flow microwave heating system is a modern method of food preservation, rarely used in industry. Strawberry puree which is produced in this way is characterized by high sensory quality, chemical and microbiological parameters. From the industrial point of view a very important thing is to assess changes during storage after microwave preservation.

AIM

The aim of this study was to determine changes in sensory, microbiology and color quality during the storage of strawberry puree after flow microwave heating using various parameters (temperature and time heating).

MATERIALS AND METHODS

Materials for this study were strawberries *Senga Sengana*, collected, cleaned of non-edible parts and immediately frozen in industrial fluidized tunnel (-24˚C). Before packing up, material was sorted on NIAGARA an optical sorter to select the best quality fruit. In order to prepare strawberry puree the fruits were crushed into small parts and homogenized into colloidal mill (Fryma), and deaerated (Fryma). The whole technological process was carried out to receive puree at a temperature no higher than 0˚C. The strawberry puree was fixed in the flow of the Enbio Technology *EnbioJet* machine using different parameters of temperature (80- 120˚C) and the time of action (7 and 10 sec.). As a control pasteurized puree was adopted (90˚C, 15 min.). A sensory quality assessment was carried out according to PN-A-75049: 1996 in the IBPRS sensory laboratory with a six-point scale (color, taste, smell, appearance and texture) and overall nine-point hedonic evaluation. Microbiological analyzes were performed in IBPRS an accredited microbiological laboratory: yields and molds according to PN ISO 21527-1:2009 and the total number of microorganisms according to PN-EN ISO 4833:2004+A1:2005. Changes in the color parameters were carried out in the CIEL*a*b* systems, using D65 illuminant and a sample thickness of 10 mm. Color values were recorded in the reflected light.

RESULTS

Strawberry puree preserved by the flow microwave heating system was characterized by high sensory quality. The analyzed parameters obtained an higher or equal evaluation compared to pasteurized puree for 8- 10 weeks of storage. All of the parameters used led to a reduction of yeast below 10 cfu/ g of puree. Gentlest conditioning of preservation (80- 90˚C, 7 sec.) inhibited the growth of mold only for 6 weeks of storage, while the complete sterility of the product was obtained only by pasteurization and microwave heating at 120˚C (10 sec.). The microwave heated puree color was much better than pasteurized puree.

CONCLUSIONS

Flow microwave heating system is an effective method of strawberry puree preservation which after choosing the appropriate parameters of preservation gives a higher quality product than pasteurized.

Projekt został sfinansowany ze środków Narodowego Centrum Nauki, oraz współfinansowany ze środków Unii Europejskiej w ramach Europejskiego Funduszu Społecznego

KAPITAŁ LUDZKI NARODOWA STRATEGIA SPÓJNOŚCI

UNIA EUROPEJSKA EUROPEJSKI FUNDUSZ SPOŁECZNY

Key words: strawberry, microwave, quality, color

Kinetics of degradation of anthocyanin during storage on mahonia liqueurs

Paulina Mizgier, Anna Sokół - Łętowska, Alicja Z. Kucharska, Dorota Wyspiańska

Wroclaw University of Environmental and Life Science
Department of Fruit and Vegetables Technology
Contact e-mail: paulinamizgier@wp.pl

INTRODUCTION

Organoleptic characteristics of liqueurs are related to the content of phenolic compounds, especially anthocyanins, which determined color of the product. Anthocyanins are compounds of low stability and high sensitivity to environmental conditions. Stability of anthocyanins depends on: pH, molecular structures, temperature, oxygen, natural ingredients of the raw material enzymes, sugars and their degradation products, as well as the conditions and storage time.

AIM

The purpose of this work was to estimate the influence of added sugar and storage temperature on the kinetics of anthocyanin degradation in mahonia *(Mahonia aquifolium)* liqueurs during 26 weeks of storage.

MATERIALS AND METHODS

Mahonia fruits were from Stacja Doświadczalna Uniwersytet Przyrodniczy in Psary and were collected in September 2011. Liqueurs were made with and without sugar and stored for 26 weeks at temperatures of 15°C and 30°C. The content of anthocyanin was determined using HPLC method (DIONEX with diode array detector, Cadenza C18 column). The elution was performed with a gradient using the 4.5% formic acid acetonitrile. The changes of colour parameters CIELab was carried out with the Color Quest XE HunterLab.

RESULTS

8 anthocyanin compounds were identified: delphinidine -3-glucoside, delphinidine -3-rutinoside, cyanidin-3-glucoside, cyanidin-3-rutinoside, petunidine -3-glucoside, petunidine -3-rutinoside, malvidine -3-glucoside, malvidine -3-rutinoside. Directly after preparation, the mahonia liqueurs contained 33,7-38,2 mg anthocyanins in 100 cm^3. After 26 weeks, in liqueurs stored at 30°C, the anthocyanins were decomposed completely. Greater stability of anthocyanin pigments was in liqueurs stored at 15°C. Liqueurs lightened during storage.

CONCLUSIONS

After 26 weeks, the content of anthocyanins in liqueur with sugar stored at 30°C was the least and the biggest changes of colour.

This work was supported by the Polish Ministry of Science and Higher Education under Grant Nr N N312 399239.

Key words: liqueurs, *Mahonia aquifolium* , anthocyanins, HPLC

Osmotic dehydration of sour cherry in fruit juices – a modern method to obtain a product high nutritional value

Paulina Nowicka[1], Krzysztof Lech[2]

Wroclaw University of Environmental and Life Sciences
[1]Department of Fruit and Vegetable Processing
[2]Instytute of Agricultural Engineering
Contact e-mail: paulina.nowicka@up.wroc.pl

INTRODUCTION

Sour cherry is one of the most attractive fruits in terms of nutritional value and sensory properties. It is characterized by intense red color, sour-sweet taste and it consists of many beneficial for health bioactive components. However, this is a seasonal fruit and this is why research for new preservation methods has been undertaken in order to obtain a cherry stable product with preserved health promoting values. Osmotic dehydration is an attractive way of processing. This process preserves the product flavor properties and during the osmotic dehydration there is no degradation of heat sensitive nutrients. As the osmotic process gives only partial preservation, often in order to dry out the raw material the convection drying method or Microwave Vacuum Drying is used. Those drying methods allows to obtain a product with nearly constant: color, flavor and nutritional value.

AIM

The aim of this study was to assess chemical value, antioxidant activity and physicochemical composition of dried sour cherries, obtained using of combined method consisting of an initial fixation osmotic dehydration of fruit concentrates, then convection and M-V drying.

MATERIALS AND METHODS

Research material consisted of: sour cherry cultivars Turgieniewka, which was collected in June 2012 from the Experimental Station for Cultivar in Zybiszowie near Wroclaw, concentrates of quince, Japanese Quince and sucrose solution was produced in Department of Fruit and Vegetable Processing Wroclaw University of Environmental and Life Sciences. Also an industrial concentrates of: apple, black currant, chokeberry, raspberry and sour cherry. In these products physicochemical parameters were determined, i.e. dry matter and titratable acidity according to PN norm, water activity with a LabMaster –aw camera and color with a portable colorimeter of the Conica Minolta. Also, the content of total polyphenols by the UPLC and total antioxidant activity by FRAP was established.

RESULTS

Conducted research has shown, that osmotic dehydration of fruit in concentrates is a way to modify the color and titratable acidity of the final product. Dried cherries differed with respect to content of polyphenolic compounds and antioxidant activity. The highest content of phenolic components was displayed by cherries that was osmotically dehydrated in concentrates of Japanese Quince and black currant, while the lowest content showed cherry drained in the sucrose solution. In addition, the research also showed that drying by using of a combined method of convection-microwave-vacuum is able to provide stability of raw materials, as indicated by the value of water activity below 0,750 and a smooth surface with preferred color, size and shape.

CONCLUSIONS

The obtained results of the studies showed that dried cherries produced by using of the combined methods of osmotic dehydration in fruit concentrates, tumble convection and fundamental microwave vacuum drying give lasting final product witch high nutritional and physicochemical value.

This work was financially supported by the National Research Centre UMO-2011/01/B/NZ9/07139
The work was performed under the direction of Aneta Wojdyło[1], PhD.

Key words: sour cherry, osmotic dehydration, dried

Is in organic farming more micoflora in relation to the conventional farming?

Anna Ostrowska, Kinga Stuper-Szablewska, Juliusz Perkowski

Poznań University of Life Sciences
Department of Chemistry
Contact e-mail: anna.ostrowska@up.poznan.pl

INTRODUCTION

Organic farming methods are studied in the field of agroecology. While conventional agriculture uses synthetic pesticides and water-soluble synthetically purified fertilizers, organic farmers are restricted by regulations to using natural pesticides and fertilizers. Soil microbial communities play an important role in soil fertility and nutrient cycling, and may affect final crop quality. Microbial communities are affected by production practices such as management system and cultivar choice.

AIM

The aim of this study was to determine differences in contamination of fungal biomass, established on the basis of measurement of ergosterol content in cereal grains samples collected from organic and conventional farming.

MATERIALS AND METHODS

Samples of wheat (n=15), barley (n=10), rye (n=10), oat (n=10) and cereal blend (n=10) collected in 2012 from conventional and organics cultivar system were analyzed. For the purpose of quantitative determination of mycoflora the chemical analysis was conducted on the content of ergosterol (ERG) (Perkowsaki et al., 2008).

RESULTS

Chemical analysis of ERG concentration as a specific marker of fungal biomass showed low contamination with microscopic fungi in wheat grain. Mean concentration of this metabolite for conventional cereals was 6,64 mg/kg and for organic cereals 5,52 mg/kg. The highest concentration of ergosterol in conventional samples was oat (9,68 mg/kg) and the lowest in wheat samples (5,16 mg/kg). In case of organic samples the highest content of ERG was observed in cereal blend samples (7,94 mg/kg) and the lowest in barley samples (2,32 mg/kg).

CONCLUSIONS

The performed statistical analysis showed a significant difference in the contents of the analysed metabolite in samples of organic and conventional cereals. Innovation on the farm has great potential to more fully exploit the biological advantages of organic farming systems in preventing microscopic fungi contamination. If we can understand why and how organic farming systems tend to suppress fungal disease and lessen the severity of microscopic fungi contamination, all farmers and consumers will reap the benefits.

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Key words: organic farming, conventional farming, ergosterol, microscopic fungi

Agricultural distillates from polish varieties of rye

Marta Pietruszka, Katarzyna Pielech-Przybylska, Józef St. Szopa

Lodz University of Technology
Faculty of Biotechnology and Food Sciences
Contact e-mail: marta.pietruszka@dokt.p.lodz.pl

INTRODUCTION

Knowledge about qualitative and quantitative composition of by-products and the mechanism of their formation, allow properly choose the parameters of the fermentation process. The mechanism of their formation is a very complex process, which is affected by many factors, including: the qualityand type of processed raw material, method of preparation of sweet mashes, density and pH of mashes, strains of yeast used in the fermentation, mineral medium, the presence of microbiological contamination, and the temperature of the fermentation.

It is important to use appropriate procedures to prevent microbiological contamination during ethanol fermentation, among other things in order to protect the quality of the raw materials and finished product i.e. raw spirit, and microflora of distillery yeast. The main limiting factor is the use of raw material contamination of good quality (unspoiled and undamaged). It is important to use procedures for pre-treatment of the raw materials, such as washing and cleaning. Clean and good quality raw material and its fast processing (particularly after grinding) minimizing the risk of microbial contamination and the risk of side effects, in the form of a smaller number of undesired volatile compounds in the obtained distillates.

AIM

The aim of this research was to evaluate the effect of the polish varieties of rye on the dynamics of fermentation and the amount and composition of the by-products in agricultural distillates obtained.

MATERIALS AND METHODS

The scope of the research included analysis of mashes prepared from rye varieties: Dańkowskie Złote, Dańkowskie Diament, Amilo and Amber (derived from plant breeding “Danko” Sp.z.o.o.). Fermentations were carried out by using dried distillery yeast strains: As-4, (0.3 g/l of mash). The sweet mashes were supplemented with: $(NH_4)_2HPO_4$ in a dose of 0.2 grams per liter of mash. Fermentations were conducted for 72 hours, at 28-30°C. The samples of mashes during and after fermentation were evaluated to determine the content of by-products (aldehydes, higher alcohols, esters) by HS-GC-FID technique. Obtained distillates also have been analyzed by gas chromatography.

RESULTS

Rye Amber is one of the newest variety from plant breeding Danko. It is characterized by high content of protein and the highest starch content (68.1%). The obtained results showed that the mash prepared using rye Dańkowskie Złote, fermented dynamically, after 17 hours ethanol concentration was observed above 1.5% vol. The highest concentration of ethanol after 72 hours was observed in the mash trial prepared from rye Amber (5.77% vol.). Course of the fermentation dynamics have confirmed the intake of total sugars and ethanol yield. It has been shown that the use of rye Dańkowskie Diament had a significant effect on the concentration of acetaldehyde in the obtained distillate. The content of this compound was 2.5-fold higher than the sample where was used Amilo rye. Also the lowest concentration of higher alcohols was observed for distillate made from rye variety Amilo.

CONCLUSIONS

Chromatographic analysis of the mashes during fermentation allowed to determine the most representative (occurring in the largest amount) compounds of by-products of ethanol fermentation, i.e.: higher alcohols, carbonyl compounds and esters.

Key words: ethanol fermentation, rye, by-products

The influence of meat curing conditions on pigments conversion and color stability of canned poultry product during storage

Karolina Popis

Warsaw University of Life Sciences
Faculty of Food Sciences, Meat Technology Department
Contact e-mail: karolina.popis@sggw.pl

INTRODUCTION

The color of meat products is the basic indicator of their quality. It is determined by many factors, such as: type of meat, effectiveness of curing process, functional additives, thermal treatment and storage time.

AIM

The aim of this study was to determine the influence of sodium ascorbate (0,0 and 0,5%) and cochineal (0,0 and 0,1%) addition on meat color development and color stability of a canned poultry product during storage (0 and 8 weeks).

MATERIALS AND METHODS

As an experimental material chicken thigh meat was used. Ground meat (3 mm) was divided into three treatments. To each of them 20% of brine was added. Curing salt (99,5% NaCl, 0,5% $NaNO_2$) constituted 2% of meat batter mass. The control treatment (WI) – contained only brine, the second (WII) additionally 0,05% of sodium ascorbate and the third (WIII) 0,05 % of sodium ascorbate and 0,1% of cochineal. Curing meat process last for 24 hours. After this time canned products (200g) were sterilized (40 minutes, 120 °C). The day after sterilization and cooling and also after 8 weeks of storage the following parameters were determined: residual nitrite level according to PN (PN-74/A-82114), contents of total pigments and nitrosylpigments according to Hornsey's method and the degree of pigment conversion. The day after sterilization and after 8 weeks of storage the color parameters a*, b* and L* in canned products were also measured.

RESULTS

The canned products with sodium ascorbate (WII and WIII) had the greatest amount of nitrosylpigments and the highest pigments conversion degree. After 8 weeks of storage those values decreased in all of the canned products. The lowest values of residual nitrite level were noticed in products with sodium ascorbate. Cochineal additive did not affect the curing meat process. All groups of canned products did not differ in respect of the L* value, both before and after storage. Storage time caused decrease of a* parameter and increase of b* parameter in all canned products. The highest values of a* parameter and the lowest values of b* parameter were noticed in canned products with cochineal additive, regardless of storage time.

CONCLUSIONS

Sodium ascorbate additive had positive impact on color and color stability of canned products during storage.
Cochineal additive had positive impact on color of products (increase of a* and decrease of b* value).

Praca wykonana pod kierunkiem Prof. dr hab. Jana Mroczka

Key words: canned poultry product, sodium ascorbate, cochineal, color stability

The antioxidant activity of the white mulberry leaves undergoing the aging process

Monika Przeor, Ewa Flaczyk

Poznan University of Life Sciences
Department of Food Service and Catering
Contact e-mail: monika.przeor@up.poznan.pl

INTRODUCTION

Morus alba, known as a white mulberry, is a fast-growing, medium sized tree. The species is native to Asia, but is widely cultivated in Europe. Originally it was cultivated to feed the silkworms employed in the commercial production of silk. Although, in Far East Medicine it has been used due to its medicinal properties for ages. Recent studies shown the health effects of different parts of mulberry against lifestyle diseases, caused presence of i.a. free radicals. During the production process of mulberry leaves drought or extract, there can occur changes in the antioxidant activity.

AIM

The aim of the research was to determine the changes in antioxidant activity of *Morus alba* leaves undergoing shredding, twisting, aging and drying before extraction.

MATERIALS AND METHODS

Material consisted of *Morus alba* leaves, variety Wielkolistna-Żółwińska, was gathered from plantation of Institute of Natural Fibres and Medicinal Plants (Pętkowo, near Poznan) in July, 2012. Fresh leaves were shredded and twisted. Then they were divided into 5 parts due to aging time: not aged, aged 1, 2, 3 and 4 hours. After that, the material was dried in 60^{o}C. Mulberry leaves drought was minced using a laboratory mill Retsch GM200, into the powder size <0,8mm. The powder was extracted twice for 5 minutes, using laboratory extractor (Dionex ASE350). Total polyphenols content, DPPH• scavenging activity, $ABTS^{+}$• scavenging activity and chelating activity were used to characterization in the extracts.

RESULTS

All tested extracts showed antioxidant activity. Depending on the aging time of leaves, radical scavenging activity was variable (differences up to 10% for $ABTS^{+}$•). Total polyphenols content and chelating properties of studied extracts also varied with the time of aging.

CONCLUSIONS

The aging process of *Morus alba* leaves in variable affects the antioxidant activity of the tested extracts.

Supported by the EU Project No POIG 01.01.02-00-061/09.

Key words: white mulberry, aging, antioxidant activity

Unconventional method for preparation of soluble fiber from starch

Sylwia Ptak, Kamila Kapuśniak (Jochym)

Jan Dlugosz University in Czestochowa
Institute of Chemistry, Environmental Protection and Biotechnology
Contact e-mail: s.ptak@ajd.czest.pl

INTRODUCTION

CODEX Alimentarius defines dietary fiber as carbohydrate polymers with 10 or more monomeric units, which are not hydrolyzed by the endogenous enzymes in the small intestine of humans and belong to the following categories: a) edible carbohydrate polymers naturally occurring in the food as consumed; b) carbohydrate polymers, which have been obtained from food raw material by physical, enzymatic, or chemical means and which have been shown to have a physiological effect of benefit to health as demonstrated by generally accepted scientific evidence to competent authorities; and c) synthetic carbohydrate polymers which have been shown to have a physiological effect of benefit to health as demonstrated by generally accepted scientific evidence to competent authorities. Also products of thermal modification of starch are considered as components of dietary fiber.

AIM

The aim of present study was to obtain a soluble dietary fiber from starch by the application a non-conventional source of energy, such as microwave radiation, to thermolysis of starch.

MATERIALS AND METHODS

Preparations were obtained by heating of potato starch in the presence of hydrochloric and citric acids at microwave field. Various power levels (10-60%) and heating times (2-7 minutes) were tested. *In vitro* digestibility of products was determined enzymatically according to AOAC International Official Method 991.43. Physicochemical properties of fibers such as water solubility and water binding capacity, reducing sugar content, dextrose equivalent and viscosity were tested. Furthermore, the average molecular weight and the molecular weight distribution of fibers were determined by using high-performance size-exclusion chromatography (HPSEC). Additionally, the stability of fibers in simulated gastric and intestinal fluids was evaluated by an *in vitro* method.

RESULTS AND CONCLUSIONS

The preliminary studies allowed to prepare fibers of increased resistance to enzymatic hydrolysis and of high stability in simulated gastrointestinal fluids. These fibers showed high water solubility, low content of reducing sugar and very low viscosity. One may conclude that microwave heating can be considered as an efficient, quick method for the preparation of soluble dietary fiber from starch.

Key words: dietary fiber, potato starch, microwave heating, citric acid

Estimation of agrimoniin content in strawberry fruits

Agnieszka Rogula[1], Alicja Z. Kucharska[2], Anna Sokół-Łętowska[2], Izabela Fecka[1]

1. Medical University of Wroclaw, Chair and Department of Pharmacognosy
2. Wroclaw University of Environmental and Life Science, Department of Fruit, Vegetable and Cereals Technology
Contact e-mail: a.rogula@op.pl

INTRODUCTION

Tannins are widespread constituents of the vegetable kingdom and are classified into two groups: hydrolyzable and condensed tannins. Ellagitannins belong to the hydrolyzable tannin group. They occur in food such as strawberries, raspberries, blackberries, pomegranates, walnuts etc. Consumption of tannins may play an important role in human health benefits. In vitro studies of ellagitannins have demonstrated various biological activities for example: antioxidant, antiviral, antimicrobial, immunomodulatory and antitumor. Agrimoniin is a very interesting compound included to oligomeric ellagitannins.
There has been a growing interest in the phenomenon of bioavailability of polyphenolic compounds. Researches show that ellagitannins are metabolized by the intestinal flora to urolithins (hydroxydibenzopyran-6-one derivatives). This metabolite has potential biological activities.

AIM

The aim of the work was to signify the agrimoniin content in different varieties of strawberry fruit. The content of this tannin was calculated using agrimoniin standard. The other authors have expressed the agrimoniin content as ellagic acid.

MATERIALS AND METHODS

Fruit *Fragaria x ananassa* (Weston) Duchesne was used as the material for researches. All samples came from one plantation (Stacja Doświadczalna Oceny Odmian w Masłowicach). Raw material was gathered in different varieties of strawberry in July 2011. The fruit was frozen immediately after gathering it. 100 varieties of strawberries were analyzed. The extracts from whole fruit were prepared by using 70% (v/v) aq. methanol with the addition of 1,5% formic acid. The extraction was performed in the ultrasonic bath in temperatures up to 40°C for 15 minutes. Before determining the extraction method was optimized. Quantification was led by using the validated HPLC-DAD method on Hypersil GOLD column (250 x 4.6 mm, □ 5 µm; Thermo Scientific, UK). The counting was made by the method of external standard on agrimoniin which was isolated in our laboratory from *Potentilla anserine L*.

RESULTS

On the basis of the HPLC-DAD analysis the amount of agrimoniin was determined in 100 varieties of strawberry fruits. The content of this compound was different depending on the analyzed varieties. The average content of agrimoniin in strawberries was 7 to 28 mg/100 g, average amount is 15 mg/100 g. The smallest content of agrimoniin was observed in Dania, Alfa, Kaster, Astra strawberry varieties. The biggest one existed in such varieties as: Totem, Gigaline.

CONCLUSIONS

Strawberries are known from the high anthocyanin content (calculated as cyanidin 3-O-glucoside) about 55 mg in 100 g fresh fruits. The presented experiment shows that they are also a rich source of agrimoniin. This ellagitannins included in fruits could play the great part in the health of the human organism.

Key words: agrimoniin, ellagitanins, *Fragaria x ananassa,* HPLC*,* urolithin

Chemical and supercritical carbon dioxide extraction of egg yolk phospholipids

Ewelina Siepka, Łukasz Bobak

Wroclaw University of Environmental and Life Sciences
The Faculty of Food Science
Department of Animal Products Technology and Quality Management
Chelmonskiego 37 - 41, Wroclaw, Poland
Contact e-mail: ewelina_siepka@up.wroc.pl

INTRODUCTION

Nowadays, human diet is poor in nutritional important ingredients like good quality lipids (rich in phospholipids and omega-3 fatty acids), amino acids, vitamins, minerals, etc. Egg yolk contains several important components and can be a great source of a diet supplements. There are many extraction methods for egg yolk phospholipids (PLs) separation process. Two of them seem to be the most profitable: chemical extraction and supercritical fluid extraction (SFE).

AIM

The aim of research was to compare two phospholipids extraction methods, chemical extraction and supercritical carbon dioxide extraction.

MATERIALS AND METHODS

Chemical extraction is an extraction of a substance from one phase into liquid phase using extraction liquids. Supercritical Fluid Extraction is the process of separating components from material using supercritical fluids as the extracting solvent. SFE can be used as a sample preparation step for analytical purposes, or on a larger scale to either strip unwanted material from a product or collect a desired product. Carbon dioxide (CO_2) is the most popular supercritical fluid, sometimes modified by co-solvents such as ethanol.

RESULTS

There are some significant differences in both extractions, but the quality of products is similar.

CONCLUSIONS

Both methods can be used in industry scale but very important disparity between of them is the cost of equipment. Chemical extraction requires only laboratory tools and SFE equipment is very rare and costly.

Project is co-financed by the European Union as part of the European Social Fund

HUMAN CAPITAL NATIONAL COHESION STRATEGY
DOLNY ŚLĄSK
EUROPEAN UNION EUROPEAN SOCIAL FUND

Key words: egg yolk phospholipids, chemical extraction, Supercritical Fluid Extraction - SFE

Effect of packaging method and period of cold storage on the sensory quality thigh muscles of Termond White rabbits

Natalia Skiepko, Iwona Chwastowska-Siwiecka, Jacek Kondratowicz

University of Warmia and Mazury in Olsztyn, Poland
Department of Commodity Science and Animal Raw Material Processing
Contact e-mail: natalia.skiepko@uwm.edu.pl

INTRODUCTION

In the meat industry are generally used two methods of modifying the gaseous atmosphere: vacuum packing and in inert gases. One of the most important aspects of the application of the protective atmospheres is to determine the composition of the gas mixture, depending on the type of packaged product. Rabbit carcasses are exported mainly in the form of packaged chilled or frozen carcasses. It is therefore necessary undertake research related the technology of production cooled and packed rabbit meat, as well as the efficient development of the quality of the simultaneous control of health safety.

AIM

The objective of this study was to determine the effect on the method packaging and period of cold storage on the sensory properties thigh muscles of rabbits cooling stored 7 and 14 days.

MATERIALS AND METHODS

The experimental material comprised breeds of Termond White rabbits (n=50), they were fattened at the Experimental Station of the National Research Institute of Animal Production (ZDIZ PIB) in Chorzelów in the autumn-winter season. Slaughter and post-slaughter handling rabbits at 90 days of age were conducted in compliance with binding procedures. Carcasses were cooled at a temperature of ca. 4°C for 24 h. Boning of thigh muscels were vacuum packed and in modified atmosphere with gas mixture composition as follows: I-70%Ar +30%CO_2 and II-30%Ar+60%CO_2+10%O_2. To packaging muscles were used barrier package about raised for gases. The muscles samples were stored in cooling conditions for period 7 and 14 days. After the completed storage an evaluation of features of the sensory quality was carried out of muscles subjected to the thermal processing according to the 5-points scale in compliance with Polish Standards (PN-ISO 4121:1998).

RESULTS

It was found that higher mean scores for aroma, juiciness, tenderness and palatability obtained unpackaged meat, as well as vacuum-packed and in the atmosphere of Ar and CO_2 (7 days) in comparing to attempts packed in mixture from O_2, what became confirmed statistically. It was affirmed that significance interaction ($p \leq 0,01$) the method and time of cold storage in attitude to aroma, between the experimental groups analyzed. It was proved, that as the cold storage time was being extended up to 14 days deteriorated of sensory features the thigh muscels packed in vacuum and Ar and CO_2. Attempts packed in mixture of three-component (up to 14 days) were assessed on the quality sufficient for juiciness, tenderness and palatability.

CONCLUSIONS

The data obtained show that the best sensory quality was characterized rabbit meat stored for 7 days and packed in a protective gas mixture of 70% Ar +30% CO_2 and vacuum. In spite of a decrease average scores for sensory features after the end of 14-day storage in group with thigh muscles packed above methods their quality was still on the good level.

** The Project was financed from funds of the National Science Center as a post-doc research project No. N N311 526740*
***Research carried out with the equipment financed under the Operational Program Development of Eastern Polish 2007-2013*

Key words: rabbit meat, modified atmosphere, cold storage, sensory quality

Effect of plant hydrocolloids addition on selected sensory properties and polyphenols content in fruit smoothies

Mirosława Teleszko

Wrocław University of Environmental and Life Sciences
Department of Fruit and Vegetable Technology
Contact e-mail: miroslawa.teleszko@up.wroc.pl

INTRODUCTION

The use of polysaccharide hydrocolloids helps shape appropriate desirable sensory characteristics of different products. It's important especially for consumers with risk of diet-related diseases. Their unique functional features are used in the production of different foodstuffs. Polysaccharide hydrocolloids are widely used in technology of reduced-calorie and low-energy foods, which play the a role of dietary fiber. This compounds are used in food concentrates industry, for thickening and stabilizing sauces and salad dressings, ketchup, in the production of margarine, yogurt, dairy desserts, ice cream, fruit preserves, meat stuffing and many other products. Commonly known polysaccharides are agar, carrageenan, locust bean gum, pectin and gums, eg. guar and xanthan. One of the most interesting fruit products are smoothies. They containing mainly juice and homogenized fruits. Smoothies are characterized by a smooth, semiliquid consistency. However, obtaining of property rheological and sensory qualities of these products is complicated. It depends on several factors, such as fruit species, degree of ripeness and the proportion of the various ingredients in product formulation. A chance to improve the rheological qualities of smoothies can be the use of plant hydrocolloids. The question is, will these substances not adversely affect of the sensory properties of the product and stability of the bioactive compounds.

AIM

The aim of this study was: 1) to determine the optimal hydrocolloids addition to smoothies recipe, invented the rheological specific of product; 2) to investigate the influence of polysaccharides on the sensory profile and bioactive compounds content of smoothies.

MATERIALS AND METHODS

Materials: laboratory made smoothies, containing apple juice, bilberry puree and dog rose juice (proportion 2: 0,5: 0,5). The hydrocolloids (agar- agar, carrageenan, , pectin, guar gum, xanthan gum, LCB) were purchased from Brenntag, Poland. Methods: the organoleptic assessment of smoothies (9-degree hedonic scale); rheological properties of products; polyphenols content by UPLC method.

RESULTS

As the results of organoleptic assesment show, hydrocolloids influence on consument acceptability of smoothies. Irrespective of type of plant polysacharides (PP), improvement the product consistence was observed. However, depending on hydrocolloids dose, the products were characterized of different rheological properties , including viscosity. Addiction of PP in smoothies recipe, especially carrageenan and guar gum, coused the changes in taste of products.

CONCLUSIONS

It's possible to use of hydrocolloids to stabilizing of smoothies rheological properties. But, the important thing is to choose of optimal dose and type of polysaccharide, which did't make to foreign taste or significantly change the consistence of products (eg. from semi-liquid to solid, like in the case of agar or carrageenan).

This work was supported by the European Union under Project No. POIG 01.01.02-00-061/09, acronym "Bioactive food". Thanks for Dr Aneta Wojdyło and Dr Maciej Oziembłowski for a cooperation.

Key words: hydrocolloids, fruit products, consistency, polyphenols

The effect of dietary oil seeds on the fatty acid profile of ostrich liver

Dominika Tolik[1], E. Poławska[2], J.O. Horbańczuk[2]

[1]Warsaw University of Life Sciences
Department of Food Technology, Faculty of Food Sciences
[2]Instituite of Genetics and Animal Breeding PAS
Animal Improvement Department
Contact e-mail: dominika_tolik@sggw.pl

INTRODUCTION

Feeding is one of the most important factors influencing fatty acid profile of animal tissue. Supplementation diets with oils seeds rich in PUFA is commonly used method of improving fatty acid profile of tissues. However there is lack of information on the effect of plant oil supplementation to ostrich diet on nutritional value, especially fatty acid profile of ostrich tissues, including also ostrich liver**.**

AIM

The aim of the study was to determine the effect of dietary oil seeds on the fatty acid profile of ostrich liver.

MATERIALS AND METHODS

The study was carried out on forty growing ostriches raised in five groups – control and with 4 and 8% of linseeds supplementation and with 5 and 10% rapeseeds supplementation in the diet. The ostriches were slaughtered at 12 months of age when their live weight had reached approximately 96.3 ± 5.5 kg. After slaughter liver samples (50 g) were taken, transported to the laboratory, homogenized and fatty acids profile was analysed using a GC-7890 Agilent gas chromatograph.

RESULTS

The higher contents of PUFA and omega-3 fatty acids in diet were negatively correlated with n-6/n-3 ratio in ostrich liver (r=0.83 and 0.78). The higher amounts of MUFA in diet influenced lower ratio of PUFA/SFA (r=0.46). It seems to be very important finding that content of SFA and omega-6 fatty acids in diet have no influence on n-6/n-3 and PUFA/SFA ratio of ostrich liver.

CONCLUSIONS

The results of the study indicate that modification of fatty acid profile to improve nutritional value of ostrich liver, can be obtained by feeding ostriches with diets rich in omega-3, but not by diets rich in omega-6.

Realized within the project "BIOFOOD" - innovative, functional products of animal origin No. POIG.01.01.02-014-090/09, which was co-financed by the European Regional Development Fund within the Innovative Economy Operational Programme 2007-2013.

Key words: fatty acids, omega-3, omega-6, ostrich liver

Cold plasma technology as a promising method of biodecontamination

Natalia Ulbin-Figlewicz, Ewa Brychcy, Dominika Kulig, Anna Zimoch, Andrzej Jarmoluk

Wrocław University of Environmental and Life Sciences
Departament of Animal Products Technology and Quality Managment
Contact e-mail: natalia.ulbin@gmail.com

INTRODUCTION

The plasma is defined as a partially ionized gas containing neutral particles as well as an equivalent number of negative electrons and positive ions. The characteristics of plasmas are significantly different from neutral gases, for example, plasma conducts electric current. Plasma decontamination is a new application of low-pressure plasma. That is a promising and an alternative technique to other conventional sterilization methods like: high temperature, radiation and ethylene oxide usage, especially in treatment of thermolabile food products. The mechanism of microbiological inactivation by cold plasma is not yet clearly defined, but researches describe three elementary processes: destruction by UV irradiation of the genetic material of the microorganism; erosion of the microorganism, atom by atom, through intrinsic photodesorption; erosion of the microorganism, and atom by atom, through etching [Moisan 2002]. Cold plasma technology can be used to inactivate both vegetative cells and spores of microorganisms in short time periods. Improved plasma process design is required to obtain significant microbial reduction without affecting the product quality and to guarantee consumer's acceptance.

AIM

The objective of the study was to investigate the inactivation effect of the plasma treatment on surface microflora of meat.

MATERIALS AND METHODS

The microbiological analyses were performed, following procedure describe in "Microbiology of food and animal feeding stuffs. Horizontal methods for sampling techniques from surfaces using contact plates and swabs" (PN-ISO 18593:2004). Total number of bacteria were counted after 72 h of incubation in 30°C on culture medium containing tryptone, yeast extract, glucose and agar (PN-A-82055-6). Psychrotrophs were determined on PCA plates (hydrolyzed casein, yeast extract, glucose, agar) incubated at 6°C for 10 days (ISO 17410:2001). Culture medium supplemented with chloramphenicol was used to determine total number of yeast and mould. Plates were incubated for 5 days at 25°C (PN-A-82055-16). Samples of meat were exposed to cold plasma for 0, 5, 10 minutes at the final vacuum of - 1 mbar.

RESULTS

Psychrotrophs, total microorganisms, and yeast and mold were significantly reduced after cold plasma treatment. . The longer time of exposure caused greater inactivation of microbes on meat surface. The most sensitive microorganisms on cold plasma treatment were psychrotrophs and numbers of bacteria, and their number decreased by 1 log cfu/g.

CONCLUSIONS

The results of the present study have shown that cold plasma has antimicrobial activity, but still is a lot of issues that need to be further investigated. Nevertheless, non-thermal plasmas have great potential as a novel method of biodecontamination.

Key words: cold plasma, decontamination, meat

The impact of exposures and growth conditions on the content of polyphenolic compounds and antioxidant activity of Cress sprouts

Dorota Wyspiańska, Paulina Mizgier

Wrocław University of Environmental and Life Science
Department of Fruit and Vegetables Technology
Contact e-mail: dorota.wyspianska@op.pl

INTRODUCTION

Garden Cress (*Lepidium sativum* L.) is a one-year plant species which belongs to the family Brassicas (*Brassicaceae*). It was cultivated in ancient Egypt, Greece and Persia. It appeared in Western Europe thanks to the Romans.
This plant is a rich source of minerals. Garden cress composition contains complex vitamins A, B, K and PP and vitamin C. Calcium content is around 100 mg/100 g. It has a diuretic effect, prevents the formation of kidney stones, removes the constipation, improves metabolism and promotes treatment of colds. It is also used in treatments aimed at improving the appearance of skin and nails.
Activators of water are the devices which change the structure of water to more advantageous both for human health and for plant growth. They increase the degree of fragmentation of water particles, alter the permeability, electrical conduction and biological properties. Their action slightly decreases surface tension of water, making the penetration of oxygen and nutrients to cells easier.

AIM

The aim of this study was to determine the content of biologically active substances and antioxidant activity of Garden Cress and investigate the effect of exposure and activators of water on the content of the above-mentioned compounds.

MATERIALS AND METHODS

In the study we used germinated cress seeds commercially available. Sprouts were watered with water-activated ADR-4, Aqua-Lyros system and Alcaredox-N1. To extract anti-oxidative compounds the solution of 80% methanol with 36% HCl (1 ml/1 l) was used . In methanol extracts, the content of vitamin C as L-ascorbic acid was determined using the method by Tillmans, total polyphenol content by Folin-Ciocalteu'a, power DPPH free radical scavenging and antioxidant activity by ABTS and FRAP.

RESULTS

Antioxidant activity and total polyphenol content depending on the germination and activators of water was varied. Application of Activator ADR-4 and the germination process in daylight propelled the highest concentration of vitamin C in germ Cress (166, 97 mg/100 g).

CONCLUSIONS

Higher values of antioxidant activity were obtained, carrying out the process of germination without daylight. An exception was the antioxidant activity against DPPH. The highest values were obtained, when grain sprouted in bright light.

Key words: garden cress, activators of water, antioxidant activity, polyphenol

Posters

E-poster session

15th May 2013

Microencapsulation of α-tocopherol using bakers' yeast as a natural carrier

Adrian Czerniak, Tomasz Jankowski

Poznan University of Life Sciences
Department of Biotechnology and Food Microbiology
Contact e-mail: adrcze@up.poznan.pl

INTRODUCTION

Among vitamin E category, α-tocopherol (αTP) is the most abundant and active form of this lipid – soluble, chain – braking antioxidants. It has substantial commercial application as antioxidant food additive and, as it is shown in the recent studies, play significant role in preventing some cardiovascular disease and cancer. However, the application of αTP in food and pharmaceutical formulations has been strongly limited by its instability when exposed to oxygen and heat. Thus, prevention methods should be considered before it is added to food or used as a dietary supplement. In recent years, several delivery systems have been developed for αTP. Most of them include emulsion solvent evaporation, nanoprecipitation, salting – out and combination of this methods. Natural or synthetic polymers are used as the wall materials. Microencapsulation in Ca-alginate and Ca-pectinate beads, spray – drying or spray – chilling methods has also been characterized in the literature. New, simple and low – cost method for αTP microencapsulation has been proposed in this study, based on bakers' yeast cells as a natural microcarrier.

AIM

The aim of this work was to optimize microencapsulation of αTP within bakers' yeast cells as a carrier material. The preparation conditions were optimized for maximal entrapment efficiency (EE, $\%_m$) using response surface methodology (RSM).

MATERIALS AND METHODS

αTP-loaded yeast microcapsules were prepared by simple mixing of vitamin E emulsion with yeast biomass and incubating for 24 h. After incubation, biomass were washed with distilled water and lyophilized. The entrapment efficiency was determined by extraction method. Preparation conditions were optimized using three – factor, five – level central composition design consisted of 2^3 factorial points, six star points and six replicates. The three preparation conditions examined as independent variables were: temperature (X_1), ethanol concentration (X_2) and yeast: αTP mass ratio (X_3).

RESULTS

RSM methodology was used to study the effect of three independent variables on the maximal EE of αTP within yeast cells. The values of EE, determined from 20 experiments generated by the central composition design, ranged from 0,01 ± 0,002 to 42,99 ± 0,13 %. The mathematical relationship between encapsulation efficiency and preparation conditions was $\mathrm{Sqrt}(C + 0{,}43) = 0{,}048X_1 - 2{,}53X_2 - 0{,}31X_3 - 1{,}68X_2^2 + 5{,}04$. Analysis of variance (ANOVA) of proposed regression model showed that it was significant ($p<0{,}001$; $R^2 = 0{,}9878$). The linear terms of ethanol concentration (X_2), yeast: αTP mass ratio (X_3) and the quadratic coefficients for temperature (X_1^2) and ethanol concentration (X_2^2) significantly influence EE. Observation of correlations showed that EE increased with increased ethanol concentration from 50 to about 54 % and then decreased with higher ethanol concentration. This correlation was expected because high ethanol concentration probably partially degrades yeast lipid bilayer and the cell wall, which act as a molecular sieve for molecules and provides passive diffusion. Higher yeast: αTP mass ratio deceased final encapsulation efficiency, which show that specific steady state between cell and αTP was probably achieved in this process.

CONCLUSIONS

Proposed mathematical model can be used for adequate prediction of the values of EE with different levels of studied independent variables. Resulted microcapsules, made under optimal condition, contained about 36 % (w/w) of αTP. This value is similar to the efficiency achieved by other researchers, which show that microencapsulation of α-tocopherol, within bakers' yeast cells as carrier material, could be attractive and alternative method for protocols described in literature.

This work was supported by Polish Ministry of Science and Higher Education grant nr 2136/B/P01/2010/38

Key words: α-tocopherol, microencapsulation, bakers' yeast, response surface methodology

Cocoa butter and it equivalents characteristization with instrumental and physicochemical methods

Bartosz Kruszewski, Mieczysław Obiedziński

Warsaw University of Life Sciences, Faculty of Food Sciences
Department of Biotechnology, Microbiology and Food Evaluation
Contact e-mail: bartosz_kruszewski@sggw.pl

INTRODUCTION

Cocoa butter is one of the most expensive commodity-based vegetable fats avaible. It can only be made from either cocoa beans, nibs, liquor, cake or cocoa dust. Cocoa butter is almost exclusively used for the production of chocolate. In contrast with other fats and oils, cocoa butter hardly finds any other practical application of significance. There are two ways in which cocoa butter finds its way into chocolate: as raw material and part of used cocoa liquor. Due to the high cost of cocoa butter it is legal to add its replacements (CBE) to 5% of chocolate weight. Just like in case of cocoa butter, also equivalents must have proper specification to define quality and usefulness in chocolate production.

AIM

The aim of the study was to make characteristics of different origin cocoa butters and its equivalents. Also typical fat quality attributes, determined with physicochemical, traditional methods were compared with those calculated from chromatographic profiles.

MATERIALS AND METHODS

In this research cocoa butters and cocoa equivalents from different places of origin were investigated. Samples of research material were stored in dry, cold and dark place until analysis. By using gas chromatograph coupledwith mass spectrophotometer (GC/MS) were determined esterified fatty acids (TAGs, DAGs, MAGs) and free fatty acids (FFA) and were calculated iodine and acid values (I.V. and A.V.) . By physicochemical methods were determined free fatty acids content, iodine, acid and peroxide value (P.V.).

RESULTS

In the study interesting composition variability of fatty acids profiles was observed. GC/MS profiles have shown presence of fourteen fatty acids with predominant content of palmitic, stearic and oleic acid. Fatty acids profiles of CBE were different from cocoa butter ones and could be useful to determine level of CBE application in chocolate processing. Values obtained by instrumental method were little bit lower than values obtained with physicochemical methods.

CONCLUSIONS

The usefulness of GC/MS for fatty acids analysis in cocoa fat and its equivalents was confirmed. GC/MS method occurs to have some advantages and disadvantages in determining FFA and fat values. It is much more quicker and cheaper method than traditional ones but has bigger inaccuracy dictated by specific uncertainty. Development of proper factors based on methods comparison can compensate this inaccuracy. Further studies of quality attributes such as sterols, volatiles and TAGs profiling are required to elaborate means for authenticity and content verification of cocoa butter and CBE.

Key words: cocoa butter, cocoa equivalents, fatty acids, iodine value, acid value, peroxide value

Biofilm reactors for bioconversion processes

Dagmara Leśniak, Hetman Marta

Poznań University of Life Sciences
Department of Biotechnology and Food Microbiology
Contact e-mail: dagmara.lesniak@up.poznan.pl

INTRODUCTION

Biofilm is a natural form of cell immobilization that results from microbial attachment to solid supports. In industrial applications usually two types of biofilms are employed, namely, biofilms that grow onto porous organic and inorganic solid supports, and biofilms that are formed as a result of flocs and aggregate formation. Industrially, biofilms are detrimental in many cases and beneficial in many others. Natural biofilm can reduce heat transfer in heat exchangers, foul reverse osmosis membranes and contamine food processing equipment. However, biofilms intentionally used in industry allow achieving several aims [Rosche B. et al. 2009].

AIM

The purpose of this paper was to compare the use of biofilms in the bioconversion and biotransformation of various compounds.

MATERIAL AND METHODS

On the basis of the available literature data a comprehensive review of biofilm reactors was made.

RESULTS

Biochemical reactors play an important role in the biochemical industry. In order to increase the reaction rate by increasing cell mass concentration, immobilized cell techniques are applied. In continuous stirred tank fermentors, biofilms maximize substrate utilization at high flow rates and minimaze the loss of microbial cells. Biofilm reactors have found application in waste-treatment plants, in food industry - production of vinegar and alcohol and soy sauce production, in biochemical industry – production of butanol, 2,3-butanediol, 1,3- propanediol [Qureshi N. et al. 2005, Rosche B. et al. 2009].

CONCLUSIONS

A comparison of biofilm reactors with other reactor systems suggests that biofilm reactors are simple and offer higher productivities than other reactor systems. They can operate for long period of time, what could help in reducing process cost. Biofilm reactors have high potential to be employed in biotechnology and bioconversion industry for viable economic resons [Qureshi N. et al. 2005].

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This work was prepared within the framework of project no.01.01.02-00-074/09 co-funded by The European Union from the European Regional Development Fund within the framework of the Innovative Economy Operational Programme 2007-2013.

Key words: biofilm, bioconversion, 1,3- propanediol

Comparison of two ELISA methods with commercially available antibodies for prolamin detection in beer

Paulina Górecka, Dorota Piasecka-Kwiatkowska, Magdalena Zielińska-Dawidziak, Małgorzata Baraniak

Poznan University of Life Sciences
Department of Food Biochemistry and Analysis, Faculty of Food Science and Nutrition
Contact e-mail: pgorecka@up.poznan.pl

INTRODUCTION

A significant increase of the number of gluten sensitive people forces food manufacturers to take care of the quality and safety of products. Taking into consideration the nature of raw materials used in beer production, drinking beer can be dangerous for gluten sensitive people, even though most of the allergenic proteins are degraded while processing. Different methods are utilized for gluten content detection in food products with ELISA method to be the most commonly used.

AIM

The aim of the work was to determine the prolamins in beer produced from various raw materials with the use of direct and indirect ELISA immunodiagnostic methods and by comparing their detection possibilities.

MATERIALS AND METHODS

The study involved six types of beer. They differed from each other in terms of composition, in particular variants of grain used to produce malt: "Karmi" (barley malt), "Książęce" (wheat and barley malt), "Żywiec" (barley malt), "Corona Extra" (barley malt, corn, rice), "Estrella" (gluten-free), "Żytnie" (rye, Pilsen, Munich, caramel and coloring malt). Determination of prolamins in the analysed beers was performed using direct and indirect ELISA with polyclonal antigliadin SIGMA A1052 and G 9144 antibodies. Because of significant amino acid sequence homology of different origin prolamins, both conjugates react also with prolamin fractions of barley, rye, soy and oat.

RESULTS

The highest content of prolamins was determined in ''Książęce" beer, i.e. 18.66 µg/ml by the direct ELISA and 15.99 µg/ml by the indirect ELISA. This was due to the beer composition (wheat and barley malt), as well as specificity of antigliadin antibodies, which are more proper for wheat gliadin.
"Książęce" beer indicated about 6 µg/ml higher content of prolamins in comparison to "Żytnie'' beer with 12,17 µg/ml by direct ELISA and 9.38 µg/ml by indirect ELISA.
The content of prolamins in the gluten-free "Estrella" beer was at the same level as declared by the producer and did not exceed 6 µg/ml in both ELISA methods. Surprisingly, "Żywiec" beer, which is produced from barley malt revealed similar prolamin content to "Estrella" beer. The technological parameters during the malting and brewing processes changed gliadin-like epitope, which turned out to be unrecognized with antibodies. It was found that "Corona" and "Karmi" beer contained similar amount of prolamins, i.e. about 6,5 µg/ml determined by direct ELISA and about 4,5 µg/ml by indirect.
It was noted that results of analysis prolamin content in all beer samples obtained by direct ELISA were 15 - 30% higher than by indirect method.

CONCLUSIONS

Direct ELISA method applied for prolamin detection in beer was much more efficient if compared to indirect method. Antibodies used in direct ELISA method detected more protein epitopes in the beers than unlabeled one in indirect ELISA.

Research financed from the project No POIG 01.01.02-00-061/09

Key words: ELISA, beer, gluten, prolamin, allergy

The influence of packaging material on pH and colour stability during chilled storage of different types of functional smoked pork loin, packaged in modified atmosphere

Monika Marcinkowska-Lesiak, Jarosław Wyrwisz, Agnieszka Wierzbicka, Adrian Stelmasiak, Urszula Ulanicka

Warsaw University of Life Sciences
Faculty of Human Nutrition and Consumer Sciences, Division of Engineering in Nutrition
Contact e-mail: monika_marcinkowska@sggw.pl

INTRODUCTION

A lot of studies have been carried out in order to study the effectiveness of packaging systems and different atmosphere composition on the preservation of meat products. Not many articles on storage of different kind of functional smoked pork loin in high barier films can be fund. In relation to different kind of functional smoked pork lion stored in high barrier films not many research articles can be found in the bibliography. However, the use of modified atmosphere packaging (MAP) is becoming extensive in industry and, above all, it is important for products shelf life.

AIM

The aim of this study was to determine the effect of the packaging material on pH and color components of three variants of smoked pork loin produced from the experimental groups which differ in type of feeding.

MATERIALS AND METHODS

Three variants of functional smoked pork loins produced from pigs of Polish Large White breed nourished by varied feeding stuffs: a) standard mixture with 2.0% rapeseed oil (K), b) standard mixture with the addition of 1.0 mg organic selenium (S), c) a standard mixture with 1.0% rapeseed oil and 2.0% linseed oil (O). Samples were stored in two type of trays with different gas permeability: PP (B); PP/EVOH/PP (E) during 16 days under modified atmospheres (30% CO_2;70% N_2) in order to study the modifications on pH and colour stability, during that period. Pork products were examined at 8-day intervals during storage at 2 °C. For pH and colour parameters, an ANOVA test was carried out to determine statistical differences along the storage period, differences among the types of swine fodder or packaging material.

RESULTS

The lowest value pH value ($p < 0.01$) during 16 days of storage was experienced in smoked pork loins produced from pigs fed with a standard mixture with 2.0% rapeseed oil (K). Results of pH value depending on the type of packaging are also highly significant ($p < 0.01$), the highest pH values were observed in products stored in trays without barrier film (B). Conducting instrumental colour constituents measurement using chromameter revealed differences between examined smoked pork loins regarding lightness (L*), redness colour (a*), yellowness colour (b*). Among the examined groups, significantly highest ($p < 0.01$) value of lightness and redness was observed in smoked pork loin produced from pigs fed with a standard mixture with 1.0% rapeseed oil and 2.0% linseed oil (O). It was also noted that products stored in trays contained barrier film (E) have been characterized significantly ($p < 0.001$) lower lightness (L*) and higher redness colour (a*). The highest value of the parameter $\Delta E_{a,b}$ characterized smoked pork loins produced from K group stored for 16 days in high permeability to gas trays (8,70).

CONCLUSIONS

Both permeability of packaging material and types of swine fodder had a significant impact on pH and colour stability of functional smoked pork loins. Their proper selection could be a major factor influencing the quality of packaged pork products and could improve their consumer acceptance.

Research was realised within the project BIOFOOD – innovative, functional products of animal origin no. POIG.01.01.02-014-090/09 co-financed by the European Union from the European Regional Development Fund within the Innovative Economy Operational Programme 2007 – 2013.

Key words: modified atmosphere packaging (MAP), Ethylene vinyl alcohol, pork products

Determination of peroxide value in rapeseed oil by FT-MIR spectroscopy

Magdalena Reder, Piotr Koczoń, Katarzyna Sujka, Hanna Ciemniewska

Warsaw University of Life Sciences
Faculty of Food Sciences, Department of Chemistry, Division of Food Chemistry
Contact e-mail: reder_magda@wp.pl

INTRODUCTION

Oxidative changes in edible oils can occur during storage (autoxidation) or at higher temperatures during heating. Oxidized lipids are very undesired compounds due to their negative effect on human health, thus it is extremely important to determine oxidation of oils in the early stage. Peroxide value, determined by standard iodometric titration method, is commonly used for the measurement of oxidative rancidity and therefore oil quality.
FT-IR spectroscopic methods are more and more frequently used in food analysis due to its advantages over standard methods. Using FT-IR method one can decrease time of analysis and usage of chemical solvents, with same measurement accuracy and precision as compared to standard methods.

AIM

The aim of this study was to establish statistical correlations and construct robust statistical model between data of peroxide value of oils, determined by standard method, and FT-IR spectral data.

MATERIALS AND METHODS

Peroxide value of 12 rapeseed oils (fresh, fried and expired rapeseed oils) has been measured by standard iodometric titration.
Infrared spectra were registered in the spectral range of 4000 – 370 cm^{-1}, with the use of Perkin Elmer System 2000 spectrometer. Transmission technique was applied to conduct 25 scans for each of studied oils, the resolution was 4 cm^{-1} and shift velocity 2 cm/s.
Statistical models were constructed with the use of TQ ANALYST 8 program.

RESULTS

Statistically significant correlations with the use of PLS (partially least square) technique were found between data set of standard method and FT-IR data. Multi linear models based on data from selected spectral regions (3600 – 3100 cm^{-1}, 1760 – 1740 cm^{-1}, 1660 – 1650 cm^{-1}, 1640 – 1620 cm^{-1}, 1170 – 1110 cm^{-1}, 980 – 960 cm^{-1}, 920 – 910 cm^{-1}) were calibrated and validated.

CONCLUSIONS

FT-IR method can be practically applied for determination of peroxide value in rapeseed oils. IR spectrum of unknown oil sample can be registered to obtain spectral data which are consequently entered to the statistical model computed within this study. As an outcome correct value of PV is obtained. No wet analysis is therefore required.

Key words: oils, frying, FT-IR, peroxide value

The physical properties of industry microencapsulated aromas

Aleksandra Jedlińska, Magdalena Śledź, Emilia Janiszewska

Warsaw University of Life Sciences (WULS-SGGW)
Faculty of Food Sciences Department of Food Engineering and Process Management
Contact e-mail: magdalena_sledz@sggw.pl

INTRODUCTION

In theory microencapsulated aromas should release smell just after reconstitution in the product. In practice, because of the outdated technology and equipment, often industry microencapsulated aromas are not effectively closed and smell immediately after drying. In order to effectively close the aroma in the microcapsules, it is necessary to feed to the drying process a stable emulsion, which is determined by its composition and the pre-treatment (mixing or homogenization). Many Polish companies have old spray-dryers that are not equipped with systems preventing from local deposits of powder in the chamber (eg, hammers, air brushes). In such dryers to reduce the losses, the resulted powder is obtained from both: the chamber and the receiver. Presented results are part of the long-term research for "Pollena-aroma" company, which due to the investment in a new technological lines decided to improve the productivity and quality of powders.

AIM

The aim of this study was to determine the influence of the type of solution pre-treatment (mixing and homogenization) on the physical properties of orange aroma in powder form. In addition, the physicochemical properties of powders obtained from receiver and chamber of spray dryer were analyzed.

MATERIALS AND METHODS

Solutions with concentration 50%, aroma content 10% and addition of maltodextrin and arabic gum in ratio 1:7, were subjected to one of three types of pre-processing (mixing, pressure homogenizing 17MPa and pressure homogenizing 25MPa), then they were dried with inlet and outlet temperature of about 180 and 80°C, respectively. Obtained powders were examined in terms of water content, water activity, bulk and tapped density, particle density and color. Micrographs were taken to define the size the powder particles.

CONCLUSIONS

Significant statistical differences between physicochemical properties (like water content, water activity, color, particle size) of powders received from different parts of the dryer were observed. The type of solution pre-treatment did not have clear effect on the physical properties of powders.

Key words: aromas, microencapsulation, spray-drying

Effect of argon plasma treatment on stability of heme pigments in meat

Natalia Ulbin-Figlewicz, Ewa Brychcy, Dominika Kulig, Anna Zimoch, Andrzej Jarmoluk

Wrocław University of Environmental and Life Sciences
Departament of Animal Products Technology and Quality Managment
Contact e-mail: natalia.ulbin@gmail.com

INTRODUCTION

Meat quality is determined by few factors, but meat colour plays the most important role in the consumer acceptability of meat. Consumers prefer bright-red fresh meat. The major substance responsible for the characteristic colour of fresh meat is myoglobin, which can exist in different forms, as bright red oxymyoglobin (MbO_2), purple-red deoxymyoglobin (Mb), or brown metmyoglobin (MetMb) [Pearson, 1994].

AIM

The objective of the present study was to determine effect of argon plasma treatment on concentration of total heme pigments and myoglobin forms.

MATERIALS AND METHODS

Meat samples were exposed to argon plasma treatment for 6 minutes at low pressure (0,5 mbar). Cold plasma was generated using a laboratory pulsed plasma reactor (Ertec Poland). The effect of argon plasma treatment on the heme pigments of pork was investigated according to Warriss [Warriss, 1979; Pikul, 1993]. A 5,0 g muscle meat sample was homogenized with 50 cm^3 phosphate buffer (pH=6,8) at 9000 rpm for 15 s. The homogenized sample was cooled to 4-6°C during 1 h, then sample was centrifuged at 4000 g for 10 min at 4°C. Extraction of pigment was done twice. The supernatant I and II were centrifuged at 3000 g for 60 min and then were filtered through Whatman filter paper. The myoglobin concentration was determined by direct spectrophotometric measurement at 525 nm. The concentration of myoglobin derivatives were measured by reading absorbance at 420, 431, 502, 525, 557, 582 nm [Krzywicki, 1982; Tang, 2004; Sorheim, 1999].

RESULTS

Cold plasma treatment did not affected on concentration of total heme pigments in meat. . No significant differences beetwen concentration of myoglobin forms in control sample and sample treated with argon plasma were found. The concentration of myoglobin forms of Mb, MbO_2 and MetMb were noted at the level: 0,25 mg/g, 0,3 mg/g, and 0,65 mg/g of , respectively. Moreover, it was not observed formation of carboxymyoglobin.

CONCLUSIONS

The result of present study have shown that cold plasma do not indicate interconversion of the myoglobin species and may be used in meat decontamination.

Key words: cold plasma, heme pigments, meat

Posters

Regular session

Determination of glycidyl esters of fatty acids in refined oils from retail outlets by LC–MS

Magda Aniołowska, Agnieszka Kita

Wrocław University of Environmental and Life Sciences
Department of Food Storage and Technology, Wrocław, Poland
Contact e-mail: magda.aniolowska@wnoz.up.wroc.pl

INTRODUCTION

3-Monochloro-1,2-propanediol (3-MCPD), a known food processing contaminant is detected in various types of food, such as acid-hydrolyzed vegetable proteins, soy sources, crackers, meat products. Recently, it has been reported that some edible oils contain relatively high levels of 3-MCPD. Furthermore, the Chemical and Veterinary Test Agency (CVUA) in Stuttgart detected glycidol fatty acid esters (GEs) in refined vegetable oils reported as precursors of 3-MCPD, which seems to be one reason why high levels of 3-MCPD occur in the oils.

AIM

The objective of this research was to perform the screening test of glycidyl esters of fatty acids content in refined oils from the commercial network in Wrocław, produced by Polish and foreign companies.

MATERIALS AND METHODS

Samples of edible, refined oils (11 rapeseeds and 5 sunflowers) were collected from retail outlets in Wrocław. The concentrations of glycidyl esters (palmitate, stearate, oleate, linoleate and linolenate) in oil were quantified using an LC-MS technique based on Granvogl and Schieberle (2011). The analytical procedure was carried out according to Becalski (2012).
Glycidyl esters extraction from oils was conducted using acetone and chloroform, then the samples were purified twice using SPE cardridges.
The glycidyl esters content was obtained by the use of LC/MS 1200 L (Varian, Walnut Creek, CA., USA) performed using an atmospheric-pressure chemical ionization (APCI). Separation was made by the use of Luna (150 × 2 mm) (Phenomenex, USA) column which was preceded by the pre-column SecurityGuard (4 × 2 mm) (Phenomenex, USA).

RESULTS

The amount of GEs detected in 16 edible oil ranged from 570 to 5251 $ng \cdot g^{-1}$. The average content of esters of sunflower oils (2530 $ng \cdot g^{-1}$) was higher than in rapeseed oils (1328 $ng \cdot g^{-1}$). GE-C18:2 was found to be a prevailing GEs of the highest concentration in all the studied samples of sunflower oil and GE-C18:3 in rapeseed oil.

CONCLUSIONS

LC-MS technique and applied sample preparation can be followed to assay of five target GEs in an oil matrix. Concentrations of GEs are correlated to the fatty acid composition. Content of GEs varying according to type of oil and companies.

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Projekt współfinansowany ze środków NCN w ramach projektu badawczego nr 2012/05/N/NZ9/01508

Key words: glycidyl esters, oil, LC-MS

The knowledge and consumer opinion about food additives used in production of food

Lidia Antoniak, Marzena Danowska-Oziewicz, Katarzyna Eufemia Przybyłowicz, Mirosława Karpińska-Tymoszczyk, Ewelina Łuczak

University of Warmia and Mazury in Olsztyn
Department of Human Nutrition
Contact e-mail: lidia.antoniak@uwm.edu.pl

INTRODUCTION

Food additives are important due to the increased security and the attractiveness of the food products in which they are used and the ability to receive their share of new products. Among consumers they are mostly for fear of their application. The modern consumer is looking for products that have information on the packaging about the lack of additives in the product. The cause of consumers concerns may be advertising of some food producers of non-use of additives in their products which suggests that the products that contain them are worse and also often unprofessional information of additives eg. in tabloids, which are the main source of knowledge on this topic for many people.

AIM

The goal of the work was an analysis of attitudes, knowledge, and opinions of a select group of consumers with regard to additives used in food production.

MATERIALS AND METHODS

A study using interview method of questionnaire survey have been completed in 2010 among the 215 students of University of Warmia and Mazury of the different sociological and demographical characteristics. In the analysis of empirical analysis applied to material, the test Chi^2 Statistica 9.0 (StatSoft Inc., Tulsa, USA) was used to compare the data frequency category.

RESULTS

It has been shown that most of respondents drew the attention to the presence of additives in foodstuffs. By analyzing the results of student feedback on the need for additional substances showed that the largest percentage of respondents indicated that the use of additives is rather necessary. Knowledge regarding to the use of the preservatives, flavourings and stabilizers measures food among most students was correct. It was noted less knowledge of the scope of the purposes of the application of antioxidant substances among a significant amount of respondents.

CONCLUSIONS

Existing concerns relating to the use of additives in food production among a significant number of consumers can attest to the need to inform consumers on this topic.

Key words: flavouring substances, stabilizers, antioxidants, preservatives

Measure percentage of each group of fatty acids in organic and conventional butter

Sylwia Bakuła, Renata Pietrzak-Fiećko, Stefan Smoczyński

University of Warmia and Mazury in Olsztyn
Department of Commodity Science and Food Analysis
Contact e-mail: sylwia.kacprzak@uwm.edu.pl

INTRODUCTION

The modern food market offers buyers a wide range of products. Many consumers use the extensive range of products, which are mostly modern processed food. The interest in organic food is also increasing at the same time. Some people acquire it for the sake of their own health, others concern about the environment, animal welfare or local industry. However many consumers has doubts about the quality and authenticity of the organic food. There is a need to do more studies that will show that organic products differ significantly in chemical composition from products produced by equivalent conventional industries. The profile of the fatty acid can be distinguishing features of health food.

AIM

The aim of this study was to analyse the fatty acid profile of milk fat in organic and conventional extra butter.

MATERIALS AND METHODS

The tested material was the organic and conventional extra butter. Samples were collected for one year from the Warmia and Mazury region. Milk fat was, after the extraction, subjected to the operation of a methanolic solution of KOH and a crystalline hydrogen sulfate, according to the IDF Standard Method 1999, and then the samples were analysed by gas chromatograph HP 6890 with an FID detector and a glass column with a length of 100m. Statistical analysis of the results was carried out in STATISTICA 10th.

RESULTS and CONCLUSIONS

Statistically significant differences were observed between selected groups of fatty acids (percentage) in organic and conventional butter during the summer. The organic butter contained significantly higher proportion of polyunsaturated fatty acids, trans-fatty acids, and significantly lower in saturated fatty acids when compared with conventional butter.

Key words: fatty acids, organic butter, conventional butter

Effect of baking on the fatty acid profile in beef meat

Justyna Batogowska, Rita Rakowska, Anna Sadowska, Małgorzata Moczkowska, Arkadiusz Szterk, Bożena Waszkiewicz-Robak, Franciszek Świderski

Szkoła Główna Gospodarstwa Wiejskiego w Warszawie
Wydział Nauk o Żywieniu Człowieka i Konsumpcji
Contact e-mail: justyna_batogowska@sggw.pl

INTRODUCTION

Meat is a valuable natural source of nutrients that play a significant role in the human nutrition. The nutritional value of the meat largely dependent on the fat content and fatty acid composition. Compared to pork beef has a much more favorable fatty acids profile. The sensory quality and nutritional value of beef in large extent depend on the temperature and time of heat treatment. Important factors are also the type of culinary element, the fat content in it and the time aging. Changes occurring in meat during the thermal treatment carried out in high temperature (baking, grilling, frying) affect not only the sensory quality, but also the nutritional value of meat which is largely documented in the literature.

AIM

However, there is still very little data about the effect of the aging time on the fatty acid profile after heat treatment. Therefore the aim of this study was to investigate the effect of the baking process in different temperatures on changes in the fatty acid profile in beef after different time of aging.

MATERIALS AND METHODS

The material in this research was semimembranosus muscles derived from the 20 - month bulls Polish Holstein-Friesian breed black-and-white variety. Meat had been aging for 7 and 21 days, and then baked using "delta T" method (baking at constant temperature difference between the interior of meat and its surrounding) to achieve temperature 65^0, 70^0 and 75^0 C at the geometric center of the meat. Fatty acids were determined using gas chromatography with flame ionization detector GC-FID.

RESULTS

The obtained results indicate that the baking process and the aging exert a significant influence on the changes of the fatty acids profile in beef, which are dependent on the baking temperature and aging time.

CONCLUSIONS

The data about impact of the heat treatment process on the fatty acid profile in beef can be helpful in choosing the type of culinary treatment after which obtained meat will be characterized by high sensory quality and high nutritional value.

Key words: fatty acids, aging meat, baking, beef

Extraction of alkylresorcinols from plant material

Izabela Biskup[1], Andrzej Dryś[2], Izabela Fecka[1]

Wroclaw Medical University
[1]Chair and Department of Pharmacognosy
[2]Chair and Department of Physical Chemistry
Contact e-mail: izabela.biskup@umed.wroc.pl

INTRODUCTION

Alkylresorcinols (AR) are group of natural non-isoprenoid polyketide-derived phenols found in many different living organisms. The main source of them is Plant kingdom, especially Poaceae family. The side chain of the homologues in cereal range from 15 to 27 carbon atoms among individual species [1]. AR have a wide range of various biological activity: antibacterial, antifungal, antiparasitic, antitumor and antioxidant [1]. All these properties make them useful in the treatment of various pathological events and for commercial applications.
Epidemiological studies showed that the consumption of whole-grain food is beneficial, possess health-promoting effects and decrease the risk of several chronic diseases [2].
However, further investigations on these phenolic compounds are necessary to clarify their function in living organisms. Therefore, precise and reliable methods for AR extraction and quantification are essential. The most popular solvent used for the simple extraction is acetone [1, 3]. Using other solvents for this purpose, including pure methanol and 80% ethanol, dichloromethane, diethyl ether, chloroform, ethyl acetate, n-hexane and methyl tert-butyl ether, was reviewed by Żarnowski and Suzuki [3].

AIM

Selecting inexpensive organic solvent for fast and efficient extraction yielding alkylresorcinols from plant material.

MATERIALS AND METHODS

Alkylresorcinols were extracted from wheat (*Triticum aestivum* L.), spelt (*Triticum spelta* L.) and rye (*Secale cereale* L.) flours. The 15 min extraction was assisted with ultrasound wash. The examined solvents were methanol, acetone, ethyl acetate and methylene chloride. Second method of extraction, 24 h maceration, was used as a reference method. Methods were compared. Alkylresorcinols were quantified by high performance liquid chromatography (HPLC). Statistical calculations were performed by use of Excel and Statistica ver. 10.

RESULTS

Extracts yielded different alkylresorcinol contents and homologue compositions.

CONCLUSIONS

The highest amounts of total AR were found in acetone extracts. Ultrasound-assisted extraction was evaluated as a shorter, simpler and more useful extraction method compared to commonly used 24 h continuous shaking method for the effective isolation of alkylresorcinols from cereal flours.

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Key words: alkylresorcinol, extraction, cereal food, ultrasound wash

Application of calcium ions in thermo-chemical modification of lysozyme

Robert Borowiak, Grzegorz Leśnierowski

Poznan University of Life Sciences
Department of Food Quality Management
Contact e-mail: boro@up.poznan.pl

INTRODUCTION

Lysozyme is a hydrolytic enzyme, which shows potent antibacterial activity, especially against Gram(+) bacteria. Thermo-chemical modification of lysozyme enables to retain its oligomers, showing increased antibacterial activity over a wider spectrum. The modified enzyme exhibits an improved usability, thus providing its wider practical utilization

AIM

The aim of this study was to analyse the effect of calcium ions (Ca^{2+}) on the oligomerization degree and the hydrolytic activity of lysozyme, which was modified by using a high-temperature method.

MATERIALS AND METHODS

Lysozyme was modified using 2% H_2O_2 (v/v) with the addition of Ca^{2+} ions at 90°C for 30 min. The analyses comprised the assessment of enzyme's hydrophobicity, its oligomerization level and determination of the hydrolytic activity.

RESULTS

Obtained lysozyme preparations showed the significantly increased hydrophobicity. The amount of lysozyme dimer increased sharply from 32% to even 61%. Application of calcium ions caused a reduction of enzyme's hydrolytic activity, which ranged up to 80-90%, obtaining the final value of 2.000-4.000 U/mg.

CONCLUSIONS

The results of modification carried out showed that Ca^{2+} ions affect lysozyme oligomerization. The application of calcium ions increased the hydrophobicity of protein surface, leading to its intensified dimerization. The main side effect was a significant loss of enzyme's hydrolytic activity.

Key words: lysozyme modification, oligomers, antibacterial activity, calcium ions

Possibility of using ionized form of water for decontamination of meat

Ewa Brychcy, Dominika Kulig, Natalia Ulbin-Figlewicz, Anna Zimoch, Andrzej Jarmoluk

Wrocław University of Environmental and Life Sciences
Department of Animal Products Technology and Quality Management
Contact e-mail: ewa.brychcy@gmail.com

INTRODUCTION

Ionized water is generated by electrolysis of a dilute salt solution. Two forms of electrolyzed water are produced: acid and alkaline. Acid ionized water has been reported to have strong bactericidal activity against many foodborne pathogens. The antioxidant properties of alkaline water help to counteract free radicals. Bactericidal properties of acid ionized water give the possibility of using it as a natural disinfectant.

AIM

The aim of this study was to determine the effects of ionized water solutions of sodium chloride and ascorbic acid on the meat surface microflora.

MATERIALS AND METHODS

The impact of acid ionized water on surface microbial decontamination and color variation of pork meat was evaluated. The examined samples were prepared according to PN-A-82055-3. The amount of yeasts and moulds, the number of psychrotrophic microorganisms and the total number of bacteria were determined according to: PN-A-82055, ISO 17410 and PN-A-82055-6, respectively. Ionized sodium chloride solutions at concentrations of 0.2% and 2% and addition of 0,1% ascorbic acid were used for this study. The control samples were unionized sodium chloride solutions at concentrations of 0.2%, 2% and 0,1% ascorbic acid solutions. Raw pork was an additional control sample. Instrumental evaluation of colour parameters L*a*b* was performed by colorimeter MINOLTA CR-400.

RESULTS

The reduction of the number of psychrotrophic bacteria by 18% was observed at meat treated with deionized water, compared to the control sample.The application of ionized water caused 90% reduction of the number of microorganisms. Yeast and mould number on the meat surface sprayed with 0.1% solution of ascorbic acid was reduced 59%, compared to the control sample. However, application of ascorbic acid after ionization process caused reduction of the total number of microorganisms by 90%.

CONCLUSIONS

There is an option to sanitize meat surfaces using ionized form of ascorbic acid aqueous solution. It is possible to decontaminate the surface of the meat by application of acidic ionized water. No significant effect of acidic ionized water on meat color variation was observed.

Key words: ionized water, meat, ionization, decontamination

The attempt to develop a method of liposomes characterization by flow cytometry

Anna Bryła, Wojciech Juzwa

Poznań University of Life Sciences
Department of Biotechnology and Food Microbiology
Contact e-mail: anna.bryla@up.poznan.pl

INTRODUCTION

Today, both in the food, pharmaceutical and medical industry, there is a major problem of strictly targeted delivery of bioactive compounds to the desired location in the organism by oral administration.
Encapsulation of given substances in liposomes could constitute a solution for the above mentioned issue.
Although, many methods of liposome preparation has been described, most techniques to examine their characteristics are still either laborious or even non standardized. Because the structure of liposomes strictly depends on the method of their production, there is a need for fast, reliable and adequate method of testing the basic features of liposomal capsules. Flow cytometry, as a laser based, biophysical technology could be employed to the multiparametric analysis of the physical, chemical characteristics of up to thousands of minimal cells per second.

AIM

The aim of the presented study, was to develop a simple and reliable analytical method, that would allow to estimate structural properties of liposomes.

MATERIALS AND METHODS

The substrate liposomes preparation was the Lecisol (Hortimex), which is a blend o 50% sunflower lecithin and 50% carrier (wheat flower and calcium phosphate). The suspension of liposomes has been prepared using dry lipid film hydration technique combined with fluorochromes labeling (Vybrant® Multicolor Cell-Labeling Kit DiO, DiI, DiD Solutions). The experiment was performed with the use of Flow Cytometer with an automatic sorting cell system BD FACS Aria™III (Becton Dickinson).

RESULTS

Based on the flow cytometry technique, a convenient method for liposome analysis has been developed. The method allows to estimate the amount of phospholipid building a vesicle, the quantity of an encapsulated solute, the structure of a liposome, the distribution of those characteristics in an obtained population.

CONCLUSIONS

As a result of this study, it has been found that flow cytometry is an accurate, relatively simple, quick way to obtain a variety of data concerning the population of liposomes produced.

The work was financially supported by the grant POIG 01.01.02-00-061/09 "Nowa żywność bioaktywna o zaprogramowanych właściwościach prozdrowotnych" implemented within the Programme Innovative Economy 2007-2013.

Key words: liposomes, flow cytometry, DiO, DiI, DiD

Changes in antioxidant activity and phenolic compounds during storage of confitures from petals of Rosa rugosa

Andrzej Cendrowski, Marta Mitek

Warsaw University of Life Sciences
Faculty of Food Sciences, Department of Food Technology, Division of Fruit and Vegetable Technology
Contact e-mail: andrzej_cendrowski@sggw.pl

INTRODUCTION

Confitures from petals of *Rosa rugosa* are products which except from their sensory qualities contain biologically active compounds which shape their pro-health character. Pro-health qualities are mostly related with the content of antioxidant compounds which support natural defense mechanisms of human body. Nevertheless, the conditions and the duration of storage may contribute to a great loss of bioactive substances, which as a result can lead to the decrease in their nutritional quality and functionality.

AIM

The aim of the work was the determination of antioxidant activity, as well as, the content of the components shaping this activity, such as: total polyphenols and anthocyanins in confitures obtained from petals of *Rosa rugosa* during storage for 6 months in the temperature of 6 and 22^{o}C without access to the light.

MATERIALS AND METHODS

Confitures were manufactured from petals of *Rosa rugosa* originated from the plantation of “Polska Róża” company situated in Kotlina Kłodzka (Kłodzko Valley). The technological part included the production of two types of confitures: high sugar confitures with soluble solids of 68% and acidity equals 0.7%, low sugar confitures with soluble solids of 40% and acidity equals 0.5%. Confitures were manufactured in laboratory conditions in accordance with the requirements described in Polish Norm (PN-90-75115:2001). The analytical part included the characteristic of the basic chemical composition of petals and confitures. Moreover, in received products, the content of total polyphenols based on Folin-Ciocaltau method and anthocyanins using the pH differential method, as well as antioxidant activity in the presence of DPPH radical has been determined after 2, 4 and 6 months of storage.

RESULTS

Confitures from petals of *Rosa rugosa* were characterized by high antioxidant activity. Insignificant decrease in the content of total polyphenols has been observed during the process of storage, while the temperature of storage was considered an important factor influencing the losses of anthocyanin dyes. The greatest losses of anthocyanins (c.a. 97%) were observed in the confiture with low sugar level, with acidity of 0.5%, stored for 6 month in the temperature of 22ºC. After the same duration of storage, the loss of anthocyanins in high sugar confitures stored in the temperature of 6ºC was the lowest and amounted to 22%.

CONCLUSIONS

It has been demonstrated that both the duration and the temperature of storage have an essential effect on the content of anthocyanin dyes and antioxidant activity in tested products. The slightest declinein the content of these dyes during storage has been observed in high sugar confitures, which may be the result of stabilizing effect of higher sugar concentrations.

Key words: antioxidant activity, phenolic compounds, storage, confiture, *Rosa rugosa*

Characterization of antibiotic resistance and virulence genes in Enterococcus spp. isolated from dairy food

Wioleta Chajęcka-Wierzchowska, Łucja Łaniewska-Trokenheim

University of Warmia and Mazury, Olsztyn, Poland
Chair of Food Chair of Industrial and Food Microbiology, Faculty of Food Sciences
Contact e-mail: wioleta.chajecka@uwm.edu.pl

INTRODUCTION

Protection of the food supply includes considerations of the microbiological quality and safety of commodities available for public consumption. Common use of antimicrobial had create a large pool of resistance genes which may be disseminate resistant bacteria into the food chain and could transfer into human gastrointestinal track. *Enterococcus* spp. are one of the most common groups of bacteria in foods, due to (primarily) with their resistance to adverse environmental conditions, and high adaptability to different environments.

AIM

Objectives of this study were to estimate frequency of resistance in *Enterococcus* spp. isolated from retail dairy food, to analyze resistance and virulence gene contents and to describe associations between phenotypes, resistance, virulence genotypes and food types.

MATERIALS AND METHODS

Dairy food samples (n=114) were obtained from the retail market and tested for *Enterococcus spp.* Identification was performed using a Simple and Multiplex PCR to species level by PCR with primer specific for the *E. faecium*, *E. faecalis*, *E. casseliflavus*, *E. gallinarum*, *E. durans* and *E. hirae.* Antibiotic resistance was determined using the disk diffusion method. Minimal Inhibitory Concentration (MIC) values were determined using antibiotic gradient method (E-test). Fifteen antibiotics commonly used in the treatment of clinical infection or in agricultural procedures were tested. Hemolytic activity was determined on Columbia Blood agar plates supplemented with 5% sheep blood. Production of gelatinase was tested on nutrient broth agar cantaining 30g gelatine. The following virulence genes: *gelE* (gelatinase), *esp* (enterococcal surface protein), *ace* (enterococcal surface adhesion), *agg* (aggregation substance), the cytolysin operon (*cylL*), cell wall adhesins (*efa A)* and sex pheromones *(cpd, cob, ccf and cad)* were amplified by PCR using published specific primers and conditions.

RESULTS

A total of 94 *Enterococcus* sp. strains were isolated from 114 dairy food samples. The most prevalent species isolated was *E. faecalis*. A high percentage of isolates were resistant to tetracycline (MIC>8µg/ml), followed by teicoplanin (MIC>16µg/ml), fosfomycin, and tigecycline. *E. faecalis* strains harbor significantly more virulence determinants than other species. Comparison of β-haemolysis and detection of *cyl* genes revealed that cytolysin determinants behave as silent genes in most non-haemolytic isolates. Silent gelatinase genes were also detected.

CONCLUSIONS

Enterococci are widely present in dairy products. Many strains isolated from dairy products are antibiotic resistant and carry transferable virulence factors which represent a potential source of resistance transmission to bacteria in humans.

This research was supported by grant Ministry of Science and Higher Education, Poland N N312 236138. Supported by the European Union Within The European Social Fund (DrINNO).

Key words: *Enterococcus* spp., antibiotic resistance, virulence factors, food safety, dairy food

Effect of marine algae biomass supplements in feed on fatty acid profile of intramuscular fat in Termond White rabbits

Iwona Chwastowska-Siwiecka[1], Natalia Skiepko[1], Leszek Gacek[2]

[1]University of Warmia and Mazury in Olsztyn, Poland
Department of Commodity Science and Animal Raw Material Processing
[2]Experimental Station, National Research Institute of Animal Production, ZDIZ PIB, Chorzelów
Contact e-mail: iwona.chwastowska@uwm.edu.pl

INTRODUCTION

In monogastric animals, the content and composition of fatty acids (FA) in fat and meat may be modified by an appropriate diet. Investigations are underway to examine changes in fatty acid profile of rabbit meat fat evoked by incorporation of plant oils or animal fats to feed ratios for animals. Feed mixtures enrichment with components characterized by a high content of PUFA *n-3* enables programming the fatty acid profile of meat as a result of transfer of particular components from the feed mixture. Omega-3 fatty acids naturally occur in linseeds, rapeseeds, hemp seeds, pumpkin seeds, and in walnuts. An alternative in livestock feeding may be unicellular marine algae and phytoplankton, both being a rich source of DHA and EPA acids, vitamins, amino acids, minerals as well as available sugars of agar type. In view of the above, there are many premises to undertake a study on the production of functional food via enrichment of rabbit meat with appropriate bioactive substances through nutritional modification.

AIM

The aim of this study was to determine fatty acid profile of intramuscular fat in thigh muscles of rabbits receiving feed mixtures enriched with 2 and 4% addition of marine algae biomass.

MATERIALS AND METHODS

The experimental material were rabbits of Termond White breed (n=150), that were allocated to 3 analogous feeding groups, 50 rabbits each. The animals (75♀ and 75♂) were fattened at the Experimental Station of the National Research Institute of Animal Production (ZDIZ PIB) in Chorzelów in the autumn-winter season. Since weaning till day 60 of life, the rabbits were fed a complete standard feed mixture, whereas in the last 30 days of fattening, mixtures of two experimental groups (group II and III) were enriched with 2 and 4% addition of biomass from marine algae *(Schizochytrium sp.)*. Slaughter and post-slaughter handling were conducted in compliance with binding procedures. Carcasses were cooled at a temperature of ca. 4°C for 24 h. Thigh muscles were determined for % composition of FFA in intramuscular fat with the method of gas chromatography and for fatty acid profile.

RESULTS

Based on results achieved, a lower content of SFA and a higher content of UFA were demonstrated in the intramuscular fat of thigh muscles of the rabbits fed the mixtures with marine algae addition, which was confirmed statistically. A highly significant (P≤0.01) decrease was noted in MUFA content in muscles of the rabbits receiving the feed mixture with 4% addition of algae biomass, compared to the control animals. The addition of algae biomass (2 and 4%) caused a highly significant increase in PUFAs content in groups II and III by 6.23 and 9.84%, respectively. The most beneficial fatty acid profile in the intramuscular fat of thigh muscles, i.e. the highest levels of EPA and DHA, and the lowest PUFA *n-6/n-3* ratio, was achieved upon feed mixture enrichment with 4% addition of marine algae biomass.

CONCLUSIONS

The application of marine algae in complete pelleted feed mixtures for rabbits, in doses of 2 and 4%, enables achieving meat with the best health-promoting values characterized by PUFA *n-6/n-3* ratio optimal for human health.

**The Project was financed from funds of the National Science Center as a post-doc research project No N N311 526740*

Key words: biomass of marine algae, rabbit meat, fatty acid profile

Evaluation of the oxidative stability of commercial hazelnuts available on the Polish market

Hanna Ciemniewska, Magdalena Reder, Katarzyna Sujka, Monika Szeliga

Warsaw University of Life Sciences
Departament of Chemistry
Contact e-mail: hanna.ciemniewska@gmail.com

INTRODUCTION

Hazelnuts (*Corylus avellana* L.) are commonly imported to Poland from distant regions, such as Turkey, Georgia and Azerbaijan. Transportation, storage, reloading and other proceedings related to the import process can cause range of adverse changes in nut composition and especially in the quality of nut oil, which is most abundant and unstable macronutrient in nuts. The nut oil is composed mainly of unsaturated fatty acids (UFA), both monounsaturated (MUFA) and polyunsaturated (PUFA), while peculiar composition depends on the nut type. The presence of unsaturated fatty acids strongly increases nutritional value of nuts, but also makes them more susceptible to oxidation, which is a basic reason of sensory deterioration and has significant effect on the shelf life.

AIM

The aim of this study was to assess the oxidative stability of the hazelnuts available on the Polish market in two different periods of the year.

MATERIALS AND METHODS

Hazelnuts in 100-200 g packages were purchased on the Polish market from 5 different producers.
Oil from each hazelnuts sample was extracted using the Oil Expeller Piteba and stored in -18°C until use. Oxidative stability was determined using PDSC (Pressure Differential Scanning Calorimeter), Rancimat method, and peroxide value determination.
The differential scanning calorimeter (TA Instruments Q 200) equipped with a pressure cell (PDSC)
was used. Experiments were performed at 140°C under 1400 kPa pressure of oxygen. The Rancimat test was carried out according to PN-ISO 6886:1997 using Rancimat type 679 (Methrom) equipment at 110°C. Peroxide value (PV) was determined according to EN ISO 3960:2008 and expressed as meqO_2/kg.

RESULTS

Preliminary results indicate that oil from hazelnuts available on the Polish market, from first period examined, has stable oxidative parameters. PDSC test performed in lower temperatures (120°C) resulted in an oxidation induction time of over 130 minutes, it shows that the hazelnut oil has much higher oxidative stability than for example rapeseed oil. Experiment conducted at 140°C resulted in oxidation induction time of over 20 minutes for all the samples tested. The peroxide value remained low (2,0-3,2 meqO_2/kg) for all the samples as well.

CONCLUSIONS

Instead of a high content of unsaturated fatty acids, the oil turned out to be stable during the import process and storage in shop conditions. Oil inside the nut can be protected by the external brown thin hull, the whole nut composition including proteins and carbohydrates, as well as bioactive compounds such as α-tocopherol and phenolics. Further conclusions will be drawn after the second period of this study.

Key words: hazelnuts, oil, oxidation stability, PDSC, Rancimat, peroxide value

The effect of mixtures of protein-polysaccharide on rheological properties of stirred yogurts

Aleksandra Ciołkowska, Waldemar Gustaw

University of Life Sciences in Lublin
Department of Fruit, Vegetables and Fungi Technology
Contact e-mail: ceola@op.pl

INTRODUCTION

Interactions between milk proteins and polysaccharide are important in determining functional and processing properties of dairy products. One of the most common fermented milk products is yogurt. Yogurts are prepared by fermentation of milk with specific lactic acid bacteria. The addition of proteins and polysaccharides in a particular range of concentration improved the rheological properties of yogurts.

AIM

The aim of this study was to investigate the effect of mixtures of protein-polysaccharide addition on rheological properties of stirred yogurts.

MATERIALS AND METHODS

Yogurts were produced from whole milk powder with addition of liquid or lyophilized protein-polysaccharide mixtures. Rheological properties of stirred yogurts were determined using a RS 300 rheometer with a concentric cylinder rotating bob and fixed cup measuring cell. Firmness of stirred yogurts were determined by penetration test using a TA-XT2i Texture Analyser. Consistency and hardness of stirred yogurts were performed with a TA-XT2i Texture Analyser equipped with a back extrusion ring.

RESULTS

The yogurts obtained with the WPI and carrageenan addition exhibited the highest shear stress values in comparison to control samples. The highest force values were observed for the sample obtained with the carrageenan addition, and its hardness was recorded 0,3 N. The firmness and viscosity values of the yogurts prepared using the addition of mixtures of 1% WPI and 0,15% carrageenan were the highest. Yogurts with the addition of liquid mixtures of 1% WPI and 0,1% carrageenan exhibited similar firmness values, but significantly lower viscosity values than yogurts with the addition of the same lyophilized mixtures.

CONCLUSIONS

The addition of lyophilized protein-polysaccharide mixture influenced the texture of the yoghurt. Yogurts with the addition of mixtures of WPI and carrageenan exhibited higher values of firmness and viscosity in comparison to the sample obtained with the other mixtures. The properties of the yogurts obtained using lyophilized mixtures of WPI and carrageenan were better than those fortified with liquid mixtures. These yogurts showed similar firmness and higher viscosity values. Our results indicate that lyophilized protein-polysaccharide mixture is suitable to improve the texture of stirred yogurts.

Key words: polysaccharide, rheology, texture, yogurt

Proteins changes during processing of wheat dough enriched with barley depending on its quantity and preparation method

Anna Czaja, Agata Wojciechowicz-Budzisz, Zygmunt Gil

Wrocław University of Environmental and Life Sciences
The Faculty of Food Science
Contact e-mail: anna.czaja@up.wroc.pl

INTRODUCTION

Properties and quality of dough depend on many factors. Its behavior is influenced by the quality of the flour, the raising agent and use of other additives. During formation and later, during fermentation, dough ingredients interact with each other. These factors influence baking properties, bioavailability of some compounds and the general behavior of the dough. Despite the fact that grains are not the best source of proteins for human nutrition, their properties are important for dough formation.
Barley is known as grain with high content of pentosans and β-glucans. Because of that it may be healthy additive to the popular cereal products. In order to develop the proper methods of production, dough properties are required to be identificate.

AIM

The aim of the present study was to evaluate proteins quantity and quality and properties such as acidity in dough with addition of wholegrain hull-less barley flour.

MATERIALS AND METHODS

The doughs were obtained by two methods: single-phase and three-phase. The single-phase method uses yeast as leavening agent and requires the association of all components in one step . The three-phase method involves the usage of sourdough, in this case prepared from wholegrain barley flour. The barley flour was obtained by milling grain from Gawrosz (former STH 7809) and STH 4933 varieties by Hagberg – Perten mill. Their amounts in doughs were 0% (a control sample), 20%, 30% and 40%. Humidity, quantity and quality of proteins and active and passive acidity were measured. All measurement were carried out twice: after mixing and after fermentation of doughs.

RESULTS

The three-phase method usage resulted in higher protein content compared to single-phase method. Additionally, some protein fractions were lower when single-phase method was used. The 40% barley quantity in doughs increased total protein content, but did not influenced quantity of particular groups of proteins in comparison to 20% and 30% addition of barley. The step of processing, the quantity of barley and used method all changed dough properties. Acidity was higher in doughs with barley and for those prepared with three-phase method.

CONCLUSIONS

The method of preparation may change dough properties. The process of fermentation in most cases did not change levels of protein fractions in doughs, therefore it might be said that this process is safe for proteins stability. The increasing addition of barley causes higher total protein content, although increasing barley addition does not cause changes among protein fractions. That may mean that majority of protein from barley is insoluble.

Key words: hull-less barley, dough, proteins, processing

Biodiversity of yeast during spontaneous fermentation of musts obtained from the Węgierka Dąbrowicka and Stanley plum varieties

Karolina Czajor, Paweł Satora

University of Agriculture in Krakow
Department of Fermentation Technology and Technical Microbiology
Contact e-mail: czajorka@wp.pl

INTRODUCTION

The chemical composition of plums, in quantitative and qualitative terms, directly influences the presence of various microorganisms (mainly yeasts) on the surface of the fruits. Because of the fact that yeast are fermenting, the differences in microbiota affect the quality of the beverage produced from fruits. The determination of the influence of the variety of plum used in the research on the composition of the microbiota living on the fruits and during their fermentation allows to conclude the quality and chemical profile of the resulting product.

AIM

The aim of this study was to determine the qualitative and quantitative composition of the yeast microbiota of spontaneously fermenting musts of the studied plum varieties as well as observe the changes during various stages of spontaneous fermentation.

MATERIALS AND METHODS

Plum mashes used for the fermentation were obtained from Wegierka Dąbrowicka and Stanley plum fruits (harvested on August/September 2012 from three plum orchards in Łącko area). The plums were sorted (mechanically injured, decayed and rotten fruits were removed), cut in quarters and weiged out to 0.5 kg per 1-L sterile glass flask. The fruits were pressed so that the juice covered their surface, then the flasks were stopped with fermentation tubes with glycerine. Alcoholic fermentation was conducted for 30 days at 20 °C. Throughout the fermentation aseptically 1 mL of sample were collected and after proper dillution spread onto WL nutrient agar and lysine agar. The quantitative analysis of the grown colonies was conducted, and the pure cultures were isolated for further qualitative analysis. The identification of the strains was performed by using conventional and the PCR-RFLP methods. The results of the research were compared to the available databases. All samples were done in triplicate.

RESULTS

In the beginning of fermentation an increased number of yeast colonies on the medium WL was noticed. Yeast population on Stanley musts was characterized by faster and more intense growth than Węgierka Dąbrowicka variety, although in the first one there was decline of yeast number at the early stages of fermentation. Among the isolated yeasts the most important were the representatives of the *Kloeckera/Hanseniaspora* genus, the quantity of which decreased during spontaneous fermentation. There has been differences in the growth rate as well as yeast cells number of the *Kloeckera/Hanspeniaspora* genus between plum varieties.

CONCLUSIONS

The spontaneous fermentation process is usually initiated by both the indigenous yeasts mainly of *Kloeckera*/*Hanseniaspora* genus. A gradual decrease in the amount of yeast may be due to the increasing content of ethanol in the settings during subsequent days of fermentation. In that case the highly fermented, high alcohol content resistant yeast of the *Saccharomyces* genus are predominant. The observed differences between the two studied varieties in qualitative and quantitative composition
of microorganisms may be due to their different chemical composition. These differences are likely to affect the chemical composition and thus the final quality of the alcohol product.

Key words: spontaneous fermentation, plums, yeast

The evaluation of folate content in yoghurt with the use of high performance liquid chromatography method

Marta Czarnowska, Elżbieta Gujska

University of Warmia and Mazury in Olsztyn
Department of Commodity Science and Food Analysis
Contact e-mail: marta.czarnowska@uwm.edu.pl

INTRODUCTION

Milk and fermented dairy products provide about 10-15% of the daily requirement for folate, the naturally occurring in food folic acid derivatives. Although folate content in milk is low (5-10 µg/100 g), due to its high consumption, it might be a significant source of this vitamin in the human diet. Moreover, many products, such as yogurt, are produced with the addition of a variety of lactic acid bacteria that can synthesize folate. Unfortunately, folate are very unstable and their content in fermented dairy products depends on many factors such as: milk quality, the processing method, species and strains of starter bacteria, incubation time and storage conditions.

AIM

The aim of the study was to evaluate folate content in the trademark milk and yoghurts, both fresh and stored at the cooling temperature up to 34 days.

MATERIALS AND METHODS

The tested material was yogurt produced with the traditional technology from cow's milk with the thermostat method. Bulk milk before inoculation process was: normalized (2.0% fat), homogenized (1st degree 18 MPa Grade, 2nd degree 5 MPa) and pasteurized (90 °C/ 5 min.). For the yoghurt production Ltd. DaniscoBiolacta vaccine (Streptococcus thermophilus and Lactobacillus delbrueckissp. Bulgaricus), called - YC11 yogurt, was used. Ripening conditions as follows: 43.5 °C / 4.5 h, pH = 6.5. Products were cooled and stored at 4 °C. Determination of folate content was performed using high performance liquid chromatography technique with the use of fluorescence detector with the method described by Czarnowska and Gujską (2012).

RESULTS

In the analyzed samples only one folate form was determined, 5-methyltetrahydrofolate ($5CH_3FH_4$). In the raw bulk milk folate content was determined at the level of 4,0 µg/100 g. The process of milk pasteurization, which was used, did not cause a significant decrease in this folate form. Statistically significant ($\alpha = 0.05$) decrease in $5CH_3FH_4$ content was observed in yoghurt in comparison to the raw bulk milk. During storage, folate content increase, in comparison to the raw bulk milk, was not noticed in the tested yoghurts, while a significant decrease in this vitamin content during storage at the cooled temp. was observed.

CONCLUSIONS

Fermented dairy products containing lactic acid bacteria for centuries have been very popular because of their healing properties. Therefore, the use of appropriate starters for the production of fermented beverages containing selected bacteria which synthesize folate, is a key point in the production of a functional food with improved nutritional value.

References:
Czarnowska M., Gujska E. 2012. Effect of Freezing Technology and Storage Conditions on Folate Content in Selected Vegetables. Plants for Human Nutrition. (2012) 67:401–406.

Key words: folate, yoghurt, storage, HPLC

Changes of water holding capacity, texture parameters and myofibrillar fragmentation index of bullocks meat obtained from Polish Holstein-Friesian breed during 12 days of ageing under vacuum

Piotr Domaradzki, Mariusz Florek, Anna Litwińczuk, Agnieszka Staszowska

University of Life Sciences in Lublin, 20-950 Lublin, Akademicka 13, Poland,
Department of Commodity Science and Processing of Raw Animal Materials
Contact e-mail: piotr.domaradzki@up.lublin.pl

INTRODUCTION

Beef meat is mainly used as a culinary meat. Regardless of the intravital and post-mortem circumstances the aging process is an important factor that influence on the final beef quality. A lot of complex changes in muscle tissue take place as a result of aging. The most visible qualitative change observe during ageing is improvement of meat tenderness. It is thought that proteolytic degradation of myofibrils structure is largely responsible for this effect.

AIM

The aim of this study was to evaluate the effect of conditioning time (during 12 days of ageing under vacuum) on the water holding capacity and texture parameters changes as well as the myofibrillar fragmentation index of two skeletal muscles from bullocks of Polish Holstein-Friesian breed.

MATERIALS AND METHODS

The research material consisted of *m. longissimus lumborum* (LL) and *m. semitendinosus* (ST) of bullocks aged approximately 18 months. Samples were taken from 41 carcasses than vacuum packed in the PA/PE foil bags and stored at 4°C. After 2, 7 and 12 days *post-mortem* the following parameters were analyzed: water holding capacity (WHC) by drip loss (DL), cooking loss (CL) and filter paper press by Graua i Hamma [1953] method (G-H). The texture studies of meat were performed with Zwick/Roell Proline B0.5 machine. Hardness, springiness, gumminess and chewiness were measured using the TPA test. Warner-Bratzler test was used to record the maximum shear force (W-B SF) and shear energy. Determination of myofibrillar fragmentation index (MFI) was performed by Hopkins et al. [2000] method.
Statistical analyses were calculated using Statistica ver. 6.0 by means of a two-way analysis of variance in order to study the muscle and storage time effects and their interactions. Fisher LSD test was used for post-hoc comparisons. Pearson's correlation coefficients between meat quality indicators (separately for muscle) were also determined.

RESULTS

A significant ($P \leq 0.01$) impact of muscle type and ageing time on all WHC properties, W-B SF, shear energy as well as hardness and springiness were found. For the LL and ST muscles, in the following days of aging DL, CL and MFI values increased whereas the amount of loose water (measured by G-H method), W-B SF, shear energy, hardness and springiness decreased. For both muscles, MFI was positively correlated with DL, CL - ($0{,}20 \leq r \leq 0{,}57$) and negatively correlated with loose water G-H - ($-0{,}30 \leq r \leq -0{,}53$) as well as springiness ($-0{,}18 \leq r \leq -0{,}23$), W-B SF and shear energy - ($-0{,}38 \leq r \leq -0{,}71$).

CONCLUSIONS

During the 12 days of ageing, the significant improvement of tenderness and decrease of loose water (G-H) for the LL and ST muscles were observed. ST muscle showed significantly lower WHC and higher values of the TPA parameters compared to the ML. However, the lower W-B SF and shear energy in the ST muscle were observed during the following days of aging. Ageing is an important process which has beneficial influence on culinary and technological beef usefulness.

Key words: beef, ageing, water holding capacity, texture, myofibrillar fragmentation index (MFI)

The effect of cold storage time on changes in the color of hard-boiled eggs

Aleksandra Drażbo[1], Iwona Chwastowska-Siwiecka[2], Natalia Skiepko[2], Katarzyna Klekotko[2]

[1]University of Warmia and Mazury, Department of Poultry Science
[2] University of Warmia and Mazury, Department of Commodity Science and Processing of Animal Raw Materials
Contact e-mail: aleksandra.drazbo@uwm.edu.pl

INTRODUCTION

Consumer demand for high-quality, long-life convenience foods is today on the rise. Color is one of the major attributes which affect consumer perception of egg quality however very little data exist on the changes of color hard-boiled eggs during storage.

AIM

The aim of this study was to determine the effect of cold storage time on changes in the color of the yolk and white of hard-boiled eggs.

MATERIALS AND METHODS

The experimental materials comprised 42 commercial eggs. The eggs were boiled for 12 minutes, chilled and shelled. 28 eggs were vacuum-packaged and were cold stored for 7 and 14 days. 14 eggs (control group) were analyzed immediately. The color of the egg yolk and white was evaluated in the CIE LAB system, based on the following parameters: lightness (L^*), redness (a^*), yellowness (b^*), chroma (C^*), hue (h°) and total color difference (ΔE). The measurements were performed on boiled unpackaged eggs – kept for 0.5 h at 4°C, and on boiled packaged eggs – immediately after unpacking.

RESULTS

An analysis of the color of the egg white showed that the experimental factor contributed to changes in L*, b* and C* values, which were highest after 14 days of cold storage. The yellowness and saturation increased proportionally to the time of cold storage. Similar trends were noted while analyzing the color of the egg yolk. The yolks of vacuum-packaged eggs stored for 14 days were characterized by the highest values of a*, b* and C* (statistically significant differences). Storage time had no influence on changes in L*. A highly significant increase in ΔE was observed in the egg yolk and white over storage.

CONCLUSIONS

The whites of vacuum-packaged eggs were lighter in color after 14 days of cold storage. The whites of boiled, unpackaged eggs were characterized by the lowest contribution of redness and the smallest shift towards yellow. In the yolks of packaged eggs, C* values increased significantly during storage, thus increasing the perceived intensity of color and the share of red and yellow components. In the white and yolk of vacuum-packaged eggs, ΔE values increased over cold storage by 0.61 and 2.51, respectively, compared with unpackaged samples, which may suggest color deterioration in the former. Eggs stored for 14 days were characterized by the highest color stability, followed by eggs stored for 7 days.

Key words: hard-boiled eggs, color, storage time.

Optimization of mineral composition for the production of fermentation metabolites by Citrobacter freundii

Agnieszka Drożdżyńska, Joanna Pawlicka, Alicja Kośmider, Piotr Kubiak

Poznań University of Life Sciences
Department of Biotechnology and Food Microbiology
Contact e-mail: agadro@up.poznan.pl

INTRODUCTION

Fermentation is the oldest of all biotechnological processes. Nevertheless, it is a very vibrant and fast growing area. The optimization of fermentation medium is very important for development of fermentation processes. The conventional methods of optimizing medium composition are time-consuming and often fail because of neglecting interactions between optimized factors. The Plackett-Burman design is one of the statistical techniques used for screening of the most important variables. This technique can evaluate the effects of many factors and determine how these factors interact.

AIM

The aim of this work was to determine the most important mineral agents for metabolites production by *Citrobacter freundii* AD119 using Plackett-Burman design.

MATERIALS AND METHODS

Citrobacter freundii AD119 isolated from food and deposited at Polish Collection of Microorganisms under accession number B/00044 was used. The strain was cultivated for 7 days at 30 °C in different media, which were prepared according to the Plackett-Burman design. After incubation the broth were collected and analyzed by HPLC (Agilent Technologies 1200 series).

RESULTS

A total of 11 mineral agents ($MgSO_4$, $CaCl_2$, $FeSO_4$, $CoCl_2$, $MnSO_4$, $ZnCl_2$, H_3BO_3, Na_2MoO_4, $NiCl_2$, $CuCl_2$, NaCl) were screened in order to determine the most important factor for the production of various metabolites (ethanol, 1,3-propanediol, succinic, lactic and acetic acids) using Plackett-Burman design. $MgSO_4$ and $CoCl_2$ were identified as factors having significant influence on metabolite production by *Citrobacter freundii* AD119. $MgSO_4$ had positive effect on the production of metabolites, while $CoCl_2$ had negative effect, however interaction between these elements had positive effect.

CONCLUSIONS

The Plackett-Burman design is a good tool for screening important factors. The mineral agents affect the production of microbial metabolites, $MgSO_4$ and $CoCl_2$ had the most significant influence on the profile of final metabolites.

This work was prepared within the framework of project no.01.01.02-00-074/09 co-funded by The European Union from the European Regional Development Fund within the framework of the Innovative Economy Operational Programme 2007-2013.

Key words: *Citrobacter freundii*, Plackett-Burman design

The composition of yeast microbiota during the spontaneous fermentation of musts obtained from Węgierka Zwykła and Čačanska Lepotica plum varietes

Ewa Dydo, Paweł Satora

University of Agriculture in Krakow
Department of Fermentation Technology and Technical Microbiology
Contact e-mail: ewa.dydo@poczta.onet.pl

INTRODUCTION

The chemical composition of plums has a direct influence on the presence of specific microorganisms (mainly yeast) on the fruits' surface, in terms of their quality and quantity. As the yeats cause fermentation, the differences in microbiota have an impact on the quality of the alcohol products. Hence, the determination of the influence of plum variety on the chemical composition of yeasts present on fruits and during their spontaneous fermentation makes it possible to predict the quality of the product obtained.

AIM

The aim of this studies was to analyse the qualitative and quantitative composition of the yeast microbiota throughout spontaneous fermentation of musts obtained from the studied plum varieties.

MATERIALS AND METHODS

Plums were harvested from an orchard in the area of Łącko between August and September of 2012. The fruits were sorted, cut in quarters and weighed out to 0.5 kg per 1-L sterile glass flask. The fruits were pressed so that the juice covered their surface, then the flasks were stopped with fermentation tubes with glycerine. Alcoholic fermentation was conducted for 30 days at 20 °C. Spontaneously fermenting juice was sampled at regular intervals and cultures were made on the growth media: WL and Lysine agar. After the incubation, the quantitive analysis of grown colonies was made, and pure cultures were isolated in order to make a further qualitative analysis. Identification of the strains was carried out using conventional methods, as well as PCR-RFLP analysis. The results obtained were compared with available databases.

RESULTS

During the particular stages of fermentation, the differences in the quality and quantity of the microflora composition were observed. *Non-Saccharomyces* yeasts dominated during the early stages of fermentation and in the fresh must. Their number did not differ significantly between the studied varieties. *Kloeckera/Hanseniaspora* yeasts played a considerable role among them. Faster decline number of *Kloeckera/Hanseniaspora* yeast was observed in Čačanska Lepotica mashes. The general number of yeasts was also different for the two of examined varieties. In musts obtained from Węgierka Zwykła plum variety, higher general number of microbiota, than in case of Čačanska variety has been observed. Time of the presence of high number of yeast and hence the duration of fermentation time, also differ between two examined varieties.

CONCLUSIONS

Decrease in the amount of *Non-Saccharomyces* yeasts that dominated during the early stage of fermentation was caused by the growing alcohol concentration in the fermenting must. They were displaced by *Saccharomyces* yeasts, more resistant to the high concentrations of ethanol. The differences in qualitative and quantitative composition the yeast microbiota between two examined varieties of plums, occuring during fermentation of musts, may be caused by different chemical composition of fruits. The observed differences in the composition of microbiota, as well as their changes during the spontaneous fermentation process of examined musts, are highly probable to influence the chemical composition, and thereby, the quality of the obtained alcohol beverage.

Key words: spontaneous fermentation, plums, yeats

Validation of the newly developed questionnaire estimating intake of vitamins B_6, B_{12} and folic acid

Małgorzata Fejfer, Magdalena Człapka – Matyasik

Poznań University of Life Sciences
Department of Human Nutrition and Hygiene
Contact e-mail: m.fejfer@up.poznan.pl

INTRODUCTION

High blood pressure is one of the most common chronic conditions worldwide and a major contributor to extent of coronary heart disease. However, appropriate lifestyle and diet can significantly reduce the symptoms of hypertension. It has been demonstrated that homocysteine level is positively associated with blood pressure (BP). Simultaneously it has been shown that a deficiency of vitamin B_6, B_{12} and folic acid can lead to hyperhomocysteinemia. In our country, 30% of patients is characterized by a high level of this compound in the blood (NATPOL Plus).

AIM

The aim of study was to develop a simple and short questionnaire estimating intake of vitamin B_6, B_{12} and folic acid and validation of the newly developed questionnaire to FFQ (*Food Frequency Questionnaire)* in order to verify its correctness.

MATERIALS AND METHODS

The study included 38 people aged 21-26 years with normal blood pressure. BMI *(Body Mass Index*)was in the range 16.2 to 28.7 kg/m^2, when 74% of subjects were characterized by normal weight, 18% were underweight, 8% - overweight. Both questionnaires were used to assess the average intake of selected vitamins for the last 12 months. Short questionnaire (SQ) included questions about the frequency and size of servings of 17 products, selected as the best source of vitamin B_6, B_{12}, folic acid, and FFQ - 76 questions included all product groups.

RESULTS

The values obtained using SQ were much lower than FFQ results. Simultaneously, according the FFQ results:80% of individuals covered demand for B_{12}, 50% for B_6 and 2% for folic acid. Validation of questionnaires showed lack of correlation (r=0,18) between B_{12} (SQ) and B_{12} (FFQ), and moderate positively correlation between B_6 (SQ) and B_6 (FFQ) r=0,45 and folic acid (SQ) and folic acid (FFQ) r=0,56.

CONCLUSTIONS

In view of the obtained results, it is recommended the reassessment of SQ selected products and to extension of the products list with a lower content of selected vitamins, but consumed more often and in larger portions.

Financially supported by the UE Project nr PO IG 01.01.02.00-061/09

Key words: homocysteine, B_6, B_{12}, folic acid, hypertension, validation

Effect of marinating on the formation of 2-amino-3,4-dimethyl-imidazo[4,5-f] quinoline (MeIQ) and 2-amino-1-methyl-6-phenyl-imidazo[4,5-b]pyridine (PhIP) in grilled pork

Agnieszka Frala[1], Włodzimierz Dolata[2]

Poznań University of Life Sciences
[1] Department of Food Biochemistry and Analysis, [2] Institute of Meat Technology
Contact e-mail: afrala@up.poznan.pl

INTRODUCTION

Several studies carried out throughout the world have shown that the thermal treatment of meat promotes the formation of many compounds, which are not present in the raw meat. Also, it has been shown that some of these substances have carcinogenic effects on the human body. Among other things, such compounds are heterocyclic aromatic amines (HCA). Contemporary man, for whom meat dishes constitute the main source of amino acids, is not able to avoid the risk of exposure to heterocyclic aromatic amines (HCA). Thus it is so important to focus on the problem of factors which may inhibit the formation of these compounds.

AIM

The scientific aim of the project was to select such marinades, which would reduce the formation of 2-amino-3,4-dimethyl-imidazo[4,5-f] quinoline (MeIQ) and 2-amino-1-methyl-6-phenyl-imidazo[4,5-b] pyridine (PhIP) in analyzed porcine muscles.

MATERIALS AND METHODS

Solid phase extraction (SPE) was used in order to isolate and purify the fractions of heterocyclic aromatic amines. HCA were determined by high-pressure liquid chromatography combined with a mass detector (UPLC-TQD). Raw material for analyses comprised of 2 muscles coming from porcine carcasses (loin, best end of neck). Different marinating brines were used in marinating. They contained, among other things, NaCl, glucose, and rosemary extract in various proportions. In addition to marinating pilsner type lager, dry red wine, mead and commercial marinade were used.

RESULTS

In marinade and non-marinade samples heterocyclic aromatic amines were determinate. 2-amino-1-methyl-6-phenyl-imidazo[4,5-b] pyridine (PhIP) was determinate in the most amount in both types of muscles. All marinades reduce the content of PhIP and MeIQ. Results of studies suggest the most effective action of commercial marinade. It reduced the content of PhIP, which - as it known - is a heterocyclic aromatic amine formed in the highest amounts during grilling. An addition of mead and marinating brine containing NaCl and rosemary caused an inhibition of MeIQ formation.

CONCLUSIONS

The concentration levels of 2-amino-3,4-dimethyl-imidazo[4,5-f] quinoline (MeIQ) and 2-amino-1-methyl-6-phenyl-imidazo[4,5-b] pyridine (PhIP) were different and depend on the type of muscles and type of the marinade.

Key words: heterocyclic aromatic amines, grilled pork, marinating

Degradation kinetics of selected compounds in red beet and chokeberry concentrate during storage

Katarzyna Gościnna

Poznań University of Life Sciences
Department of Fruit and Vegetables Technology
Contact e-mail: goscinna@up.poznan.pl

INTRODUCTION

From the nutritional point of view juices play an important role in our diet. A significant group comprises red-colored juices, derived from natural raw materials containing betalain and anthocyanin pigments. These pigments are relatively unstable compounds.

AIM

The aim of this study was to evaluate the influence of storage at 4, 15 and 25°C for 11 months on stability of anthocyanins, betalains and polyphenols in a mixture of red beet and chokeberry concentrates.

MATERIALS AND METHODS

Contents of anthocyanins, betalains and polyphenols were determined by HPLC and spectrophotometry.

RESULTS

During storage soluble solids and pH did not change significantly. Storage temperature and time had
an important effect on the contents of these compounds. A greater degradation of anthocyanins was recorded at higher temperatures. A anthocyanin and betacyanin degradation followed the first-order kinetics. At 4, 15 and 25°C half-life of anthocyanins was 51, 107 and 347 days, respectively,
and activation energy was 49.1 kJ/mol. The greatest betalain stability was observed for the concentrate stored at 4°C. At that temperature the highest value of 770 days for half-life and 71.1 kJ/mol activation energy were observed. Polyphenol content increased during the first 28 days of storage at each temperature. After 1 month of storage in each case the contents of these compounds decreased, and the losses were greater at higher storage temperatures.

CONCLUSIONS

Anthocyanins, betacyanins and polyphenols were degraded during storage. Greater losses were found for these compounds at higher temperatures.

Key words: anthocyanins, betalains, polyphenols, degradation kinetics

The volatile profile of transgenic, thaumatin II expriming cucumber fruits and the determination of lipoxygenase pathway protein

Michał Gośliński[1], Tomasz Rychlik[2], Renata Zawirska-Wojtasiak[2]

[1]Nicolaus Copernicus University, Ludwik Rydygier Collegium Medicum in Bydgoszcz,
Department of Nutrition and Dietetics
[2]Poznań University of Life Sciences,
Department of Food Science and Nutrition,
Contact e-mail: m.goslinski@cm.umk.pl

INTRODUCTION

Aroma is one of the most important quality criteria of fruit and vegetables. Plants have the ability to produce aroma volatile aldehydes and alcohols, which give rise to characteristic flavors and odors. Damage to plants, wounding, cutting, and so on, initiates a cascade of enzymic reactions, ending with the production of carbonyl compounds and their derivatives, which is known as the lipoxygenase pathway.
A cucumber (*Cucumis sativus* L.) is a popular vegetable appreciate of its flavor.The main constituents of cucumber aroma are six- and nine- carbon atoms compounds biosynthetized from fatty acids. Isolation and identification of volatile components from blended cucumber tissue has shown that (E,Z)-2,6-nonadienal and (E)-2-nonenal are the most important.

AIM

The aim of this study was isolation and identification of proteins, especially thaumatin and enzymes of lipoxygenase pathway. Furthermore it was investigated whether the genetic modification produce some changes in cucumber volatile profile.

MATERIALS AND METHODS

Four lines of genetically modified cucumbers with different levels of thaumatin II transgene expression were selected for evaluation. Plants of non-modified Borszczagowski cv. (*Cucumis sativus* L.) were used as a control (line B).
The aroma of cucumber fruits was evaluated by GC/MS chromatography in the isolates obtained by solid phase microextraction method (SPME).
For protein extraction from the cucumber tissue a combination of TCA/acetone and phenols method were used. The protein mass determination was performed by SDS-PAGE electrophoresis using thaumatin and lipoxygenase as standards.

RESULTS AND CONCLUSIONS

The analysis showed rather no qualitative but quantitative differences between modified and non-modified samples in the control as well as in the transgenic lines. Genetically modified samples showed higher concentrations of volatiles, particularly of the main cucumber fruits odorant (E,Z)-2,6 nonadienal. However, estimated activity of the enzymes of the lipoxygenase pathway, responsible for the cucumber volatiles production, was not correlated with the concentration of the aroma compounds.

Key words: transgenic cucumber fruits, lipoxygenase pathway, aroma, thaumatin II

Binding of some Fusarium and Alternaria mycotoxins by fermentative bacteria

Daniela Gwiazdowska[1], Agnieszka Waśkiewicz[2], Anna Gliszczyńska-Świgło[3]

[1]*University of Economics, Faculty of Commodity Science, Department of Natural Science and Quality Assurance*
[2]*Poznań University of Life Science, Department of Chemistry*
[3]*University of Economics, Faculty of Commodity Science, Department of Technology and Instrumental Analysis*
Contact e-mail: d.gwiazdowska@ue.poznan.pl

INTRODUCTION

Mycotoxins are secondary metabolites produced by hyphomycetes fungi, that are capable of causing different diseases in humans and animals. *Fusarium* and *Alternaria* mycotoxins commonly occur in crops as well as they can be detected in food and feed, therefore different methods of detoxification or toxins removal are investigated. These strategies include physical, chemical and biological methods. Biological detoxification consist in the degradation or binding of mycotoxins. Especially the microorganisms that naturally occur in food and possess GRAS status, such as lactic and propionic acid bacteria, are of high interest.

AIM

In the presented paper ability of some lactic and propionic acid bacteria to bind some *Fusarium* and *Alternaria* toxins was investigated.

MATERIALS AND METHODS

Three *Fusarium* toxins: nivalenol, deoxynivalenol and zearalenone as well as two *Alternaria* toxins: altenuene and tenuazonic acid were chosen to investigation. Three species of *Lactobacillus*, two species of *Bifidobacterium* and one species of *Propionibacterium* were tested for their ability to remove mycotoxins from medium. Bacteria were cultivated in MRS medium and centrifuged. Biomass was suspended in PBS to receive density 10^{10} CFU/ml and mixed with mycotoxins solutions to achieve a final concentration 10µg/ml. After incubation and centrifugation, concentration of mycotoxins and their main derivatives were measured with HPLC.

RESULTS

The results showed that all tested bacteria removed examined mycotoxins from medium. Percent of the concentration reduction was differentiated and depended on both examined mycotoxin and used strain. Better results were observed in case of *Fusarium* toxins in comparison with *Alternaria* metabolites. Usually the higher efficiency of process was observed in case of lactic acid bacteria, especially *Bifidobacterium*. Removal of mycotoxins was observed in samples with viable as well as nonviable cells, what indicates that probable reason of that process was an adsorption to cell surface.

CONCLUSIONS

It was found in this study that both lactic acid bacteria and propionibacteria significantly reduce mycotoxins concentration in liquid medium. The effectiveness of the process depends on the bacterial strain and mycotoxin. Selected strains of lactic acid bacteria and propionibacteria may be used as feed additive to decrease mycotoxins amount and limit their harmfulness for animals.

This work was partially supported by the Polish Ministry of Science and Higher Education (Grant No N N312 494740)

Key words: mycotoxin, detoxification, lactic acid bacteria, propionibacteria, binding

Evaluation of the potential of new Clostridium species *to produce organic acids and 1,3-propanediol*

Marta Hetman, Dagmara Leśniak

Poznań University of Life Sciences
Department of Biotechnology and Food Microbiology
Contact e-mail: martaspy@up.poznan.pl

INTRODUCTION

Clostridium species are known as natural producers of organic acids, mainly butyric and acetic acid and have been used for its industrial production in the past 100 years. Butyric acid and acetic acid are widely used in food industry. Their esters are extensively used as flavors additives to increase fruit-like fragrance in the food industry.
The other product of fermentation – 1,3-propanediol – has also a potential application in food industry. The condensation product of 1,3-PD and terephthalic acid is a copolyester with an excellent properties such as stain resistance and good resilience. It is a very promising engineering plastic that has the potential to replace the traditional polyethylene terephthalate (PET) and polybutylene terephthalate (PBT) and can be used as packaging material, such as beverage bottle. 1,3-PD also has a number of other interesting applications in food industry in addition to that of a polymer constituent. In recent patents it was discussed as a component of animal feed because of its viscosity and in drinking water because of biocidal or biostatical effect of its formic acid ester.

AIM

The aim of this study was to verify fermentation profiles of new *Clostridium* strains.

MATERIALS AND METHODS

The wild type of *Clostridium butyricum* was isolated from environmental sample. Other species were obtained from mutants with high tolerance to glycerol via genome shuffling method. The metabolic profiles of the new *Clostridium butyricum* strains were verified during batch fermentations in a medium containing glycerol as a carbon source at a concentration of 70 g/L, with automatic pH and temperature regulation.

RESULTS

The study has shown that new *Clostridium* species produce more organic acids than the wild type. Differences in kinetics of 1,3-PD production also could be observed.

CONCLUSIONS

Concentration of metabolites during glycerol fermentation can be increased by strain development. With the decreasing supply of world crude oil, the increasing supply of food industry by-products which can be used for butyric acid production and the increasing consumer demand for organic natural products in food additives, pharmaceutical products, and preservatives, the production of butyric acid, acetic acid and 1,3-propanediol through microbial fermentation has generated again a favorable business climate.

This work was prepared within the framework of project no.01.01.02-00-074/09 co-funded by The European Union from the European Regional Development Fund within the framework of the Innovative Economy Operational Programme 2007-2013.

Key words: *Clostridium butyricum*, fermentation, organic acids, 1,3-propanediol

The impact of the lactic acid bacteria, propionibacteria and raw milk isolates on main cow milk proteins SDS-PAGE profile

Joanna Jasnowska-Malecka

Poznan University of Economics
Department of Natural Science & Quality Assurance
Contact e-mail: j.jasnowska@ue.poznan.pl

INTRODUCTION

Milk is a basic food product for humans affording essential nutritional components (proteins, fats, carbohydrates, minerals and vitamins). Cow milk contains about 30 different proteins which are potentially allergenic for humans. The main allergens of milk are represented by caseins (alfa S1, alfa S2, beta, kappa) and whey proteins (beta-lactoglobulin and alfa-lactalbumin).
To reduce milk products allergenicity many thermal and non-thermal (mainly enzymatic) treatments are undertaken during production process. The lactic acid fermentation is considered to be one of the safety food production method. During fermentation process the lactic acid bacteria reduce lactose content (lactose intolerance) and reduce allergenicity of milk proteins. Some of lactic acid bacteria and propionibacteria strains are classified to the probiotic microorganisms. Recently the huge interest of the use of probiotic bacteria conferring beneficial effects on the human health in production of safety foods is observed.

AIM

Aim of the work was the assessment of biodegradation of milk proteins by propionibacteria and lactic acid bacteria and raw milk isolates by the means of SDS-PolyAcryl Gel Electrophoresis

MATERIALS AND METHODS

The strains used for experiments were: *Lactobacillus rhamnosus, Bifidobacterium adolescentis, Propionibacterium freundenreichii ssp. shermani* and grampositive rods and coccus isolatets from raw milk. Bacteria were added to medium containing 10% solution of milk powder or casein solutions. The incubation time was stopped by centrifugation after 0, 15 minutes and 1; 2; 3 hours. Proteins separated from the culture precipitate and supernatant were analyzed by SDS-PAGE, stained with Coomassie Brilliant Blue. Changes in protein concentration were examined by the use of Bradeford method.

RESULTS

The electropherograms differed in intensity of protein bands, what corresponds to quantitative changes in electrophoresis profile of milk proteins depending on bacteria strain. The strongest effect on milk proteins under 25 kDa was caused by enzymatic activity of *Lactobacillus rhamnosus.*

CONCLUSIONS

The effect of enzymes of lactic acid bacteria and propionibacteria on milk proteins can be seen by the use of SDS-PAGE. Taking into account the bacteria with the strongest enzymatic system for technological milk protein hydrolysis to reduce allergenycity of milk proteins needs to be supported by ELISA examination of hydrolysis products.

Key words: Allergenic milk proteins, lactic acid bacteria, propionibacteria, SDS-PAGE

Effect of type of grain and methods of dough fermentation on bread quality

Paulina Karczewska, Alicja Ceglińska, Joanna Rolczyk

Warsaw University of Life Sciences
Faculty of Food Sciences, Department of Food Technology, Division of Cereal Technology
Contact e-mail: paulina.wolska1@wp.pl

INTRODUCTION

In recent years there has been a steady decrease in the consumption of bread in Poland. This effect depends on many factors, such as bread volume and crumb texture and the sensory characteristics. These features often do not meet consumer expectations. Therefore, an alternative to bread made of wheat flour and rye flour could be bread made of spelt flour and triticale obtained from dough conducted by different methods (direct and indirect).

AIM

The aim of this study was to investigate the influence of kind of grain and method of dough fermentation on the bread quality.

MATERIALS AND METHODS

The research material consisted of different extraction (70 and 95%) flours obtained from selected grains: wheat, spelt, triticale and rye. Wheat, spelt and rye flours are trademarks, and triticale flour was obtained by milling of triticale grain within laboratory. Additionally the breads obtained from the above types of flour were used as research material. An analysis of the physicochemical characteristics of flour, such as moisture content, total protein content and falling number was determined. Laboratory baking test was carried out using direct and indirect methods of dough fermentation, and then set the baking process on the basis of bread efficiency and baking loss of bread. Bread volume, bread crumb hardness and conducted scores for the quality of bread were determined.

RESULTS

All tested flour characterized by a moisture content below 15%. Among the studied flours significantly higher content of total protein were characterized by wheat and spelt flour in comparison with rye. Flour falling number test contained in a wide range, and was significantly differentiated by the type of grain. Significantly higher efficiency of bread was characterized with rye bread compared with other types of bread. Showed a significantly lower bake rye bread compared with wheat and spelt breads. Bread dough kept derived from the direct method characterized by less baking loss. Significantly lower crumb hardness of bread obtained was characterized by the indirect method. No effect of any of the investigated factors on the volume of the resulting bread. Based on the test scoring breads, except triticale bread, classified as first class quality.

CONCLUSIONS

There was a significant effect of the type of grain total protein content and flour falling number test. Baking process depend significantly on the type of grain. Significantly more efficient and less baking loss was characterized by rye bread. The hardness of the resulting bread depended significantly on the used methods of dough, showed significantly lower hardness of bread crumb cake obtained from conducted using the indirect method.

Key words: wheat, spelt, triticale, rye, methods of dough fermentation, bread quality

Antilisterial activity of lactic acid bacteria isolated from silages

Katarzyna Kluczyńska, Daniela Gwiazdowska, Marta Gawron

Poznań University of Economics
Department of Natural Science and Quality Assurance
Faculty of Commodity Science
Contact e-mail: katarzyna.kluczynska@ue.poznan.pl

INTRODUCTION

Over the last decades increased concern of practical use of lactic acid bacteria (LAB) in food protection has been observed. It is known that LAB produce metabolites with antagonistic properties as bacteriocins, organic acids and hydrogen peroxide. Bacteriocins are characterized by a numerous significant properties. These protein compounds are both tasteless and odorless as well as colorless. Another valid advantage worth mentioning is the possibility of inactivation by digestive enzymes. Data indicates that some LAB bacteriocins possess antilisterial activity. This bacteria is a foodborne pathogen which has been associated with different types of food including raw and minimally processed food. Listeriosis is an infection caused by eating contaminated food with mortality rate of 20 %.

AIM

The aim of the research was determination of antibacterial activity of lactic acid bacteria isolated from silages towards *Listeria monocytogenes*.

MATERIALS AND METHODS

A total of 48 microorganisms strains was isolated from alfalfa silage and haylage. *Listeria monocytogenes* ATCC 19111 was used as indicator microorganism.
Antilisterial activity of lactic acid bacteria was determined by well diffusion assay. Inoculum of indicator microorganism was plated on BHI agar, next the wells were cut out of the medium. The 48 hour cultures of LAB were inserted into these wells in amount of 100 µl. The incubation was taking place 24 hours in 37°C. Antagonistic activity was determined as an inhibition zone in Petri dish. Confirmation of protein nature of active substances was performed by enzymatic hydrolysis with pepsin, trypsin and chymotrypsin.

RESULTS

A selection and evaluation of LAB isolates from silages was carried out over the studies. All of them presented antagonistic activity towards *Listeria monocytogenes*. The zones oscillated from about 1 to 6 mm of limited or inhibited growth of bacteria. Strains presented highest antilisterial activity, were selected for further study. Extracts obtained from cultures of selected LAB have been inactivated under the influence of all tested proteolytic enzymes, what confirm their protein nature.

CONCLUSIONS

Conducted research showed that tested LAB isolates are a rich source of bacteriocins. Sensitivity to pepsin, trypsin and chymotrypsin proved their protein nature and showed their sensitivity toward digestive enzymes.

Key words: lactic acid bacteria, LAB, silage, *Listeria monocytogenes*, bacteriocins

Pan-frying of hamburgers in different vegetable oils

Krzysztof Krygier, Jakub Kobyliński

Warsaw University of Life Sciences, SGGW
Faculty of Food Sciences, Department of Food Technology, Division of Fats and Oils and Food Concentrates
Contact e-mail: kuba24h@gmail.com

INTRODUCTION

Frying represents a particular way of cooking food using oil or fat as a fluid heat vector. This process is used to give a particular organoleptic characteristics (color, aroma, consistency), to various food products. During the frying process reactions forming products of decomposition having a potential risk of toxicities can also occur. However pan-frying can be an alternative to deep-fat frying. It can be used for continuous cooking of meat products in the food industry, and has been considered as a possible alternative to reduce excessive fat uptake that can occur during deep-fat frying. During pan frying, the oil is heated as a thin film at high temperature for a short time. To the best of our knowledge there are a little literature data concerning the impact of pan-frying on quality of oil, that is why we have decided to conduct this experiment.

AIM

Comparison of changes in the frying oil during pan-frying of hamburgers in different vegetable oils.

MATERIALS AND METHODS

The vegetable oils selected, namely canola oil, sunflower oil and cold pressed linseed oil, are among the most popular frying oils and they were purchased from local stores. Hamburgers having approximate dimensions 10 cm diameter, 1 cm thick, 50 g of mass were also purchased from local store.

The frying experiments were conducted in the same manner as the actual household cooking process. Pan-frying was performed in Teflon stainless pan fryer (4 cm high, 24 cm diameter); two hamburgers (50 g each) were fried in 0,15 L (138,5 g; 0,7 cm high) of oil, for 5 min (2,5 min each side) at average 140 ± 5 ℃, using an electric plate of a portable electric kitchen cooker equipped with a thermostat. The oil temperature was monitored with mercury thermometer. Total frying time for each of the oils was 2 h. Samples for determination of acid value were taken at 0, 30, 60, 90, 120 minutes of frying. Additionally after 120 minutes of frying the samples for determination of polar compounds were taken.

RESULTS

During pan frying it was observed that acid value of oils being fried continues to grow. Canola oil had lowest value of initial (0,16) and final acid value (1,40). Linseed oil had the highest values of acid value; both initial (1,31) and final (1,54). Sunflower oil had a value between these two oils (0,26 in the beginning and 1,47 after 120 minutes of pan-frying). Similar results was also observed in content of polar compounds. Canola oil had lowest value of polar compounds (6,5 %), sunflower oil had medium value (8,04 %) and the highest value of this components was found in linseed oil (10,01 %).

CONCLUSIONS

As the pan-frying time increased, there was an increase in the acid value. It is noteworthy that none of investigated oils reached limit to the amount of acid value (2,5) and polar compounds (25 %). Based on the acid values and amount of polar compounds of oils heated at 140 ˚C, thin film heating (pan-frying) appeared not to be a very deteriorative process.

Key words: pan-frying, vegetable oils, acid value, polar compounds, quality

The effect of thermal processing of cruciferous vegetables, carrot and potato on functional properties of dietary fiber

Patrycja Komolka, Danuta Górecka, Małgorzata Świniarska

Poznań University of Life Sciences
Department of Food Service and Catering
Contact e-mail: pkomolka@up.poznan.pl

INTRODUCTION

Dietary fiber is composed of many compounds exhibiting various properties. Individual fractions are characterized by different functional properties, resulting in different effects in the human digestive tract.

AIM

The aim of this study was to determine the effect of heat treatment on the functional properties of dietary fiber in selected vegetables.

MATERIALS AND METHODS

The experimental material comprised common cabbage cv. *Cilion*, red cabbage cv. *Lektro,* savoy cabbage cv. *Fiona*, carrot cv. *Dolanka* and potato cv. *Augusta*. Vegetables were boiled, steamed and/or baked. The content of neutral detergent fiber (NDF), acid detergent fiber (ADF) and acid detergent lignin (ADL) were determined by the detergent method according to Van Soest with modification by Mc Queen, while the contents of hemicelluloses and cellulose were calculated from the difference between NDF and ADF. Total dietary fiber content and the soluble and insoluble fractions were determined according to Asp method. Functional properties of dietary fiber as water binding capacity and oil absorption were examined according to Robertson method with Górecka modification and Carpez method, respectively.

RESULTS

The content of dietary fiber in vegetables was very high. These products were found to be rich in cellulose and lignin. Heat treatment of vegetable affected the functional properties of dietary fiber. The highest water binding capacity was characterized by savoy cabbage boiled, while the smallest potatoes boiled in water. The highest degree of oil absorption was characterized by savoy cabbage boiled, while the smallest common cabbage steamed.

CONCLUSIONS

Thermal processing of vegetables had a significant effect on contents of dietary fiber and its fractions and functional properties of dietary fiber. The functional properties of dietary fiber can be used to design food products with special dietary use.

Financial supported by the UE Project no POiG 01.01.02.00-061/09.

Key words: dietary fiber, thermal processing, functional properties, carrot, potato, cabbage

Impact of culture conditions on vitamin B_{12} biosynthesis from crude glycerol

Alicja Kośmider, Agnieszka Drożdżyńska, Joanna Pawlicka, Piotr Kubiak

Poznań University of Life Sciences
Department of Biotechnology and Food Microbiology
Contact e-mail: kosmider@up.poznan.pl

INTRODUCTION

It is estimated that by 2016 the world biodiesel market will achieve the quantity of 37 billion gallons, which means that significantly more than 4 billion gallons of crude glycerol will be produced every year. The potential sale of this fraction might have an influence on the total price of biodiesel and make it cheaper. Therefore, new uses for crude glycerol must be sought and many innovative methods of utilization of this waste are under investigation. One possible use of crude glycerol is to use it as a carbon source for production of vitamin B_{12} in fermentation processes. It is well known, that vitamin B_{12} plays an important role in animal and human diet, it is also widely used in treatment of pernicious anemia.
Recently, results of medium optimization containing crude glycerol towards high vitamin B_{12} synthesis by propionic acid bacteria were reported (Kośmider et al., 2012). However, efficient production of this metabolite demands further studies.

AIM

The aim of this study was to optimize culture conditions (pH, temperature, aeration, time of 5,6-dimethylobenzimidazole addition, glycerol supplementation) towards high vitamin B_{12} biosynthesis from crude glycerol by *Propionibacterium freudenreichii* ssp. *shermanii.*

MATERIALS AND METHODS

Propionibacterium freudenreichii ssp. *shermanii* 1 strain (obtained from the collection of the Department of Biotechnology and Food Microbiology, Poznań University of Life Sciences, Poznań, Poland) was used. The carbon source in culture medium was crude glycerol from biodiesel production containing 86% (w/w) of pure glycerol. In order to optimize culture conditions batch and fed-batch cultivations in 5-litres stirred-tank reactors Biostat A-Plus (Sartorius, Germany) with a working volume of 4 L were carried out. Vitamin B_{12} concentration in culture samples was quantified by HPLC.

RESULTS

The best results (12.8 mg/L) were achieved in batch fermentations at 35°C with daily pH regulation to 6.5 and stirring at 200 rpm. 5,6-DMB was added at 96th hour of the process and aeration was started at that moment at 0.33 vvm in cycles: 12h of aeration followed by 12h without aeration.

CONCLUSIONS

Vitamin B_{12} production increased 3-fold compared to the results obtained before the optimization experiments.

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Key words: vitamin B_{12}, crude glycerol, propionic acid bacteria, fermentation

Potato glycoalkaloids – the poison or useful bioactive component?

Przemysław Kowalczewski, Grażyna Lewandowicz

Poznań University of Life Sciences
Department of Biotechnology and Food Microbiology
Contact e-mail: przemyslaw.kowalczewski@up.poznan.pl

INTRODUCTION

Potatoes are a popular, carbohydrate-rich food prepared and served in a variety of ways. Freshly harvested contain of about 80% water. 60–80% of the dry matter is starch. Potatoes contain also vitamins (vitamin C, B1, B2, B6, niacin) and minerals (magnesium, potassium, iron, phosphorus, zinc) and phytochemicals, such as carotenoids and natural phenols. Unfortunately, they contain also glycoalkaloids (GAs) of well documented toxicity. The most important are α-solanine and α-chaconine which represent approximate 95% of total GA in the potato, *Solanum tuberosum* L. They are regular constituents of conventional potato varieties and, in small amounts, contribute to the typical potato flavour. Higher amounts make the potato taste bitter and might cause in consumers discomfort or illness. The toxicity of GAs to humans has focused a lot of attention of food technologist as well as biologists looking for new potato varieties of a low GAs content. As a result, the total GAs content in commercial potato varieties is usually below 200 mg/kg , i.e. the recommended safety level in potatoes for human consumption (FAO/WHO, 1999). However it can increase during storage, transportation and under the exposure to light, heat, cutting, slicing, sprouting, and phytopathogens.
Glycoalkaloids are secondary plant metabolites synthesized to be toxic to bacteria, fungi, viruses, insects, and animals. They are commonly found in plants of the *Solanum* genus. These include many common vital agricultural plants including potato (*Solanum tuberosum*), tomato (*Solanum lycopersicum*), and aubergine (*Solanum melongena*). Bioactivity of GAs is not limited to their toxicity. They have been reported to possess anticancer, anticholesterol, and anti-inflammatory properties. Several studies have shown that GAs exhibit an inhibitory effect on the growth of cancer cells originating from human skin, liver, prostate, breast and colon.

AIM

The aim of this study was to demonstrate the applicability of GAs in the treatment of cancer and their toxicity to humans.

MATERIAL AND METHODS

The review was made basing on the available literature data.

CONCLUSIONS

An analysis of the literature proves that GAs, the natural components of potato, clearly are toxic to both humans and animals. However, the results of in vitro tests were shown the possible use of GAs as medicinal substances active against cancer. GAs can be also applied in production of novel antiviral creams.

References

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The work was financially supported by the grant POIG 01.01.02-00-061/09 "Bioactive food" implemented within the Programme Innovative Economy 2007-2013.

Key words: potato glycoalkaloids, α-solanine, α-chaconine, toxicity

Effect of candelilla wax on the properties of potato starch films

Dariusz Kowalczyk, Barbara Baraniak

University of Life Sciences in Lublin, Poland
Department of Biochemistry and Food Chemistry
Contact e-mail: dariusz.kowalczyk@up.lublin.pl

INTRODUCTION

Environmental pollution caused by synthetic plastic films triggered the need to develop packaging from renewable biopolymers. Depending on formulation, formation method, or modification treatments, bio-based materials can be biodegradable and/or edible, which opens *great application possibilities*. Starch is an abundant and cheap biopolymer. It is known to have good film forming ability and forms films with sufficient mechanical resistance. Disadvantage of starch is its high hydrophilicity. Therefore, in order to improve moisture barrier properties of the starch films, the addition of hydrophobic compounds is recommended.

AIM

The main goal of this study was to apply candelilla wax to the edible potato starch films to reduce their water vapor permeability. The specific objectives were to investigate the effects of wax incorporation on the physical, mechanical, optical, and water barrier property of the films.

MATERIALS AND METHODS

Emulsion films were prepared from 4 % w/w potato starch solutions containing 2.5 % w/w of sorbitol (plasticizer), 0.5% w/w Tween 40 (surfactant) and 0.5, 1.0, 1.5, and 2.0% w/w of candelilla wax. Starch gelatinization was performed on the way of heating of starch solutions at 100^{o}C during 2 h. In order to obtain films, the solutions were poured a thin layer and dried. Films were conditioned before testing in the controlled atmosphere of the relative humidity of 50% at 25 ^{o}C. Physicochemical analysis of the films included measurements of moisture content, water sorption isotherms, water vapor permeability (WVP), mechanical properties (tensile strength (TS), elongation at break (E%), puncture strength (PS)), light transmission and transparency.

RESULTS

Introduction of candelilla wax to the potato starch films composition resulted in decreased hydrophilicity.

Consequently, a significant improvement in WVP of the films was observed, regardless of the wax concentration used. The average reduction in WVP reached 33%. It was found that incorporation of candelilla wax significantly decreased TS and E%. After 0.5% wax addition, TS dropped to half of the levels (2.87 MPa) compared to films without wax (5,98 MPa). When the highest wax concentration was used, even the *threefold decrease* in TS and E% was observed. The incorporation of wax at 0.5% remarkably decreased the PS of the films, from 2.61 to 1.85 MPa, and 2.0% wax addition reduced this value to 1.37 MPa. Potato starch films without candelilla wax were clear and transparent, whereas candelilla wax containing films were opaque. Film transparency and light transmission decreased with wax concentration increment.

CONCLUSIONS

Introduction of candelilla wax to the potato starch films composition results in improved moisture barrier properties, but negatively affects the mechanical strength, elongation and film transparency.

This research was supported by the Polish Ministry of Science and Higher Education under Grant No. N N312 501540.

Key words: edible films, starch, wax, WVP, mechanical properties

Sensory Quality of Edam cheese and cheese-like products enriched with probiotic culture Lactobacillus paracasei LPC-37

Marika Kowalska, Grażyna Cichosz

University of Warmia and Mazury
Department of Dairy Science and Quality Mangment
Contact e-mail: marika.kowalska@uwm.edu.pl

INTRODUCTION

Increased nutrition awareness among consumers and healthy lifestyle concerns are the main driving force behind the observed development of functional product market. In order to meet customers' expectations it is necessary to find solutions that would make it possible to widen the range of products offered in the dietary segment.

Among such products there could be cheese and cheese-like products enriched with probiotic cultures, e.g. *Lactobacillus paracasei* LPC-37. If present in sufficient amounts (min. 10^6 cfu/g), probiotics have various health-promoting effects: they limit growth of pathogenic microflora in human intestine. However a new product can be launched provided that its sensory quality is high and repeatable.

AIM

The conducted research mainly aimed to assess the influence of the probiotic culture *Lactobacillus paracasei* LPC-37 on the sensory quality of Edam cheese and cheese-like products.

MATERIALS AND METHODS

The subject of research was Edam cheese and cheese-like products produced without probiotic culture addition (the control batch) and with probiotic culture addition (the experimental batch). The research was take into account:

- dynamics of proteolysis and peptidolysis in cheese and cheese-like products according to ISO 27871: 2009/ ISO 27871:2011 (IDF 224).
- point-based sensory assessment during ripening (10 weeks) and storage (3 months) of cheese and cheese-like products according to PN-ISO 6658:1998

RESULTS

Obtained results indicate that replacement of non-starter lactic acid bacteria with probiotic strains *Lactobacillus* is essential for sensory quality of cheese. Cheese enriched with *Lactobacillus paracasei* LPC-37 was characterized by higher sensory quality, especially the taste and also had better stability of the storage.

CONCLUSIONS

The application of the probiotic culture *Lactobacillus paracasei* LPC-37 to the production technology of Edam cheese and cheese-like products makes it possible to manufacture cheese with modified sensory features and higher storage stability of these products.

Key words: Edam cheese, cheese-like products, *Lactobacillus paracasei* LPC-37, sensory quality

Analysis of the physical and technological features of the pork loin for animals fed with forage containing bioactive compounds

Karolina Kozań[1], Dominika Guzek[1], Dominika Głąbska[2], Ewelina Pogorzelska[1], Agnieszka Wierzbicka[1]

Warsaw University of Life Sciences, Faculty of Human Nutrition and Consumer Sciences
[1] Division of Engineering in Nutrition; [2] Department of Dietetics
Contact e-mail: karolina_kozan@sggw.pl

INTRODUCTION

In pork products, being a frequent component of diet in developed countries, functional components are highly desirable. However, the addition of selenium or vitamins into forage may result in changes of basic chemical composition [Skrivan et al., 2012, *Food Chem, 130, 660-664*], texture [Swigert et al., 2004, *Meat Sci, 67, 81-86*] and technological features of meat [Mateo et al., 2007, *J Anim Sci, 85, 1177-1183*].

AIM

The aim was to analyse the influence of forage supplementation with flaxseed oil, selenium and vitamin E on the basic chemical composition, texture and technological features of the pork loin.

MATERIALS AND METHODS

The object was pork loin from 20 Polish Landrace x Duroc animals. The 3 groups were fed: control ("C" containing 2% of canola oil – 6 animals), experimental 1 ("E1" – 3% of flaxseed oil, 1 mg of organic Se and 100 mg of vitamin E/ kg of the forage – 8 animals) and experimental 2 forage ("E2" – 3% of flaxseed oil, 1 mg of Se and 200 mg of vitamin E/kg of the forage – 6 animals). The measured parameters were basic chemical composition – water, fat, protein, ash, collagen (near-infrared spectroscopy), texture – tenderness, hardness (Warner-Bratzler shear test), technological features (water binding properties) – drip loss in raw meat, cooking loss, water loss after thermal treatment, water holding capacity. To characterize relationships, W Shapiro-Wilk test, t-Student test and U Mann-Whitney test were used (α=0.05).

RESULTS

Protein (p=0.0088) and ash (0.0037) for "E1" were lower than for "C", while water was higher (0.0179) and collagen did not differ. Ash (0.0182) and collagen (0.0023) for "E2" were higher than for "E1", while water was lower (0.0423) and protein did not differ. Fat did not differ. Lower tenderness and hardness were for "E1" (0.0000, 0.0000) and "E2" (0.0000, 0.0000) in comparison with "C". Cooking loss did not differ, while in case of drip loss in raw meat: for "C" it was higher than for "E1" (0.0000) and "E2" (0.0344), as well as for "E2" higher than for "E1" (0.0299). Water loss after thermal treatment for "E2" was lower than for "C" (0.0197), while water holding capacity for "E1" was higher than for "C" (0.0419).

CONCLUSIONS

The addition of Se and vitamin E to the forage, causes different characteristics of the pork loin than without mentioned components. The influence of vitamin E is dose dependent – the higher doses, accompanied by selenium supplementation, seem to be more beneficial than lower doses, as they are associated with better general basic composition and lower water loss in meat after thermal treatment.

"Researches was realized within the Project "BIOFOOD-innovative, functional products of animal origin" no. POIG.01.01.02-014-090/09 co- financed by the European Union from the European Regional Development Fund within the Innovative Economy Operational Programme 2007-2013".

Key words: pork meat, loin, functional products, chemical composition, texture, technological features.

Effect of plasticizers and hydrophobic substances on mechanical and permeability characteristics of chitosan and alginate based biomaterials

Dominika Kulig, Ewa Brychcy, Natalia Ulbin-Figlewicz, Anna Zimoch, Andrzej Jarmoluk

Wrocław University of Environmental and Life Sciences
Department of Animal Products Technology and Quality Management
Contact e-mail: dom.kulig@gmail.com

INTRODUCTION

Edible films and coatings are adding value to agricultural and food industries by-products (Embuscado, Huber, 2009). The function of films and coatings is to inhibit or reduce the migration of moisture, oxygen, carbon dioxide, lipids, aromas, amongst others, since they provide semi-permeable barriers. In addition they can transport food additives such as antioxidants, antimicrobial agents, flavors and/or improve mechanical integrity and/or handling characteristics of the food (Fontes, Ramos, 2011). Specific barrier requirements and food specifications will determine the type of layer that is best for given situation (Embuscado, Huber, 2009).

AIM

The objective of the present study was to design and optimize composition of edible, biodegradable films obtained from chitozan and sodium alginate and improve their physicochemical properties.

MATERIALS AND METHODS

Aqua solutions of sodium alginate and chitosan (1% w/w) were mixed with different kinds of plasticizers (glycerol and polyethylene glycol - PEG) or hydrophobic substances (Beeswax and Tween 20) under certain conditions to achieve homogenous hydrogels. Solutions were degassed and structured on teflon plates in climate chamber (60% RH, 20°C, 48h). Obtained films were tested on water vapor permeability (WVP) and mechanical properties.

RESULTS

Addition of 30% and 50% of beeswax to chitosan hydrogels caused decrease of puncture strength and increase of elastic properties, but any significant differences in WVP and tensile strength of beeswax-polymer films were not observed. Significant reduction of WVP of chitosan films was noticed, after 20- 40% Tween 20 incorporation, but equivalent level of this hydrophobic substance in sodium alginate films caused opposite effect on tested parameter. Elongation increases of chitosan films were observed, after 30% PEG addition. Chitosan and alginate coatings produced with PEG plasticizer are less resistant and more permeable, than with glycerol.

CONCLUSIONS

Plasticizer and hydrophobic substance were chosen to experimental coatings composition in optimization process. Functional properties of alginate and chitosan films were improved by glycerol addition. Barrier properties were improved due to Tween 20 usage in composition of chitosan coatings.

Key words: biomaterials, chitosan, sodium alginate, plasticizers, hydrophobic substances

The development of a sprout as a method of determination optimal germination time of barley grain

Katarzyna Kupisz, Józef Błażewicz, Agnieszka Zembold-Guła

Wrocław University of Environmental and Life Sciences
Department of Food Storage and Technology
Contact e-mail: katarzyna.kupisz@wnoz.up.wroc.pl

INTRODUCTION

One of the most important parameters arising of efficiency of malt, and thus possibility to get malt of suitable parameters is a time of germination of brewing barley grain. In practice, there are many methods used for measuring the usefulness of malting barley. This can be a quick assessment of grain, carried out by using the appropriate analyzers, micromalting process of grain, or a full analysis of grain, malt and wort by Molina-Cano. The brewers require proven, fast, cheap and precise method of determination for above mentioned parameters. The determination can be made by estimation of sprout length in conditions similar to pilsner type malt obtainment.

AIM

The aim of this study was a determination of the effect of different doses of fertilization and sharing of nitrogen fertilizer and the growing seasons on extractivity, index Q of malting quality and the development of sprout barley on pilsner type malts.

MATERIALS AND METHODS

The material used for this study was barley grain of Marthe, Malwinta, Sebastian, Stratus and Mauritia varieties, which were derived from strict field experiments conducted in 2007-2008. The grain germination process, under conditions analogous to those used in the preparation of pilsner type malts, was conducted for 3, 4, 5 or 6 days. At the end of the process, 100 grains were collected from each variant, and husk was removed by hand. The length of sprout was determined as: <1/4, 1/4÷3/4, 3/4÷1 or >1 (hussar), in relation to the length of the whole caryopsis.
The optimal time for sprout development was determined on the basis of the maximum number of sprouts with a length of 3/4 ÷ 1 in relation to the length of the whole caropsysis and composed with malts extractivity and index Q of malting quality.

RESULTS AND CONCLUSIONS

The results showed a significant correlation between the length of sprout and the length of germination process of grain. It was found that the optimal length of germination process is mainly conditioned by the variety traits. In addition, the method of assessing the development of sprout allows in cheap and easy way to determine the appropriate germination time of barley grain, in order to obtain the highest quality malt from the material of standard protein. This method also allows for optimizing germination time, modified by the influence of complex interactions that occur during subsequent growing seasons.

Key words: germination of barley grain, spring barley, sprout

The characteristic of probiotic fermented sheep milk with increased proportion of whey proteins

Agata Lasik, Jan Pikul, Dorota Cais - Sokolińska

Poznań University of Life Sciences
Department of Dairy Technology
Contact e-mail: alasik@up.poznan.pl

INTRODUCTION

The popularity of fermented milk has helped to increase their consumption and also to promote their reputation as health-promoting products. The physical, chemical and sensory properties of fermented milk dependent on the type of starter culture, the condition of the process and the type of milk (e.g. cow, goat, sheep) used in their production. From the nutritional point of view, sheep milk is more valuable than cow and goat milk. It is a reach source of protein, calcium and energy. In recent years, successful attempts have been undertaken to use whey proteins as a food additives as well as using different mammal's milk.

AIM

The aim of the study was to characterize the probiotic fermented sheep milk with increased proportion of whey proteins.

MATERIALS AND METHODS

The materials used in the experiments were sheep milk of natural ratio of whey to casein proteins (1:4) and sheep milk in which the ratio of whey to casein proteins amounted to 1:1. In order to increase the proportion of whey proteins in sheep milk the microfiltration process was applied. Starter culture used in the fermented milks production was LA-5 (Chr. Hansen). The fermentation process and the stability of the final products during 21-days cooling storage was described on the basis of active and titratable acidity, lactose, galactose, lactic acid and alcohol content.

RESULTS

Higher, in relation to natural, ratios of whey to casein proteins in sheep milk increased the acidity of the final product after incubation and decreased the degree of fermented lactose. The cooling storage of fermented milks did not affected changes in active and titratable acidity, galactose, lactic acid and alcohol content of the final products.

CONCLUSIONS

Changes in ratios of whey to casein proteins result in differences in dynamics of sheep milk fermentation but not influenced on final product's quality.

Key words: sheep milk, probiotic, whey proteins, fermentation

Biosynthesis of 2,3-Butanediol by Bacillus licheniformis NCIMB 8059

Mariusz Lesiecki, Adrian Czerniak, Dagmara Leśniak, Ewelina Płóciennik

Poznan University of Life Sciences
Department of Biotechnology and Food Microbiology
Contact e-mail: marles@up.poznan.pl

INTRODUCTION

2,3-Butanediol (2,3-BD) is a chiral bivalent alcohol which exhibits a wide range of potential utilizations as a solvent, liquid fuel or precursor for 1,3-butadiene – an intermediate for synthetic rubber production. Several microorganisms are able to synthesis 2,3-BD. So far the highest yields were reached using risk class 2 strains e.g. *Klebsiella* species, however an industrial process with risk class 1 microorganisms are cheaper and less recalcitrant,
This study focuses on the potential of the risk class 1 bacterium *Bacillus licheniformis* NCIMB 8059 to produce 2,3-BD from glucose.

AIM

The main study objective was to statistically optimise the biosynthesis of 2,3-Butanediol by *Bacillus licheniformis* NCIMB 8059 strain.

MATERIALS AND METHODS

In order to optimise the biosynthesis of 2,3-Butanediol by *Bacillus licheniformis* NCIMB 8059 strain, response surface methodology (RSM) was used in this work. The optimisation experiment was planned according to D-optimal design and consisted of 25 runs. The effect of yeast extract (YE) and concentration of CH_3COO^-, Fe^{2+} and Mn^{2+} ions was evaluated on the final level of 2,3-butanodiol in fermentation broth.
Sugars and other carbon compounds (organic acids, uronic acids, 2,3-BD, acetoin) concentration was determined preferably by HPLC or GC.

RESULTS

Obtained results showed statistically significant influence ($p < 0,05$) of the yeast extract, CH_3COO^- and Mn^{2+} ions concentration on the studied process. On the basis of statistic analysis, optimal values of analysed variables were determined as follows ($g \cdot dm^{-3}$): yeast extract – 4; CH_3COONH_4 – 4; $FeSO_4 \cdot 7H_2O$ – 0,1; $MnSO_4 \cdot H_2O$ – 0,3; that corresponded to 8,9 $g \cdot dm^{-3}$ final 2,3-Butanediol concentration.

CONCLUSIONS

Under optimised conditions *Bacillus licheniformis* NCIMB 8059 can effectively convert glucose to 2,3-BD. Production of diol achieved nearly 9 $g \cdot dm^{-3}$ and efficiency of production reached 0,28 $g \cdot g^{-1}_{glucose}$ in 24h of cultivation. It shows that risk class 1 bacteria strains are promising direction in research of microbial production of 2,3-Butanediol.

This work was supported by ERA-IB EU-project called "Production and Upgrading of 2,3-Butanediol from Biomass" (ERA-NET-IB/03/2009)

Key words: 2,3-Butanediol, response surface methodology (RSM), *Bacillus licheniformis* NCIMB 8059

Effect of rearing conditions of hens on egg quality

Lewko Lidia[1], Gornowicz Ewa[1], Tomasz Szablewski[2]

[1]National Research Institute of Animal Production, Experimental Station Kołuda Wielka, Waterfowl Genetic Resources Station in Dworzyska
[,2]Poznań University of Life Sciences, Department of Quality Management
Contact e-mail: lidia.lewko@izoo.krakow.pl

INTRODUCTION

Laying hen management system affects directly and indirectly not only bird behavior, laying performance and wholesomeness but egg quality traits too (Tauson, 2005). Chicken egg is nowadays considered to be the natural and most valuable food product rich in nutrients (Anton et al., 2006).

AIM

The aim of this study was the evaluation of quality traits in egg of selected indigenous laying hen hybrids subjected to different management systems.

MATERIALS AND METHODS

Eggs from a uniform flock of laying hen hybrids divided into three groups, each subjected to different management system, i.e. in cages, on deep litter and on free range were used as experimental material. There were 18 birds in each experimental group. All birds were fed on the diet containing: 17.5% crude protein; 17.7 MJ metabolisable energy; 3.6% fibre; 0.82% lysine; 0.36% methionine; 3.6% calcium and 0.34% digestible phosphorus. Birds kept on straw litter and in cages were maintained in a closed poultry house under controlled microclimate conditions and the light programme was similar to the outside natural conditions as in the case of birds kept on free range. Stocking density of birds on litter and on range amounted to 8.5m2/hen. One hundred eggs were taken at random from each experimental group of layers at the age from 34 to 36 weeks. A complete set of physical egg traits was determined, i.e. weight of egg and its fractions and the percentage content of main egg fractions; egg index; air space height; albumen height and its pH, Haugh units; colour and pH of yolk; shell colour, thickness, density and elastic strain. The detailed statistical analysis was carried out with the use of Statistica 6.0 programme.

RESULTS

Eggs from caged layers demonstrated the heaviest weight (61.06g), the lowest egg index (77.86%) and the lightest shell colour. Moreover, those egg were found to have the highest percentage albumen (57.04%) and yolk (29.89%) content as well as the highest weight of the two egg fractions amounting to 18.20g and 34.89g, respectively. Yolks of eggs from caged layers exhibited the highest pH value (7.06) and the lightest colour at the level of 7.04. The most desirable albumen quality traits i.e. the greatest height (5.00mm), Haugh unit (69.70) as well as the highest pH value (9.33) were noted in the albumen of layers kept on straw litter. The examination of egg shell demonstrated the highest weight (5.76g) of the greatest thickness (360.14µm) and density (81.01mg/cm^2) of the shell.

CONCLUSIONS

The detailed characteristics of physical traits of eggs from laying hen hybrids revealed significant ($p \leq 0.05$) differences resulting from the bird management systems. Eggs produced by caged layers demonstrated numerous traits required in egg processing (heavy weight egg and its fractions). On the other hand, high and dense albumen after egg breaking and strong shell were noted in eggs produced by layers kept on straw litter and the traits specified above can meet the requirements of individual consumers.

Key words: management, egg, quality, physical traits

Influence of drying method and storage on carotenoids content in dried carrot

Arkadiusz Łuba, Dorota Nowak

Warsaw University of Life Science - SGGW
Faculty of Food Sciences
Contact e-mail: arek.luba@wp.pl

INTRODUCTION

Carrots are one of the most popular vegetables is Poland. The carrots crops make up 17% of all vegetables crops, and the average consumption is 20 kg / person per year. It contains large amounts of carotenoids (8 - 22 mg/100 g in the eatable parts, mainly beta-carotene). Food factory processes about 55% of carrots plant (900 000 t per year). One of the main way of its processing is drying. However, this process causes the loss of carotenoids. Proper preparation of the material before drying can effectively reduce the loss of these substances during drying and storage. Grindings gives a shape and improve drying, but in the mean time the tissue enzymes are release, which accelerate oxidation. Blanching is a type of the initial heat treatment, used to thermal inactivation of the enzymes. Other advantage of this process is the removal air from the space between cells. However, blanching also destroys desireble coumponds, like vitamins, essential oils, chlorophyll. Although carotenoids are substances that are quite resistant to technological treatments, blanching may cause loss of their contents.

AIM

The aim of this study is to present the analysis of the effect of pre-treatment on the carotenoids content directly after the drying process and the effect of storage on their stability.

MATERIALS AND METHODS

Bolero varieties of carrot was used for the research on carotenoids content. Carrot was dried in two ways: by convection (70˚C) and IR-radiation. The parameters flow velocity of air (0,5 and 1,5 m/s) and distance from infrared source (0,2 and 0,3m) were variable. Before drying, the material was grinded to slices or chips and optionally slices were blanched in steam for 3 minutes. Examination of carotenoids content was performed according to the Polish Standard [PN-EN 12136:2000] after two days of drying and after two months of storage.

RESULTS

In dried carrot slices average carotenoid content was 113,99 mg/100 g dm, while in chips was 102,32 mg/100 g dm. After storage in dried sliced carotenoid content was 69,94 mg/100 g dm and for chips was 51,17 mg/100g. Blanched slices had a higher carotenoid content than dried nonblanched (respectively: 137,11 and 113,99 mg/100g dm) and after storage (respectively, 108.52 and 69.94 mg/100g dm). After storage the highest content of carotenoids (130,45 mg/100 g dm) was observed in slices, which were blancheed and dried by infrared radiation at a distance of 20 cm from the source and the air flow velocity of 1.5 m/s.

CONCLUSIONS

Degree of grinding had no significant effect on the carotenoids content in dried carrot examined in two days after the drying, but in dried carrots which were stored two months the average content of these compounds was higher in the slices than in chips. Material submitted to blanching before drying was characterized by a higher average content of carotenoids than nonblanched material. This dependence was observed in both dried carrot: examined two days after the drying and after storage. The method of drying had no significant effect on the carotenoid content in dried carrot examined two days after the drying, and after two months of storage. During storage, the content of carotenoids was reduced in all tested samples.

Key words: carotenoids, carrot, drying, storage, grinding, blanching

Evaluation of freezing of white roll in the spiral arctic freezer a7/26 HEINEN company and its impact on product quality

Piotr Mach

Warsaw University of Life Sciences
Faculty of Food Sciences
Contact e-mail: dwnoz@sggw.pl

INTRODUCTION

Bread is one of the most widely consumed food products in the World. Paralleling the huge consumption, new developments have been continuously sought by the bakery industry in produceing, storing and distributing the bread products of improved palatable and nutritional qualities. Bread and other bakery products have a very short shelf life. Their quality is dependent on the period of time between baking and consumption. During storage a bread stale by lossing a freshness. Freezing is one of the most important refrigeration processes widely applied in food preservation. One of type of the frozen breads is croscope freezing.

AIM

The aim of this study was to evaluate the operational a7/26 arctic freezer HEINEN used for freezing wheat bread. The study allowed the selection of the optimal conditions for the freezing process wheat bread and its effect on the quality of the product.

MATERIALS AND METHODS

The material used to researches was white roll (55g). Investigations:

- Cooling and freezing of material
- Freezing processes and temperature measurements
- Measurement of weight loss and moisture distribution.

The researches were realized in the SPC bakery in Warsaw.

RESULTS

Freezing of bakery products in optimal conditions does not guarantee of full success. Also should be measured quality of frozen products, affects time of storage on quality preservation.

CONCLUSIONS

If the freezing is faster of better baked product, the shelf life of product is longer.

Key words: bread, freezing, quality

Influence of selected fixation methods of bacterial cells on the effectiveness of Lactobacillus rhamnosus adhesion to enterocytes

Corinna Markowicz

Poznań University of Life Sciences
Department of Food Sciences and Nutrition
Contact e-mail: corinna.markowicz@gmail.com

INTRODUCTION

Fixation of bacterial cells is one of the most influential steps in the study of these microorganisms. It allows to maintain the cells in a particular phase of the cell cycle, and their immobilization, while maintaining the morphological and structural features in greater or lesser extent. The choice of fixing agent depends on the subsequent experimental procedure. Fixing agent may be either physical or chemical. However, regardless of its type, its use always causes some changes in the external structural elements of the bacteria involved in the processes of adhesion to the surface.

AIM

The aim of the study was to determine the effect of selected methods of preservation of *Lactobacillus rhamnosus* on its adhesion to the enterocytes.

MATERIALS AND METHODS

The experiment was carried out using the Caco-2 cell line and *Lactobacillus rhamnosus* GG. Bacterial cells were metabolically labeled with ^{3}H-thymidine in MRS liquid medium, at 37°C for 18 to 20 hours. The biomass of 2 ml of culture was resuspended in 1 ml of the appropriate fixative and incubated (sodium azide, dimethylforamide, formaldehyde, ethanol, isopropanol, glutaraldehyde, and paraformaldehyde). All solutions prepared in PBS with calcium and magnesium ions. Also thermal fixation at 80°C for 20 min was applied. The effectiveness of fixation was checked by making the control cultures of fixed bacteria. The preservation of biological activity and cellular component structures were checked by horseradish peroxidase and alkaline phosphatase activity analysis. After the fixation, the adhesion assay of bacteria to Caco-2 cells was carried out. The effectiveness of the adhesion was measured using a scintillation counter.

RESULTS

Effective fixation of the bacterial suspension was obtained with 4% formaldehyde (24 h), 70% ethanol (20 min), 70% isopropanol (20 minutes), 1% glutaraldehyde (10 min), 1% paraformaldehyde (10 min) and the temperature 80 ° C (20 min). The highest reproducibility was obtained using 4% formaldehyde (24 h), 70% ethanol (20 min) and 70% isopropanol (20 minutes). The smallest loss of enzyme activity of fixed bacterial cells were observed after 4% paraformaldehyde treatememt, the strongest - when using 1% paraformaldehyde. Adhesion performance after fixation of bacteria with70% ethanol, 70% isopropanol, 1% glutaraldehyde and 1% paraformaldehyde was increased by 1/3 to 1/2 of the values characterizing the living bacteria, and remained at a similar level after fixing bacteria with 4% formaldehyde.

CONCLUSIONS

The results confirm that the external structural elements of fixed *Lactobacillus rhamnosus* GG cells retain factors responsible for adhesion to the enterocytes. These elements are modified in bacteria by the action of fixative agents, which alters the ability of adhesion. Formaldehyde cross-linking effect is weaker than paraformaldehyde and glutaraldehyde, which translates into probably the least changed adhesion performance. The use of 4% formaldehyde for 24 hours to fix the *Lactobacillus rhamnosus* GG has probably the weakest effect on the protein structure of the bacterial components. Confirmation of this hypothesis , however, requires more detailed research.

Key words: fixation, adhesion, enterocyte, probiotic bacteria.

Influence of Gel-fat preparate and sterilization parameters on properties of a model meat canned product

Miazek Joanna, Mroczek Jan

Warsaw Uniwersity of Life Sciences – SGGW
Faculty of Food Technology, Division of Meat Technology
Contact e-mail: joanna_miazek@sggw.pl

INTRODUCTION

Fat is a very controversial food ingredient because it can have impact on many diseases but also affect many important technological functions in meat products. Fats contained in meat stuffing, added even in small amounts are melting and flowing out of the casing, forming a coating in canned meat products or baked patties. Preparation Gel-fat, consisting of sodium alginate, methylcellulose and modified starch, is designed to increase resistance to melting fat during cooking. The preparation according to the manufacturer's declaration also allows you to maintain a constant, hard consistency of fat regardless of the heat treatment. Could potentially be used in the production of sausages grilled salami (produced with the addition of soft fats), as a replacement for the production of fat French pates, as a raw material for the production of canned sterilized, pasteurized and meals in jars without coating fat. Gel-fat preparate could allow for the replacement of animal fats by vegetable fats allowing the creation of new diet products.

AIM

The aim of this study was to investigate the effect of Gel-fat additive and sterilization parameters (prolonged sterilization time from 30 to 40 minutes) on the properties of a model meat canned product.

MATERIALS AND METHODS

Two meat batters (with and without addition of Gel-fat preparate - 0 and 1%) were manufactured.
The raw material for the preparation of batters were: fresh meat from chicken thighs - without skin and bones, fresh pork fat without skin, and functional additives: curing salt and ascorbic acid. After 24 hours cans filled with stuffing and then sterilized (120°C for 30 and 40 minutes). Water holding capacity was determined in raw meat batters. After sterilization products were analyzed for cooking loss, the force of penetration and pH. The results of the study were statistically analyzed (using the Statgraphics Plus 4.1 - Univariate analysis of variance (ANOVA) and Tukey's test).

RESULTS

The addition of Gel-fat preparate increased the water holding capacity in raw batters (from 64,56% to 75,00%) and caused an increase in hardness of the sterilized product (of about 3.5 units). Gel-fat preparate additive had no effect on the amount of thermal leakage. The obtained results showed that the prolonged time of sterilization significantly increased the cooking loss (from 12,53% to 16,03% for control variant; from 13,33% to 16,32% for variant with 1 % Gel-fat preparate additive). Prolonged time of sterilization significantly reduced the penetration force of meat canned products (from 12,98 N to 10,95 for control variant; from 15,76 N to 14,90 N for variant with 1 % Gel-fat preparate additive). Both: sterilization time and Gel-fat preparate additive had no effect on the pH.

CONCLUSIONS

Longer sterilization time affected cooking loss and texture of the canned product, as expected. Gel-fat preparation didn't affect cooking loss. Therefore one could assume that it did not reduce the amount of fat which was melted out during the sterilization process.

Key words: Gel-fat preparate, sterilization, meat canned product

Contents of cadmium and lead in wild edible mushrooms from Podlaskie voivodship

Iwona Mirończuk-Chodakowska[1], Katarzyna Socha[2], Anna Witkowska[1], Małgorzata Zujko[1], Maria Borawska[2]

Medical University of Bialystok
[1] Department of Food Commodities Science and Technology
[2] Department of Bromatology
Contact e-mail: iwona.mironczuk-chodakowska@umb.edu.pl

INTRODUCTION

Mushrooms can accumulate heavy metals. Generally mushrooms picked in unpolluted areas are characterized by lower contents of heavy metals, as lead and cadmium, than the mushrooms from highly urbanized or industrial areas.

AIM

The aim of the present study was to determine contents of lead and cadmium in fruiting bodies of popular wild edible mushroom species and to assess dietary exposure to these metals in the low urbanized Podlaskie voivodship.

MATERIALS AND METHODS

Eighteen species of wild-edible mushrooms were tested (three samples of each mushroom species): *A. mellea, B. badius, B. chrysenteron, B. edulis, B. subtomentosus, C. cibarius, L. deliciosus, L. aurantiacum, L. scabrum, M. procera, R. caperatus, R. heterophylla, R. vinosa, S. bovinus, S. grevillei, S. luteus, T. flavovirens, T. portentosum.* Mushrooms were collected from forests and grassland areas. Mushrooms fruiting bodies were cleaned, cut to small pieces, than dried in air-dryer to a constant mass, and ground. Approximately 0.300g dried samples were mineralized in nitric acid automatic microwave digestion system. Metals were analyzed using inductively coupled plasma mass spectrometry (ICP-MS).

RESULTS

The lowest Pb levels were observed in *T. portentosum* 0.141µg/g dry mass (DM) and *B. chrysenteron* 0.152 µg/g DM, while the highest Pb concentrations were detected in *R. vinosa* - 2.607µg/g DM and *M. procera* - 2.082µg/g DM. Minimum Cd contents were found in *R. heterophylla* - 0.1 µg/g DM, while the maximum contents were observed in *B. chrysenteron*-10.20µg/g DM. The obtained results were compared to the tolerable upper limit of 0.3µg/g fresh mass (FM) for lead established for cultivated mushrooms by the European Commission regulation no. 629/2008 of 2 July 2008 amending regulation (EC) no. 1881/2006 setting maximum levels for certain contaminants in foodstuff. According to this regulation, none of the mushrooms analyzed exceeded this limit. For mushrooms other than *P. ostreatus*, *L. edodes* and *A. bisporus,* the tolerable limit for cadmium set in European Union is 1µg/g FM. Neither of the mushrooms exceeded this limit.

CONCLUSIONS

Concentrations of Pb and Cd found in wild-growing mushrooms assayed do not differ substantially from these in Europe, and the levels of these metals are much lower than those from areas affected by industrial pollution. According to the Report of the Joint FAO/WHO Expert Committee on Food Additives (2010) all mushroom samples do not represent a toxicological risk from cadmium and lead intoxication. Two of the tested mushrooms – *R. caperatus* and *B. chrysenteron,* may marginally exceed provisional tolerable monthly intake for cadmium, when temporarily high consumption of mushrooms (100g/day) is taken under consideration.

Key words: wild edible mushrooms, cadmium, lead

Antioxidant activity and phenolic compounds in sour cherry liqueurs and their changes during storage

Paulina Mizgier, Anna Sokół- Łętowska, Alicja Z. Kucharska, Dorota Wyspiańska

Wrocław University of Environmental and Life Science
Department of Fruit and Vegetables Technology
Contact e-mail: paulinamizgier@wp.pl

INTRODUCTION

Sour cherry are the important raw materials used in the production of: juices, frozen food, fruit preserves, compotes, jams and alcoholic beverages: fruit wines and liqueurs. Especially liqueurs are very popular among consumers. Liqueurs are alcoholic extracts of plant components, such as: pectins, tanins, vitamins, organic acids, mineral salts, sugars, essential oils , pigments and polyphenols.

AIM

The objective of this work was to determinate the changes in total polyphenols content and antioxidant activity of sour cherry liqueurs with or without sugar, during 12- weeks of storage, at temperatures of 15°C and 30°C.

MATERIALS AND METHODS

To prepare of liqueurs ripe fruits of the Łutówka variety sour cherries were used. Liqueurs were stored for 3 months at temperatures of 15°C and 30°C. Total phenolic were measured by the method with the Folin- Ciocalteu reactant and the results expressed as mg gallic acid (GAE) in 100 ml. Antioxidant activity was measured with the radical cation $ABTS^{+\bullet}$, DPPH and FRAP and expressed as micromoles of Trolox /100 ml.

RESULTS

Directly after preparation, the sour cherry liqueurs contained from 111,6 to 118,1 mg GAE/100 ml. During storage fluctuations of total phenolic compounds content was observed The content of polyphenols was comparable before and after 12 weeks. During the 12 weeks of storage, the highest average antioxidant activity against DPPH and ABTS radicals showed sour cherry liqueurs with sugar, stored at temperature of 15°C.

CONCLUSIONS

The high antioxidant activity of liqueurs can be prepared by adding sugar and storing at temperature of 15°C.

This work was supported by the Polish Ministry of Science and Higher Education under Grant Nr N N312 399239.

Key words: liqueurs, sour cherry, antioxidant activity, polyphenol

Analysis of the fatty acids in beef from 5 certain bovine muscles as a function of aging time

Małgorzata Moczkowska, Anna Sadowska, Rita Rakowska, Justyna Batogowska, Arkadiusz Szterk, Bożena Waszkiewicz-Robak, Franciszek Świderski

Warsaw University of Life Sciences
Faculty of Human Nutrition and Consumer Sciences, Department of Functional Food, Organic and Commodities
Contact e-mail: malgorzata_moczkowska@sggw.pl

INTRODUCTION

Currently, special attention is paid to the level of intramuscular fat (IMF) in bovine meat and the relationship between the composition of fatty acids and the key quality parameters, including sensory attributes and color stability. The fat content in beef meat varies greatly depending on the part and degree of trimming. Not only the amount of fat is essential, but also its composition. The dietary recommendations continued to point out the reduction of saturated fatty acids (SFA), and increasing the consumption of polyunsaturated fatty acids (PUFA), especially n-3. The major fatty acids of the n-3 include eicosapentaenoic acid (EPA, 20:5 n-3), and docosahexaenoic acid (DHA, 22:6 n-3), which have a preventive effect of many diseases. Knowledge of changes in fatty acid profile under the influence of the aging process of beef can be helpful in optimizing the raw material for the preparation of nutritional value.

AIM

The purpose of this study was to determine the effect of aging on the content of fatty acids in the five selected beef carcass muscles.

MATERIALS AND METHODS

The material consisted of five selected beef carcass muscle, namely *m. the biceps femoris*, *m. gluteus medius*, *m. semimembranosus*, *m. supraspinatus*, m. *vastus lateralis. M. biceps femoris muscles* and *m. vastus lateralis* under aging for 10 and 35 days and the other muscles examined for 10 and 21 days. Examined muscle aging process was carried out under constant refrigeration (at 2 ± 1 ° C), after wrapping them in a vacuum. Profile and content of fatty acids were determined by gas chromatography with flame ionization GC-FID. The principle of the method consists in carrying triglycerides contained in the fat meat (cold extraction) of methyl esters of fatty acids and the qualitative and quantitative analysis of these esters.

RESULTS

There was a high content of fatty acids C16: 0, C18: 0, C18: 2 n-6 c in all the examined muscles, after all 10 days and 21 and 35 days of aging. In addition, significant differences in the content of individual fatty acids in beef carcass examined muscles were demonstrated. There was a significant decrease in fatty acid content, such as C18: 2n6c, C18: 3n-6, C18: 3n-3 with prolonged aging process.

CONCLUSIONS

Based on the survey, it was found that both the aging process and the type of muscle has a significant effect on the fatty acid profile of beef. Selecting the right time of aging process should not only lead to improving sensory quality of beef, but also take into account the nutritional aspect, in particular, changes in the content of fatty acids, especially those with a beneficial effect on human health.

„Research was realised within the Project no WND-POIG.01.03.01-00-204/09 Optimizig of Beef Production in Poland According to "from Fork to Farm" Strategy co-financed by the European Regional Development Fund under the Innovative Economy Operational Programme 2007 – 2013"

Key words: beef, aging, fatty acids, muscle

Chemical treatment and disinfection of food processing wastewater – diversity of problems and solutions

Ewelina Mroczek, Piotr Konieczny

Poznań University of Life Sciences
Faculty of Food Science and Nutrition
Contact e-mail: e.mroczek@up.poznan.pl

INTRODUCTION

Application of the chemicals in water and wastewater installations which are directly operating in industrial plants within many industries or in specialized municipal objects is characterized currently by a large variety. Among the basic reagents, by which the flow of wastewater can be affected we can include coagulants, flocculants, disinfectants and reagents for pH adjustment, such as NaOH or lime milk.

MATERIALS AND METHODS

Both, some selected available bibliographic sources, as well as results of own experiments, were used for preparing this study.

AIM

The aim of this work is a brief overview of these applications in the food companies of various branches such as meat, poultry, fish, fats processing plants etc.

RESULTS

Introduction of selected chemical reagents to the waste water stream accompanied by a lot of interesting technological effects associated with the intensification of wastewater treatment, improving methods of sludge treatment and reducing their odor. However, at the same time, it may also occur some troubles and hazards by chemical treatment of wastewater and sludge. Some examples of the new challenges both for producers of chemicals and their users are discussed in this study, too.

CONCLUSIONS

Currently, the most dynamic market development of chemicals recommended for use in the wastewater treatment and / or wastewater disinfection is generated among others in the European (including Polish) food industry. There is reasonable to discuss various innovative proposals on this area taking into consideration needs of food processors and opinions of managers of wastewater treatment plants.

Finansowanie konferencji ze środków Katedry Zarządzania Jakością Żywności.

Key words: food processing, wastewater, sludge, chemical treatment.

Migration of residual polyacrylamide flocculants from farm to table in respect to potential hazard for food consumer

Ewelina Mroczek[1], Piotr Konieczny[1], A. Waśkiewicz[2], T. Kleiber[3]

Poznań University of Life Sciences
[1] Faculty of Food Science and Nutrition
[2] Faculty of Chemistry
[3] Faculty of Horticulture and Landscape Architecture
Contact e-mail: e.mroczek@up.poznan.pl

INTRODUCTION

In the light of results of long term investigations, acrylamide was register to the list of chemicals demonstrating both toxic, carcinogenic and mutagenic properties, as well. Foods rich in carbohydrates and intensively treated with heat are indicated as one of most important source of his substance. This is also raw material used also for commercial production of polymerized polyacrylamide preparations which are applied in pulp and paper, cosmetic and textile industries. Acrylamide flocculants are also used in water treatment , chemical treatment of sludge, and the last one , in case of food processing, is recommended to organic fertilization. Therefore, this is reasonable to ask about mobility of such residual substances in the environment, and in particularly to discuss the problem in respect to potential hazard of consumer of edible plants or even of processed plant origin food.

AIM

In this work an attempt to monitor hypothetic migration of residual polyacrylamide monomer in whole food chain from farm to table has been undertaken.

MATERIALS AND METHODS

Based on own experiments a comparative analysis of polyacrylamide monomer content in selected flocculants determined by the use of HPLC technique has been done. Since in many plant tissues acrylamide is more likely to accumulate, his presence in head lettuce as test plant in hydroponic cultivation has been investigated. A necessity to investigate biodegradation mechanisms of polyacrylamide before their use for agricultural purposes has been also indicated including composting or biogas production processes.

RESULTS AND CONCLUSIONS

As a result of this discussion systematic monitoring and more detailed experiments has been postulated in respect to content of residual acrylamide monomer in the whole chain links from farm to table, which are likely to contact consumer and to be a potential hazard for his health and life.

Finansowanie konferencji ze środków Katedry Zarządzania Jakością Żywności.

Key words: residual acrylamide flocculants, food safety, farm to table approach

Application of total phenolic content, the antioxidant activity and colour for the discrimination of red grape cultivars

Małgorzata Muzolf-Panek, Anna Kaczmarek

Poznań University of Life Sciences
Department of Food Quality Management
Contact e-mail: mpanek@up.poznan.pl

INTRODUCTION

Phenolic compounds, mainly anthocyanins are the main constituents present in red grapes (mostly in skin). They play an important role in the sensory quality (colour) and bioactive properties (antioxidant activity) of fruit. Phenolic content and composition and thus the antioxidant activity are affected by several factors such as grape varieties and environmental conditions. Thus, the parameters characterizing these qualitative features could be used for the differentiation of the red grape cultivars.

AIM

In the present study the use of total phenolic content (TPC) including anthocyanins, the antioxidant activity (AOX) and colour as a parameters for cultivar determinations was investigated.

MATERIALS AND METHODS

To this end, TPC of methanolic extracts of selected red grape cultivars (light and dark skin Red Globe, Autumn Royal, Palieri, Black Magic) was monitored by Folin-Ciocalteu method. Total anthocyanin content, the main fraction of phenols present in red grapes, was determined with pH-differential method. Moreover, the antioxidant activity of red grapes was measured by the DPPH method and expressed in IC50 and TEAC (Trolox equivalent antioxidant capacity) values. The colour of red grape skins was determined by Minolta Chroma Meter CR-200b in CIE L*a*b* system. Obtained data were treated using principal component analysis (PCA), linear discriminant analysis (LDA) and cluster analysis (CA).

RESULTS

Based on the results obtained it could be stated that grapes with the darkest skin characterize the highest level of TPC and anthocyanin content, and pink grapes contains relatively small amount of these compounds compared to the red skin grapes. Between TPC content and all colour coordinates significant correlations were determined. Total anthocyanins correlates well with L* and b* coordinates. Furthermore, strong correlations for the antioxidant parameters IC50 as well as TEAC with TPC were revealed. Based on the discrimination analysis it follows that the highest discrimination power possess the colour coordinate (b*), colour hue (h*) and total anthocyanin content. Finally, using the parameters mentioned above it is possible to differentiate various red grape cultivars. Results of PCA grouping of samples shows that first three components explaining >96% of the total variance that were taken into account. The first principal component separates light skin Red Globe grapes from the others, whereas the second component separates the dark skin Red Globe from the remaining. As a result of the cluster analysis initial division into two grape groups was obtained: pink and red. Furthermore, in the group of red grapes another two clusters were distinguished. One of them includes the Red Globe grapes while the second group contained remaining cultivars of red grapes. The biggest similarities were observed between Autumn Royal, Black Magic and Palieri cultivars.

CONCLUSIONS

Based on the parameters presented in this paper it is possible to differentiate red grape cultivars. Total anthocyanin content and colour coordinate b* as well as colour hue (h*) have the highest discrimination power.

Key words: red grapes, antioxidant activity, phenolic content, anthocyanin content, colour

The fatty acid profile of the yolk in eggs laid by hens fed diets with a different blue lupine content

Jakub Naczmański, Aleksandra Drażbo

University of Warmia and Mazury in Olsztyn
Department of Poultry Science
Contact e-mail: jakub.naczmanski@uwm.edu.pl

INTRODUCTION

Alternative protein sources in laying hen diets, and their use to modify the fatty acid composition of egg lipids, remain poorly investigated. Due to increasing consumer interest in products delivering health benefits, the modification of food products of animal origin at improving their health-promoting properties is an important consideration.

AIM

The objective of this study was to determine the effect of different inclusion levels of blue lupine meal in layer diets on the fatty acid profile of the egg yolk.

MATERIALS AND METHODS

The experiment was conducted over a 24-week laying season. 150 Lohmann Brown layers aged 18 weeks were divided into three groups of 50 birds each. The hens were kept in battery cages, and were fed iso-protein and iso-energetic diets with the following protein sources: group 1 – soybean meal (SBM), sunflower meal (SFM) and rapeseed meal (RSM), group 2 – SBM, RSM and 10% blue lupine, group 3 - SBM, RSM and 20% blue lupine. The fatty acid profile of the yolk was determined at the end of the experiment, on eight eggs from each experimental group.

RESULTS

Layer diets with different inclusion levels of blue lupine had a significant effect on the fatty acid profile of egg yolks. Eggs laid by hens fed lupine meal had a significantly lower content of saturated fatty acids (SFAs) whose share of the total fatty acid pool was as follows: 35.42% in group 1, 35.24% in group 2, 34.06% in group 3. The experimental factor contributed to an increase in the concentrations of polyunsaturated fatty acids (PUFAs) in the yolk, from 18.20% in group 1 to 20.83% in group 3. The levels of monounsaturated fatty acids (MUFAs) decreased significantly in groups of hens fed lupine-supplemented diets. In comparison with group 1, the concentrations of n-3 and n-6 PUFAs in groups 2 and 3 increased significantly, leading to a significant decrease in the n-3/n-6 PUFA ratio, from 12.96 in group 1 to 12.22 in group 3 (20% lupine meal content).

CONCLUSIONS

The results of the study show that the supplementation of laying hen diets with blue lupine meal can modify the fatty acid profile of the egg yolk, including an increase in PUFA content and an improved n-3/n-6 PUFA ratio.

Key words: laying hens, fatty acids, blue lupine, egg quality

The physicochemical properties of high protein sponge cakes obtained from different whey protein preparations

Maciej Nastaj[1], Bartosz Sołowiej[1], Waldemar Gustaw[2]

University of Life Science in Lublin
[1] Department of Biotechnology, Human Nutrition and Food Commodities
[2] Department of Fruits, Vegetables and Fungi Technology
Contact e-mail: mnasty@o2.pl

INTRODUCTION

Many food products contain proteins and saccharides, both contribute to their structure, texture and stability. Whey proteins are known for their functional and nutritional properties. They may be purchased in several forms, the most common are whey protein isolate(WPI) and whey protein concentrate(WPC).

AIM

The aim of this paper was to obtain a dietetic sponge cakes with high protein content that can be considered a food supplement or meal replacer for sportsmen and active people.

MATERIALS AND METHODS

WPI and WPC 80 were kindly delivered by courtesy of Milei GmbH, Allgau, Germany. Powdered sugar was purchased in a local store. 15 and 20 % (m/v) protein solutions were prepared by stirring for 2h at room temperature. The solutions were whipped in beaker in water bath at 70°C by using a kitchen mixer for 10 minutes. Subsequently the powdered sugar was added (5, 10 and 15 %) and mixture was whipped for 5 minutes to consolidate the batter structure. The batters were scooped up in a baking tins and baked in an oven for 30 minutes at 130°C. Prior to thermal treatment, the rheological properties (yield stress) of the batters were determined by using a ThermoHaake RS 300 rheometer. The mechanical properties (hardness and crispness) were conducted by TA-XT2i texture analyser. Also the colour was evaluated by using a X-RiteColor® Premier 8200 equipped with 400 nm UV filter.

RESULTS AND CONCLUSIONS

The properties of the sponge cakes depended on the ingredient concentration. The highest hardness values were recorded for the cakes obtained from WPI. For both analyzed preparations, higher powdered sugar addition resulted in a hardness increase. The following dependency was observed: the higher hardness, the greater resistance to fracturability. The highest L* values were observed for cakes obtained from WPI. For both preparations, the protein concentration decrease effected in lower luminescence values. Higher concentrations of powdered sugar led to increase of a* and b* parameters, what means in practice, that the samples are greener (less redder) and yellower (less bluer). Knowing effects of particular ingredients (preparation type, sugar concentration) allows to control the texture and colour of produced cakes. The obtained product, unlike traditional protein drinks, exhibits long shelf life and can be consumed directly because requires no preparation.

Key words: whey proteins, foams, sponge cakes, rheology, sport nutrition

The amino acid composition and nutritional value of proteins preparation produced by enzymatic hydrolysis of a commercial fodder preparation of potato protein

Agnieszka Nemś, Anna Pęksa, Joanna Miedzianka, Joanna Gaj

Wrocław Uniwersity of Environmental and Life Sciences
The Faculty of Food Science, Department of Food Storage and Technology
Contact e-mail: agnieszka.nems@wnoz.up.wroc.pl

INTRODUCTION

Produced by starch factory, due to the weak hydrating properties dried potato protein has adverse functional properties and though high nutritional value, it is not used in food production. Hydrolysis of proteins with enzymes is a traditional and widely used method for obtaining preparations of functional and nutritional qualities.

AIM

The aim of the study was to determine the effect of using different variants of the enzymatic hydrolysis of potato feed protein concentrate using enzymes Alcalase from *Bacillus lichenioformis* and FLAVOURZYME from *Aspergillus oryzae*, the protein content and amino acid composition of the obtained hydrolysates.

MATERIALS AND METHODS

The material used for the study involved the preparation of commercial potato feed protein, coming from Potato Industry Enterprises SA in Lomza. The product was enzymatic hydrolysed with proteases of *Bacillus licheniformis* (A), and also proteases: from *Aspergillus oryzae* and Bacillus licheniformis (AB). Hydrolysis was carried out in two variant time: 2 and 4 hours. Enzyme was used in an amount of 50 µl per 1 g protein.

RESULTS AND CONCLUSIONS

Based on the research, it was found that the commercial preparation of potato protein characterized by a high nutritional value and the process of hydrolysis contributed to the improvement of the property. Both the initial preparation and the hydrolysate had a full value of amino acid composition. Index nutrition CS ranged from 179% -361%. It has been shown that a shorter time of hydrolysis was insufficient to obtain a preparation of a preferred amino acid composition. The results of hydrolysate contained this time less protein and less the amount of amino acids such as methionine and cysteine than was given in the reference. CS ratio of these preparations ranged from 93.94% -152.9% (variant A) and 91.13% -241% (variant AB). The preparations after 4 hours of hydrolysis, resulted in no limiting amino acids. CS ratio was in the range of 114% - 266% (variant A) and 120.5% -294.2% (variant AB). The best efficiency of proteolysis as well as the amount of expressed protein which is dissolved in the hydrolysate, obtained using only alcalase enzyme from *Bacillus licheniformis*. The combination of Alcalase and complex enzymes from *Aspergillus oryzae* FLAVOURZYME helped to achieve the highest degree of hydrolysis DH.

Key words: potato protein, hydrolysates, amino acids, nutritional value

Study of acrylamide in various types of bread - risk assessment in relation to the Polish population

Fabian Nowak

University of Warmia and Mazury in Olsztyn
Chair of Commodity Science and Food Analysis
Contact e-mail: fabian.nowak@uwm.edu.pl

INTRODUCTION

In 1994 International Agency for Research on Cancer (IARC) has classified acrylamide as substance average of dangerous, potentially carcinogen for humans (in the IARC classification as a carcinogen 2 A) International studies have confirmed neurotoxic and carcinogenic effects of acrylamide. Acrylamide is formed by the reaction of asparagine and a reducing sugar in a temperature above 120℃ as part of the Maillard reaction. Acrylamide is present in all types of food that has been or will be subjected to heat treatment such as potato products, coffee and cereal products in that particular attention should be paid to the bread.

AIM

Assessment of acrylamide in selected types of bread and exposure estimation on the example of the Polish population

MATERIALS AND METHODS

The study was conducted on samples of different types of bread generally available in the local market. To determine the average consumption of bread in Poland, were used Central Statistical Office statistics data about Houshold budget survey in 2011. Acrylamide content was determined by RP-HPLC.

RESULTS

The highest amount of acrylamide in the crumb was found for pumpernickel (835.89 μg/kg), the lowest in rye crisp bread (10.14 μg/kg). In the crust the highest average acrylamide content stand out wholemeal bread with OMEGA 3 fatty acids (217.18 μg/kg), the lowest in gluten-free butter bread (24.00 μg/kg). The content of acrylamide in the crust in relation to the content of this compound in the crumb was higher on average by 31%. Statistical analysis of the results showed that there are a number of statistically significant differences ($P \leq 0.05$) in acrylamide content between types of bread and content of this compound in the crust and crumb.

CONCLUSIONS

The study showed that acrylamide was present in all tested types of bread. The differences between the concentrations of the compound may result from a variety of composition, as well as various parameters of the baking. Estimated exposure analysis showed that the average Pole takes about 1.5 – 127 μg acrylamide per day (depending on the type of bread consumed). In compared to the level of recommended limit of this compound in the human diet only systematic pumpernickel intake can be dangerous and give rise to cancer. Consuming other types of bread does not pose a direct threat neurotoxic or carcinogenic. It must be noted that the bread is not the only source of acrylamide in the human diet with so much attention should be paid to monitoring its content in food.

Key words: acrylamide, bread, HPLC, analysis, risk

Comparison of the chemical composition of sour cherries depending on the years of cultivation

Paulina Nowicka, Kamila Strąg

Wroclaw University of Environmental and Life Sciences
Department of Fruit and Vegetable Processing
Contact e-mail: paulina.nowicka@up.wroc.pl

INTRODUCTION

Sour cherries are one of the widely cultivated fruit in the world. They are not only attractive in taste, but also they are characterized by a high content of many valuable nutrients and biologically active. Therefore, they are suitable both for direct consumption as well as an excellent raw material for food processing. These flavor characteristics, chemical composition and biological activity, as in the case of other fruit, are formed with the aid of cultivar and weather conditions occurring during the growing season. Therefore, we can meet both sour cherries with dark and light color, sour and sweet taste and healthy ingredients different content.

AIM

The aim of this study was to assess chemical composition of some varieties of sour cherry, which were harvested in three consecutive years and then demonstrate the correlations between the the amount of certain chemical parameters and the variety of sour cherries and the weather conditions during fruit ripening.

MATERIALS AND METHODS

The experimental material consisted of 30 varieties of sour cherries fruit, which was collected in June and July 2010, 2011 and 2012 from the the Experimental Station for Cultivar in Zybiszowie near Wroclaw. In the fruits, which were material, identified: dry matter, soluble solids, pectin contain, total acidity, ash, total sugars and vitamin C according to PN norm.

RESULTS

The results indicated that the cherry fruits characterized by a high content of mineral substances and titratable acidity, but a small amount of vitamin C and pectins. Topas variety, in all three years, were characterized by the highest titratable acidity (2010 – 2,79g apple acid/100g, 2011 – 2,44g apple acid/100g, a w 2012 – 2,65g apple acid/100g sour cherry). The highest ash content were characterized
the following varieties: Stevensbear – 1,55%, W7/02 - 0,81% oraz W4/02 – 0,69%, but as in the case of acidity, harvest season shaped the values of this parameter. Is also noticeable that specific factor of cultivation of the sour cherries, also shape dry matter and contain of total sugars and Vitamin C.

CONCLUSIONS

The obtained results show that sour cherry is a valuable nutrient resource and food processing material. Chemical composition of fruit is strongly correlated with variety and harvest season as well.

This work was financially supported by the National Science Centre UMO-2011/01/B/NZ9/07139
The work was performed under the direction of Aneta Wojdyło PhD

Key words: sour cherry, chemical compounds, cultivar

The possibility of using wheat fiber in the production of canned pork

Elżbieta Olczak, Maciej Gunia

Warsaw University of Life Sciences Poland
Faculty of Human Nutrition and Consumer Sciences
Departament of Food Gastronomy and Food
Food Gastronomy Chair
Contact e-mail: elzbieta_olczak@sggw.pl

INTRODUCTION

The adverse health consequences due to the large amount of fat in the diet, increasing the affect of the sensory attributes and increase technological efficiency are the principal reasons meat production a reduced fat content and replacing it with fiber. There is interest of new technologies for the manufacture of meat products with increased fiber content and a reduced fat content.

AIM

The aim of this study was to investigate the effect of additive 1% and 2% wheat Vitacel WF 400 on afficiency, sensory technological and sensory of canned pork meat.

MATERIALS AND METHODS

The study was conducted on pork of which the stuffing. Added fiber Vitacel WF 400 in an amount of 1% and 2% by weight of the meat stuffing. The composition of individual batters accounted for: canned control - pork shoulder 100%; canned “A” - pork amount 99% and fiber Vitacel 1%; canned “B” - pork shoulder 98% and 2% fiber Vitacel. The content of all other ingredients were identical cans. Canned filled, hermetically sealed, sterilized at 120 ° C for 60 min. After removing the cooled and weighed. Marked efficiency flavour canned. Sensory research performed by analyzing odor characteristics, texture and tastiness canned pork scaling method (PN ISO 4121: 1998) using linear graphic scale section 10 cm (0-10 j.u.). Evaluation was by done 30-person team of trained assessors in the sensory analysis. Statistical analysis was performed using the StatSoft, Inc. (2011) Statistica, version 10.www.statsoft.com.

RESULTS

Addition of fiber Vitacel WF 400 canned at 2%, affected significantly to the increase in efficiency (98,45%), while at 1% slightly (92.47), for canned without the addition (85%), reducing juice. Reduced calorie dietary supplement, while without degrading general product. Use of the preparation in an amount of 1% resulted in a reduction of energy by 91%, and the 2% fiber canned reduced energy value of 85%. The results indicate that fiber Vitacel WF 400 can be used as an additive the meat in canned food to reduce calories and increase productivity. Increased participation of fiber in canned pork has increased brevity, increase in the intensity odor of spices and sterilization odour, while reduce the intensity of the flavour of meat, fatty, sterilization and spices. Lower fiber content in canned pork meat stuffing caused that the product was more juicy, while 2% fiber the product was more concise. Addition of 1% fiber for canned caused a decrease in odor intensity attributes and taste of meat, fatty and spices.

CONCLUSIONS

1. The results show that the fiber can be used as an additive in an amount of 1% and 2%, due to increase the efficiency of the technological process and very good overall quality of canned.
2. The addition of fiber in an amount of 1% and 2% reduced energy value of the product.
3. Increased fiber content of 2% contributed significantly to the sensory quality characteristics such as the intensity of the odor of spices, odor of sterilization and conciseness.
4. The addition of fiber in an amount of 1% reduced the intensity of the flavour of meat, fat, spices and intensity of flavour sterilization.

Key words: fiber Vitacel, canned meat, efficiency

Lactobacillus plantarum viability and antibiotic susceptibility testing with fluorescence-based assays

Magdalena Olszewska, Łucja Łaniewska-Trokenheim, Sylwia Fiertak

University of Warmia and Mazury in Olsztyn, Poland
Department of Industrial and Food Microbiology
Contact e-mail: magdalena.olszewska@uwm.edu.pl

INTRODUCTION

The viability of *Lactobacillus* spp. is crucial for their applications as starter cultures and as probiotics. It is well known that different criteria should be fulfilled by selected strains in terms of functionality, usefulness and safety. In studies on survival and stress response, the quantitative assessment of viability is important.

AIM

1. Usefulness of fluorescence-based assays for viability assessment of *Lactobacillus plantarum* was investigated.
2. Assessment of survival when *Lactobacillus plantarum* is exposed to antibiotic agents (ampicillin, cephazolin, streptomycin and tetracycline). Three methods were compared by monitoring levels of lactobacilli at different antibiotic treatments.

MATERIALS AND METHODS

The esterase substrate carboxyfluorescein diacetate (CFDA) and the fluorescent *in situ* hybridization (FISH) and culture method were applied for active-cell discrimination using a *Lactobacillus plantarum.*

RESULTS

Test results using CFDA, FISH and culture analysis indicated the resistance of *Lactobacillus plantarum* to streptomycin and tetracycline, moderate susceptibility to cephazolin and susceptibility to ampicillin.
In accordance to viability assessment, the active/viable cell counts in investigated model systems were significantly different, as a comparison between two methods: CFDA and culture revealed. There was no significant difference between cell counts estimated by FISH and culture method, simultaneously indicating a strong correlation and analogy of population development assessed with these tools.

CONCLUSIONS

Fluorescence-based assays have many possible applications. In this investigation the application of viability assessment after exposure to antibiotics was validated. Likewise, chosen assays can be used for screening *Lactobacillus plantarum* under various stress conditions. The developed assays can also be suitable as a fast screening method for susceptibility assessment of lactic acid bacteria to a wide range of antimicrobial compounds, including antibiotics.

Key words: *Lactobacillus plantarum,* viability, antimicrobial agents, fluorescence-based assays

Analysis of the food market in terms of availability of hardened fats

Sylwia Onacik-Gür, Emilia Grybowicz

Warsaw University of Life Sciences
Department of Food Sciences
Contact e-mail: sylwia.onacik@gmail.com

INTRODUCTION

Trans fatty acids present (TFA) in the food products can be natural component of dairy and meat products or the effect of industrial processes. *Trans* isomers develop during the hydrogenation process, refinement and high temperature heat treatment. TFA in partly hydrogenated fat may constitute even 60%.
It has been confirmed in many researches that trans fatty acids have negative impact on health and they are crucial in developing cardio-vascular diseases. In some countries, the steps have been taken to reduce the application of hydrogenated fat, by restricting the containment in food products and labeling the amount of them on packages.
In Poland there is not any regulation concerning trans isomers in food products except for baby food.

AIM

The aim of this work was to analyze availability in the Warsaw market of food products containing hardened fat.

MATERIALS AND METHODS

Information located by food producers on packages of their products.
Food products were divided into following groups:

- Cookies
- Chocolate bars and halvahs
- Chocolate with filling
- Soup concentrates
- Margarine

Market analysis was done in seven shops. Five of them were bigger than 1000 m^2 and two of them less than 1000 m^2.

RESULTS

Based on information located on packages, it was concluded that over 50% of sweets (cookies, chocolate with filling, chocolate bars and halvahs) were containing hardened fat. The highest number of products containing hydrogenated fat (60 % of total range) was among chocolate bars with filling. The availability of products including hardened fat was the highest in the hypermarket Real, the lowest availability of these products was in the hypermarket TESCO and in the supermarket Biedronka. Most of the products, which did not contain hydrogenated fat, had been produced by foreign concerns.

CONCLUSION

In Polish market there are still many food products containing fat, which is called 'hydrogenated'. These products might be a crucial source in terms of nutrition due to negative *trans* fatty acids. Labeling the content of TFA on packages of food products, which are available in Polish markets, would help consumers to make better choices.

Key words: hardened fat, hydrogenated fat, *trans* isomers, *trans* fatty acids, market analysis

Comparison of knowledge in the field of fats among university students from Poland and The Netherlands

Sylwia Onacik-Gür

Warsaw University of Life Sciences
Department of Food Sciences
Contact e-mail: sylwia.onacik@gmail.com

INTRODUCTION

According to most of the scientists and nutritionists, *trans* fatty isomers (TFA) have a negative impact on human health. Because of hazards related to an excessive consumption of TFA, international organizations such as EFSA and WHO have stated that daily intake should be reduced as much as possible.
Nowadays in some countries there are applied limits of maximum level of TFA and in other countries it is obligatory to inform the consumers about the content of *trans* fatty acids on the packages. In European Union there is no official limitations on uses of fats containing TFA. However, members of the EU may implement their own regulations.

AIM

The aim of this work was to analyze the knowledge in the field of *trans* fatty acids and nutritional recommendations related to fats among the students at the University of Life Sciences in Warsaw and Wageningen.

MATERIALS AND METHODS

The research was done by a questionnaire composed of 16 questions. The study was conducted on answers of 97 students from Warsaw University of Life Sciences and Wageningen University of Life Sciences in 2012.

RESULTS

In comparison of students' test results in the field of *trans* fatty acids and fats in general, the most significant differences of knowledge between two universities statistically did not occur ($p<0,05$). Eating habits concerning fats/oils, cakes and pastry products were very similar in both populations.
Women were consuming sweet snacks much often than men. In the Netherlands 80% and in Poland 62% of female students declared that they have been eating these types of products at least a couple of times in a week.

CONCLUSIONS

It is important to educate people about the negative influence of TFA on health and to inform them which products might be a source of *trans* isomers. Eating habits of women should change as they consume sweet snacks too often, which could be a source of undesired fatty acids in their diet.

Key words: *trans* fatty acids, consumer awareness, Polish students, Dutch students, eating habits

1,3-propanediol – a potential raw material for biodegradable packages for food products' production

Dorota Orczyk, Katarzyna Leja, Włodzimierz Grajek

Poznań University of Life Sciences
Department of Biotechnology and Food Microbiology
Contact e-mail: dorota.orczyk@up.poznan.pl

INTRODUCTION

1,3- propanediol (1,3-PD) is an alcohol which consists of two hydroxyl groups, with the formula $C_3H_8O_2$. 1,3-PD is an important chemical by-product in polymers production. An increasing demand for polyesters and polypropylene (PTT) resulted in an increased 1,3-PD production. PTT is a biodegradable polymer with a huge potential for packaging industry - especially for packages for food products. Microbiological synthesis of 1,3-PD from glycerol is a promising alternative to chemical methods of this diol production.

AIM

The aim of the work was the conversion of glycerol to 1,3-PD by *Clostridium butyricum* in fed-batch fermentations.

MATERIALS AND METHODS

Microorganisms: *Cl. butyricum* isolated from natural environment probe were from the collection of the Department of Biotechnology and Food Microbiology, Poznan University of Life Science. Raw material: pure glycerol CZDA (POCH S.A.). Batch and fed-batch fermentation was carried out in 5 L bioreactors (Sartorius Stedim Poland Sp. z o.o.). Precultivation was carried out in Hungate tube (24 h). Then, the medium in bioreactor was inoculated. The bioreactor was filled to 40% of its capacity. Fermentation was carried out with agitation (the stirrer speed was maintained on the level of 60 rpm), with pH (on the level 7.0) and temperature (37°C) automatic control. After fermentation the cell free supernatants were collected. The products were delineated with a high liquid performance chromatography (HPLC) technique. The Hewlett Packard system consisted of an auto sampler and a pump, and a refractive index detector was used.

RESULTS

More effective production of 1,3-PD was observed in fed-batch fermentation than in batch process. In this model of fermentation, 54,82 g/L of 1,3-PD was obtained. In the batch fermentation, only ca. 34 g/L was obtained.

CONCLUSIONS

From the economical point of view, utilization of crude glycerol has two beneficial aspects: elimination of chemical synthesis to 1,3-PD production, and solution of the problem with management of crude glycerol – a by-product of biodiesel production. Moreover, polymers obtained from 1,3-PD are important raw materials which can be used in packaging industry because of their good resistance to deformation and good tensility properties.
If the process of such package materials' manufacture is to be profitable, however, maximization of 1,3-PD by microbiological way is a necessary condition in the process.

This work was prepared within the framework of project no.01.01.02-00-074/09 co-funded by The European Union from the European Regional Development Fund within the framework of the Innovative Economy Operational Programme 2007-2013.

Key words: 1,3-propanediol, *Clostridium* spp., glycerol

A comparison of mycotoxins in cereal grains grown in conventional and organic farming

Anna Ostrowska, Juliusz Perkowski, Kinga Stuper-Szablewska

Poznań University of Life Sciences
Department of Chemistry
Contact e-mail: anna.ostrowska@up.poznan.pl

INTRODUCTION

Critics of organic farming have asserted that organic food is more likely to contain mycotoxins because organic farmers do not use fungicides. There have been relatively few careful studies comparing mycotoxins levels in conventional and organic foods, but the few that have been published reach the opposite conclusion, or state there appears no major differences between these two systems of farming.

AIM

On the basis of the available literature data and Statistics survey literature made investigation about mycotoxins level contamination of cereals grain from organic farming.

MATERIALS AND METHODS

Work methodology was based on a comprehensive review of available publications. The analysis of literature comes down to a comparative report on the results of other authors and their evaluation.

RESULTS

Mycotoxins were detected in conventional food 50 percent more often than in organic and at average level a little over twice as high, as shown in the Organic Center's 2005 State of Science Review "Breaking the Mold – Impacts of Organic and Conventional Farming Systems on Mycotoxins in Food and Animal Feed." Research provides two likely explanations. It turns out that many fungicide applications on conventional farms actually increase mycotoxins levels. In some cases, application of a fungicide only partially controls the target fungi pest, placing the organism under stress and triggering its normal defense mechanisms, including production of mycotoxins. Higher levels of mycotoxins have been reported in multiple studies in wheat and other grains grown under high-yield, chemical-intensive conventional systems, compared to the same grains raised organically. Most of these studies conclude that the high levels of nitrogen fertilizer used on conventional wheat actually stimulates fungal growth, and if weather conditions change and place fungal populations under stress, they begin producing mycotoxins as a part of their survival response.

CONCLUSIONS

Organic farming is not generally more endangered by the risk of contamination of the products with mycotoxins than other farming systems.

Key words: organic farming, conventional farming, mycotoxins

Gluten-free bread vs. traditional wheat-rye bread – MAIN DIFFERENCES

Mariusz Pacyński, Renata Zawirska-Wojtasiak

University of Life Sciences
Faculty of Food Science and Nutrition, Institute of Food Technology of Plant Origin
Contact e-mail: marpac@up.poznan.pl

INTRODUCTION

Bakery products, particularly bread, constitute the basis of most people's diets. The smell of fresh bread is a common factor which determines product acceptance by consumers. However, traditional bread is excluded from the diet of people with celiac disease. A characteristic aroma of traditional, wheat-rye bread is well-known. The aroma profile of gluten-free breads, constituting the staple food in the diet of celiac patients, has not been characterized to date.

AIM

The aim of this study was to characterize the aroma profile of gluten-free bread by sensory and instrumental analysis and compare it with the aroma profile of traditional bread.

MATERIALS AND METHODS

The aroma of gluten-free breads available on the Polish market has been evaluated using sensory and instrumental analysis (GC/MS) of volatile compounds. Descriptive sensory analyses were used in sensory evaluation. The data was presented on a diagram in the form of graphic projection after PCA (Principal Component Analysis) interpretation. Qualitative and quantitative analyses of volatile compounds were performed by SPME-GC/MS. SPME-GCxGC-TOFMS was used in qualitative analysis only.

RESULTS

Even those gluten-free breads which received the best scores in the sensory analysis did not have the typical aroma of traditional bread. Qualitative and quantitative chromatographic analyses showed that pyrazines, found only in the aroma of traditional breads, were the primary group of compounds differentiating profiles of traditional and gluten-free breads. No significant differences were observed in the amounts of identified compounds between crust and crumb of gluten-free breads, in contrast to traditional bread. 2-methylpyrazine was detected only in the crust of traditional bread, in which the level of furfuryl alcohol was much higher than in the crust of gluten-free bread. In the case of crumb significant quantitative differences between traditional and gluten-free breads were observed for 3-methyl-1-butanol. Within gluten-free breads this compound was found in higher amounts among breads with better scores in sensory examination, while it was comparable to the content in the crumb of traditional bread. Moreover, gluten-free breads contained significantly higher amounts of phenylethyl alcohol, with the highest levels recorded in those with the worst scores of sensory examination.

CONCLUSIONS

Identification of the most significant differences in the aroma profile of gluten-free breads in comparison to traditional bread makes it possible to develop a formulation of gluten-free bread with an improved aroma.

Key words: gluten-free bread, traditional bread, volatile aroma compounds, sensory quality

Trehalose production by Propionibacterium spp.

Joanna Pawlicka, Agnieszka Drożdżyńska, Alicja Kośmider, Piotr Kubiak

Poznań University of Life Sciences
Department of Biotechnology and Food Microbiology
Contact e-mail: joannap@up.poznan.pl

INTRODUCTION

Over the few years a number of new functional ingredients called nutraceuticals has appeared in the food and pharmaceutical market. Low-calorie sweeteners, group B vitamins, conjugated linoleic acid (CLA) are some examples that can be obtained through fermentation by food-grade microorganisms.
Bacteria belonging to the genus *Propionibacterium* can be used as "cell factories" for the production of nutraceuticals. They have the ability to produce many valuable substances, including trehalose – the low-energy sugar and osteoporosis preventing agent.

AIM

The aim of this study was to select strains of *Propionibacterium* spp. able to accumulate high amounts of trehalose.

MATERIALS AND METHODS

Strains of *Propionibacterium* spp. were tested for trehalose production. Each strain was grown on 2 different carbon sources: glycerol and glucose. Fermentation was carried out at 30°C for 7 days and pH was regulated each 24h to 6.8. Substrates and products concentration were quantified by HPLC. Optical density (OD) was used to determine cell dry mass for biomass yield calculation.

RESULTS

All tested *Propionibacterium* spp. were able to grow on two different carbon sources – glucose and glycerol and had similar metabolic profiles. All produced propionic acid as main end-product, the highest yield of propionic acids was above 10 g/L. *Propionibacterium* spp. also synthesized some quantities of other organic acids: acetic, succinic, lactic. Executed experiments confirmed that intracellular trehalose was accumulated by all tested *Propionibacterium* spp., regardless of the carbon sources used.

CONCLUSIONS

The present study confirmed that *Propionibacteriu*m spp. are able to synthesize trehalose from glucose and glycerol. In next step of study, the impact of environmental factors (e.g. osmotic pressure, temperature) will be investigated as trehalose is believed to be stress-response metabolite.

Key words: *Propionibacterium* spp., trehalose, nutraceuticals

Brewing with oats

Paulina Pawłowska, Anna Diowksz, Edyta Kordialik-Bogacka

Lodz University of Technology
Institute of Fermentation Technology and Microbiology
Contact e-mail: paulina.pawlow@gmail.com

INTRODUCTION

Oats are not a conventional raw material for brewing. Nowadays this grain is used in the brewing industry mainly as a flavor adjunct. Interest in oats is a result of a need for investigating the production of beer from guaranteed gluten-free raw materials. Recent research shows that oats can be tolerated by the majority of people who suffer from celiac disease, which requires lifelong adherence to a gluten-free diet. Brewing with oats can be demanding and troublesome due to the specific characteristic of this cereal. Oats are rich in protein, lipids and β-glucan and consequently lower in starch than traditionally used barley. Oats can be used for beer production, but it requires optimization of the technological process.

AIM

The aim of this study was to brew a beer from malted oats. The oat beer was compared to a beer produced from conventional barley malt. Both types of beers were prepared under the same conditions.

MATERIALS AND METHODS

Oats of Sławko variety and barley of Stratus variety, harvested in 2011, obtained from Plant Breeding Strzelce, were used as the raw material for the technological process. Grains were malted using optimized procedures in micromalting machine in Maltings Soufflet (Poznań). The regular malts, as well as sour malts (with lactic acid bacteria *Lactobacillus delbrueckii ssp. delbrueckii 20074* added to grain during soaking) underwent mashing process. Hop pellets of Marynka variety type 45 were added during wort boiling. Yeasts *Saccharomyces cerevisiae TT* and *Saccharomyces pastorianus W30/78* were used for top and bottom fermentation, respectively. The obtained beers were analyzed according to Polish Standards and EBC Methodology.

RESULTS

Bottom-fermented beers showed lower alcohol content (2,8-4,1%) in comparison to top-fermented ones (3,8-4,4%). Consequently, beer extract remained at the level of 4,2-4,7% and 2.3-2.9%, respectively. It corresponded to a lower degree of attenuation in bottom-fermented beers (62-63%), than in top-fermented beers (78-79%). In both, oat and barley beers, the protein content as well as free amino nitrogen (FAN) level reached very high values. Total protein constituted 8,2-8,7% of extract content in oat beers, while in barley beers it was 7,0-7.5%. FAN ranged from 22 to 30mg/100 cm^3 in the first case, and 21 - 23mg /100 cm^3 in the second one. Oat beers showed lower viscosity than the control barley beer. However, they were characterized by a very high turbidity: more than 80-90 ECB units. The color of both kinds of beer was high and amounted 8,5-10 ECB. All the beers represented low total acidity (2.0-2.4cm^3 NaOH/100 cm^3) and pH value at about 4.0. They revealed bitterness values at a range 19-20 BU.

CONCLUSIONS

Oats could play an important role in the production of gluten-free beers, which are addressed to people suffering from celiac disease. This study shows that it is possible to produce beer with new, unconventional raw materials such as oats.

Study supported by research grant MNiSW, N N312 359539.

Key words: oats, beer, fermentation, gluten-free, celiac disease

Analysis of the colour of the pork Longissimus dorsi muscle before and after thermal treatment in case of meat of animals fed with forage containing selenium and vitamin E

Ewelina Pogorzelska[1], Dominika Guzek[1], Dominika Głąbska[2], Karolina Kozań[1], Agnieszka Wierzbicka[1]

Warsaw University of Life Sciences, Faculty of Human Nutrition and Consumer Sciences
[1]Division of Engineering in Nutrition; [2]Department of Dietetics
Contact e-mail: ewelina_pogorzelska@sggw.pl

INTRODUCTION

The colour, being important attribute during purchase, is for consumers the indicator of freshness of pork meat. It is affected by oxidative processes [Chaijan, 2007, *Songklanakarin J. Sci. Technol. 30, 47-53*] and antioxidative compounds added during production, e.g. selenium [Bobček et al., 2011, *Biotechnol. Anim. Husb. 27, 791-798*] and vitamin E [Sales & Koukolova, 2011, *J. Anim. Sci. 89, 2836-2848*].

AIM

The aim was to analyse the influence of applied supplementation of forage with flaxseed oil, selenium and vitamin E on the colour of the pork *Longissimus dorsi* muscle before and after thermal treatment.

MATERIALS AND METHODS

The object was pork *Longissimus dorsi* muscles from 18 Polish Landrace (PL) and 18 PL x Duroc (PLxD) animals – 6 PL and 6 PLxD in each group. The groups were fed control ("C" – containing 2% of canola oil), experimental "1" ("E1" – 3% of flaxseed oil, 1 mg of Se and 100 mg vitamin E/ kg of the forage) and experimental "2" forage ("E2" – 3% of flaxseed oil, 1 mg of Se and 200 mg vitamin E/ kg of the forage). Thermal treatment (TT) was conducted in convection oven (180°C to 71±1°C in geometrical center of element). A slices of meat were the object of the study. The colour before and after TT was measured (10 measurements) in the L*a*b* colour system (Minolta CR-400). To characterize the relationships, ANOVA and post-hoc Tukey test were used (α=0.05).

RESULTS

For L* (p=0.0001) and b* (0.0000) before TT, as well as for L* (0.0164), a* (0.0004) and b* (0.0007) after TT, the cumulative influence of breed and forage was observed. For PL "E2" group, the L* before TT was higher than for other samples, while after TT it was higher than for PL "E1" group (0.0140). The a* before TT, for "E1" was lower than for "E2" (0.0406 for PL, 0.0005 for PLxD), while after TT, for "E1" was lower than for "E2" for PLxD only (0.0069). The b* for PL, in case of "E1" and "E2" before TT was higher than in case of "C" and after TT was lower than in case of "C".

CONCLUSIONS

The supplementation of forage with Se and vitamin E has a breed-dependent influence on the colour of pork *Longissimus dorsi* muscles. The supplementation with flaxseed oil, Se and higher doses of vitamin E, in case of PL breed, results in brighter colour in comparison with control and forage with lower doses, while after TT, difference is significant in comparison with lower doses only. Higher doses result in more intensive red colour for PL and PLxD, but after TT, difference is significant for PLxD breed only.

"Researches was realized within the Project "BIOFOOD-innovative, functional products of animal origin" no. POIG.01.01.02-014-090/09 co- financed by the European Union from the European Regional Development Fund within the Innovative Economy Operational Programme 2007-2013"

Key words: pork meat, colour, *Longissimus dorsi*, flaxseed oil, selenium, vitamin E

Monitoring of the environmental conditions during the White Mulberry leaves aging

Monika Przeor[1], Ewa Flaczyk[1], Irena Jóźwiak[2], Eugeniusz Korbas[2], Marian Remiszewski[2]

[1]*Poznań University of Life Sciences, Department of Food Service and Catering*
[2]*Institute of Agricultural and Food Biotechnology, Department of Food Concentrates*
Contact e-mail: monika.przeor@up.poznan.pl

INTRODUCTION

White mulberry (*Morus alba* L.) plant was originally cultivated in Asia where the leaves were used as food for silkworms. Recent studies indicate that white mulberry leaves are rich in polyphenols, alkaloids (mainly 1-deoxynojirimycin), triterpenes and steroids. There is an increasing interest of mulberry leaves because it has been found that the leaves have antihyperglycemic effect, skin whitening property, protection against cerebral ischemia, and antiatherogenic effect. As mulberry shows significant bioactivities it is widely used to produce various functional foods.
The production process seems to be important for the quality of the finished product. During the aging process of *Morus alba* leaves there are changes in environmental conditions that shape the properties of the extract.

AIM

The aim of the study was to monitor pH of reaction medium, during *Morus alba* leaves aging prior to the drying process.

MATERIALS AND METHODS

The studied material were *Morus alba* leaves, variety Wielkolistna-Żółwińska, gathered from Institute of Natural Fibres and Medicinal Plants plantation (Pętkowo, near Poznań) in July, 2012. Fresh leaves were shredded and twisted, then divided into five parts according to aging time: not aged, aged for an hour, 2, 3 and 4 hours. All samples of mulberry leaves were collected in a beaker and homogenized in water. pH measurements were performed in the liquid every fifteen minutes.

RESULTS

The research indicated that in all the tested samples of mulberry leaves the pH values were growing with the passage of time. There was a different initial pH value of the environment for different aging variants, despite using leaves from the same collection. It has been reported that the mean increase in pH was 0.2 for one hour, regardless of the variant.

CONCLUSIONS

Summing up, leaves aging causes change in pH to more alkaline.

Supported by the EU Project No POIG 01.01.02-00-061/09.

Key words: white mulberry, aging process, environmental conditions, pH value

Effect of the microencapsulation process and the addition of antioxidants on fish oil stability

Marzena Anna Przybysz, Monika Zawiślak

Warsaw University of Life Sciences, Faculty of Food Sciences
Department of Food Sciences
Division of Fats & Oils and Concentrates Technology
Contact e-mail: marzena_przybysz@sggw.pl

INTRODUCTION

Omega-3 fatty acids occurring in fish oil play an important role in the proper development and functioning of our organism. Despite this, the human organism cannot synthesize them itself and they must be supplied in the diet. Currently, the level of consumption is relatively low. Regular fish consumption or dietary supplements are recommended. The main obstacle to the dietary supplementation of omega-3 fatty acids is their susceptibility to oxidative changes, and very frequently, an unacceptable taste and smell.
Hence, the advisability of the study to increase the stability of fish oil by microencapsulation.

AIM

This research aims to determine the effect of the type and amount of the carrier (microcapsule wall material) as well as the addition of antioxidants on the oxidation stability of microencapsulated fish oil by spray drying.

MATERIALS AND METHODS

ROPUFA '30' N-3 FOOD OIL – fish oil was used as a core. The carriers (walls of microcapsules) were made of: arabic gum, maltodextrins (glucose equivalent 16,4) and starch sodium octenyl succinate. Green tea extract and butylated hydroxyanisole – BHA (E320) were used as antioxidants. Fish oil was 10 % of the emulsion weight, and the amounts of the carriers added ranged from 20 to 30 %. The microcapsules were obtained by spray drying. The stability of microencapsulated fish oil was determined by peroxide value measurements of oil extracted from the microcapsules, oil from the microcapsule's surface and Fourier transformation applying infrared spectroscopy (FT-IR). Determination of the peroxide value was carried out in accordance with the Polish Standard PN-ISO 3960:2005. Microencapsulated fish oil and liquid fish oil (comparative test) were stored for eight months at room temperature in a colorless glass jars containers fully exposed to daylight.

RESULTS

The results show significant oxidation changes in the fish oil after microencapsulation by spray draying. The type and amount of the additive carrier significantly affects the stability of the fish oil microencapsulated by spray drying. Fish oil enclosed in a microcapsule composed of modified starch (E1450) was characterized by a greater stability compared with the oil contained in microcapsules containing gum arabic. Addition of maltodextrins to microcapsules of gum arabic as well as the modified starch microcapsules significantly increased the oxidative stability of microencapsulated fish oil. The addition of antioxidants (BHA or green tea extract) resulted in improved oxidative stability of microencapsulated fish oil. The most effective antioxidant was the green tea extract.
Spectral analysis of the extracted oil showed changes in the composition of the oil during storage resulting from oxidation of the fish oil.

CONCLUSIONS

Liquid fish oil is highly unstable. Microencapsulation of fish oil by spray drying does not extend its stability in a satisfactory manner. Hence, further encapsulation using fluidization or spray cooling methods seems advisable.

Work was done under the supervision of: dr hab. Elżbieta Dłużewska

Key words: microencapsulation, fish oil, wall materials, antioxidants, spray drying

The effect of post-mortem aging and grilling process on conjugated linoleic acid (CLA) in selected beef muscle

Rita Rakowska, Anna Sadowska, Bożena Waszkiewicz-Robak

Warsaw University of Life Sciences
Faculty of Human Nutrition and Consumer Sciences
Contact e-mail: rita_rakowska@sggw.pl

INTRODUCTION

Consuming meat products, is a good opportunity to supplement diet in nutrients, as well as bioactive compounds, such as conjugated linoleic acid (CLA), the content of which determines the pro-health quality of the product. It is known that the preparation of beef for consumption (first of all heat treatment) is associated with changes in the content of bioactive components including conjugated linoleic acid. However, the appropriate technological procedure of raw meat, including aging process can have a significant effect on minimizing the loss of the bioactive compound.

AIM

The aim of this study was to determine the effect of meat aging time and grilling process on CLA content in selected beef muscle.

MATERIALS AND METHODS

The material consisted of beef originating from the 18-month Limousine bulls fed semi-intensive. The meat was aged for 7, 14 and 21 days and then subjected to the process facilities. The content of conjugated dienes of linoleic acid was determined using the gas chromatography with flame ionization detector GC-FID. The principle of this method was to perform triacylglycerols present in the fat into the fatty acid methyl esters, followed by the qualitative and quantitative analysis of these esters.

RESULTS

Based on the study, it was found that both the aging and the grill processes had a significant impact on the content of conjugated linoleic acid in selected beef muscle. These processes resulted in increased of CLA content in meat.

CONCLUSIONS

In conclusion it is possible to optimize the technological process parameters in order to maximize the content of selected bioactive compounds in beef meat.

Key words: conjugated linoleic acid (CLA), meat aging, grilling, beef

The ascorbic acid content in different varieties of strawberry fruit

Agnieszka Rogula[1], Alicja Z. Kucharska[2], Anna Sokół-Łętowska[2], Izabela Fecka[1]
[1] *Medical University of Wroclaw, Chair and Department of Pharmacognosy*
[2] *Wroclaw University of Environmental and Life Science, Department of Fruit, Vegetable and Cereals Technology*
Contact e-mail: a.rogula@op.pl

INTRODUCTION

Ascorbic acid plays a great part in the human organism. Together with vitamin E, bioflavonoids and carotene it takes part in most reactions of metabolism. Vitamin C is instrumental in creating collagen I intercellular substance. As one of the most important antioxidants it also takes an essential function in reactions of toxic counteracting or immunity. It delays creating of cancer nitrosamine. Above all it has got bacteriostatic and bactericidal properties towards some pathogenic microorganism. Vitamin C exists in fresh fruit and vegetables in different quantity. Citrus fruit, strawberries, briar-rose, pepper, green parsley are the essential source of this vitamin. Average daily demand of an adult for vitamin C is great and it is about 60-200 mg. Therefore it is very important to know the content of this vitamin in different raw plant materials.

AIM

The aim of this work was labeling of the content of ascorbic acid in different varieties of strawberry fruit in its three phases of fructification (green, pink and red fruit).

MATERIALS AND METHODS

Fruit *Fragaria x ananassa* (Weston) Duchesne (12 varieties) served as the study material. All samples came from one plantation (Stacja Doświadczalna Oceny Odmian w Masłowicach). Raw material was gathered in the ripening stage in July 2011. The whole fruit was frozen immediately after gathering it. The content of Vitamin C was estimated in 3 fructification stages (green, pink and red fruit). The amount of ascorbic acid was estimated by means of isocratic HPLC-DAD method using Cadenza column. 0,1 % Metaphosphoric acid was used as an eluent. Vitamin C was identified by their retention times and absorption spectra. Quantification was carried out by external standard calibration curves.

RESULTS

On the basis of the results it is possible to note that the ascorbic acid content was different depending on the variety of strawberry. The increase of Vitamin C content was observed in all samples together with the fruit ripening. The smallest amount of Vitamin C was signified in green strawberries, the highestin red ones. The smallest content of Vitamin C in red fruit was observed in ISK 525, Maria, Valetta strawberry varieties. The biggest one existed in such varieties as: Selvic, Siabelle, Elvira. The content of Vitamin C in examined varieties of strawberry red fruit was average from 58 to 192 mg in 100 g. That means that one portion of strawberries (100 g) fulfills of daily demand of Vitamin C for the human organism.

CONCLUSIONS

The study shows that the amount of ascorbic acid in strawberries varied according to cultivar, and ripening stage. This information should allow to select strawberries with an optimal content of this compound.

Key words: ascorbic acid, *Fragaria x ananassa*, HPLC, strawberries

The assessment of the quality of a short-cut forms of pasta available on the Warsaw market

Daria Romankiewicz, Grażyna Cacak-Pietrzak, Magda Gońda

Warsaw University of Life Sciences
Department of Cereal Technology
Contact e-mail: daria_romankiewicz@gmail.com

INTRODUCTION

In Poland since the 1960's we can observe a progressive increase in consumption of pasta. The influence on this process has many different factors, among other things: new way of life, wide assortment, low price, as well as wide range of using pasta. According to statistics, in 2011 the average Pole ate 4,4kg of pasta. The typical pasta is made from product which is obtained from milling of the durum wheat grain and/or of the common wheat grain and water. On the Polish market consumer has a wide range of different kind of pasta, which come both from local and foreign producers, and which are diversified in terms of composition.

AIM

The aim of this project was the assessment of the quality of a short-cut pasta – fusilli shape, made by different producers available at the Warsaw market.

MATERIALS AND METHODS

Tested materials consisted of eight samples of short-cut pasta – Fusilli shape. Three samples came from local producers, whereas five from import. The used material/samples were bought twice in other conduct test on pasta which came from two different batches. The range of the project included among other things, the quality of packaging assessment and labeling. The content of pasta of inappropriate length and deformed shape was indicated. The physical-chemical properties were marked: content of water, total protein and total ash. The culinary features such as: dry mass losses during cooking as well as factor of the pasta mass increase, were indicated. Additionally the organoleptic assessment, before and after cooking was conducted by ten-person team. The results were formulated by the statistic program Stratigraphic Plus 4.1. of one-way variance method of analyses at the significance level α=0,05. The homogeneous groups were marked with Turkey's test.

RESULTS

The packaging of tested pasta were marked according with Regulation of the Ministry of Agriculture and Rural Development of 10th July 2007, on the labeling of foodstuffs. The percentage of pasta of inappropriate length or deformed shape was small; at most was at 3%. The content of water was in the range from 6,5 to 8,7%, while the total ash from 0,66 to 1,02%. The content of total proteinin tested pasta contained in the range from 11,74 to 14,07%. The dry mass losses of pasta during cooking was from 4,29 to 5,26% and the factor of the pasta mass increase from 1,96 to 2,66%. The amountof points awarded in organoleptic assessment of pasta before and after cooking amounted to accordingly; from 2,7 to 4,8% and from 2,7 to 4,7%.

CONCLUSIONS

The pasta were significantly different, in respect of most tested features, except the dry mass lossesof pasta during cooking. The pasta made from product (stock) which was obtained from millingof the durum wheat grain where characterized by higher ash content. In this group of pasta, togetherwith the increase of content total protein were observed decreases of the dry mass losses during cooking, as well as factor of the pasta's mass increase. In the organoleptic assessment none of the samples did not got the maximum number of points. The lowest mark was given to the pasta made from semolinaand wheat flour pasta, with the addition of eggs.

Key words: pasta, quality, fusilli, semolin, wheat flour

The effect of the beer sample preparation on the content of potassium and sodium

Iga Rybicka, Karolina Dyc, Anna Gliszczyńska-Świgło

Poznań University of Economics
Faculty of Commodity Science
Contact e-mail: iga.rybicka@ue.poznan.pl

INTRODUCTION

Atomic absorption spectrometry in a flame (*FAAS*) is a rapid and reliable method for determination the mineral content in various materials, including alcoholic beverages, such as beer. For mostof minerals, there are different methods of sample preparation before the proper mineral determination, e.g. Cu, Mn, Pb and Zn content in Spanish beers was analyzed directly in degassed beers, but beers chosen to analyze Al content were digested with nitric acid in a digestion block or in a microwave oven.

AIM

The aim of the study was to compare two different methods of preparation of the beer sample in the aspect of the mineral, potassium and sodium, content.

MATERIALS AND METHODS

Four beer brands were obtained from the Polish market to analyze their sodium and potassium content using *FAAS*. Before determining the content of minerals, each beer sample was prepared in two different ways: (1) using ultrasonic degassing and (2) ultrasonic degassing with acid mineralization in a digestion block.

RESULTS

The content of sodium in beers after acid mineralization was between 9.3±0.1 to 31.5±0.1 mg/l, whereas in the same beers prepared solely with ultrasonic degassing the content of this mineral was about two-fold higher and ranged from 17.8±0.3 to 59.1±2.9 mg/l. Similar differences were also observed for the potassium content, which ranged from 169.1±5.4 to 303.6±12.4 mg/l for mineralized beers and 276.7±3.8 to 578.8±3.0 mg/l for degassed beers.

CONCLUSIONS

Preparation of the beer sample has significant effect on the content of potassium and sodium measured using *FAAS*. Results of the study indicate that cheaper, less labor-intensive and time-consuming direct determination of sodium and potassium in beer is more effective than the method demanding the acid mineralization.

Key words: beer, atomic absorption spectrometry, acid mineralization, minerals, sodium, potassium

Studies on anti-inflammatory effect of broccoli sprout extract using in vitro model of gut inflammation

Joanna Rychlik, Anna Olejnik, Katarzyna Kowalska, Włodzimierz Grajek

Poznań University of Life Sciences
Department of Biotechnology and Food Microbiology
Contact e-mail: joanna.rychlik@up.poznan.pl

INTRODUCTION

Many studies indicated that inhibition of proinflammatory factors production in response to inflammatory stimuli is a useful strategy to prevent inflammatory associated diseases such as cancer.A small body of literature suggested that some compounds derived from broccoli sprouts suchas indole-3-carbinol or sulforaphane may protect against inflammation, inhibiting cytokine production, but this activity of whole broccoli have not been evaluated.

AIM

In this study, we have demonstrated the mechanism underlying the anti-inflammatory properties of broccoli sprout water extract using coculture system with intestinal epithelial Caco-2 cells (apical side) and macrophage RAW264.7 cells (basolateral side).

MATERIALS AND METHODS

For assessing the anti-inflammatory effect of broccoli sprout extract (BS) the coculture system with epithelial Caco-2 cells (apical side) and macrophage RAW264.7 cells (basolateral side) was used. Human intestinal epithelial cells Caco-2 and murine macrophage RAW264.7 were cultured in DMEM supplemented with 1% non-essential amino acid solution, 10% decomplemented FBS and gentamicin (50mg/L medium). Caco-2 cells were cultured on Transwell insert plates (1.1 cm^2, 0.4 μm pore size, Millipore) for 3 weeks to obtain TER value > 1200 Ω *cm^2. RAW264.7 cells were seeded into the 24-well tissue culture plate and incubated overnight to completely adhere to the wells. The Transwell inserts on which Caco-2 cells had been cultured were added into multiple plate wells preloaded with RAW264.7 cells. In an experiment to evaluate the anti-inflammatory effect of BS extract, 0.4 ml of BS extract (non-digested and subjected to *in vitro* digestion) was applied to the apical side for 3 h, and then LPS (500 pg/mL) was added to the basolateral side in this model. After an additional incubation of 3 h, culture supernatants from the basolateral side were collected for TNF-α, IL-6, IL-8 and PGE_2 measurement using commercially available ELISA kits (R&D Systems).

RESULTS

Treatment with BS extract resulted in down-regulation of IL-8 production from Caco-2 cells. Moreover BS extract decreased TNF-α, IL-6 and PGE_2 production from RAW264.7 cells compared with the non-treated control. The highest inhibition percentages (about 40%) were observed in case of PGE_2 and TNF-α for BS extract at concentration 1mg/mL. BS extract subjected to *in vitro* gastrointestinal digestion also inhibited pro-inflammatory cytokines production and PGE_2 synthesis. The average reduction in contents of inflammation markers (TNF-α , IL-6, PGE_2) was 30%.

CONCLUSIONS

These results suggested the possibility that the oral administration of broccoli sprouts exerted an anti-inflammatory effect in the intestine through the inhibition of excessive IL-8 secretion and suppression of the production of TNF- α, IL-6 and PGE_2 from immune cells. However these important observations need to be confirmed by the quantification of TNF-α, IL-6, IL-8 and COX-2 mRNA expression.

Key words: broccoli sprouts, anti-inflammatory effect, Caco-2/RAW264.7 co-culture

Determination of curd - ripened fried cheese origin by using16S and 26S rRNA genes fingerprinting of microbiota communities by PCR DGGE

Tomasz Rychlik[1], Artur Szwengiel[1], Edna Arcuri[3], Didier Montet[3], Baltasar Mayo[2], Jacek Nowak[1], Zbigniew Czarnecki[1]

[1] *Poznań University of Life Sciences, Faculty of Food Science and Nutrition, Institute of Food Technology of Plant Origin, Department of Food Fermentation and Biosynthesis, 31 Wojska Polskiego street, 60-624 Poznań, Poland*
[2] *Instituto de Productos Lacteos de Asturias (IPLA-CSIC), Carretera de Infiesto s/n, 33300 Villaviciosa, Asturias, Spain*
[3] *Centre de Cooperation Internationale en Recherche Agronomique pour le Developpement, CIRAD, UMP Qualisud, 34398 Montpellier Cedex 5, France*
Contact e-mail: tomrych@up.poznan.pl

INTRODUCTION

Fried cheese from Wielkopolska is one of the few traditional fermented products in Poland endowed with a Protected Geographical Indication (PGI) label. Its traditional manufacturing process, maintained through the ages in the Wielkopolska region, gives the product an original and specific character. The sensory properties of the fried cheese are closely related to the particular cheese technology, but also to its associated microbiota which plays a key role in creating its typical aroma and taste.
Having regard to Commission Regulation (EC) No 1898/2006 laying down detailed implementationof European Union Council Regulation (EC) No 510/2006 on the protection of geographical indications and designations of origin of agricultural products and foodstuffs the product specification shall set out, inter alia, details of the specific quality and other characteristics attributable to the geographical origin.

AIM

The main aim of this study was to propose an analytical tool that will permit to link microbial ecologyto the geographical origin of the food with protected status.

MATERIALS AND METHODS

Fried cheese manufactured in a small dairy farm in the Wielkopolska region in was sampled at crucial cheese stages of its manufacture, up to ripe cheese at day 28. Total microbial DNA of cheese samples was purified following phenol-chloroform extractions. Then, the DNA was used as a template to amplify by the PCR technique the region V3 region of the bacterial 16S rRNA gene and the D1 region of the eukaryotic 26S rRNA gene, using the universal primer pairs F338GC/R518 and NL1GC/LS2, respectively. Electophoresis of PCR amplicons was carried out overnight in polyacrylamide gels with 30–60% formamide-urea denaturing range. After staining the gel with ethidium bromide, bands were visualized and photographed.

RESULTS

Some common bands' appeared in all of the samples, regardless of location and producer. The band profiles of cheeses from different sources was specific for almost each district, and in particularly the product from Silesia, which is not protected by EU law.

CONCLUSIONS

The PCR-DGGE profile of microbiota communities in analysed cheeses showed that DGGE profiles could provide unique biological bar codes which allow tracking back the food to its authentic location.
This method seems to be an effective, simple and rapid traceability tool for some fermented dairy food products denominated with protected status.

Key words: Fried cheese from Wielkopolska, traceability, PCR-DGGE, Protected Geographical Indication

The content of polyphenols in herbal and slimming teas

Anna Sadowska, Rita Rakowska, Emilia Skarżyńska, Bożena Waszkiewicz-Robak

Warsaw University of Life Sciences
Faculty of Human Nutrition and Consumer Sciences
Contact e-mail: anna_sadowska@sggw.pl

INTRODUCTION

The dynamic development of the Polish herbal products market and the growing consumer interest in proper nutrition affect the growth of consumer interest in herbal medicine. Therefore there have been an increase of herbal products consumption, especially herbal teas, which are a convenient form of herbs consuming. These teas are the source of bioactive components preferred acting on the body, which often relieve some of the discomfort. Herbal teas contain large amounts of polyphenols that have antioxidant and anti-inflammatory effects as well as beneficial acting on the human body.

AIM

The purpose of this study was to determine the content of the polyphenol compounds in a variety of herbal and slimming teas.

MATERIALS AND METHODS

Material consisted of the following herbal teas: mint, lemon balm, lemon balm with pear, chamomile, St. John's wort, linden and various types of slimming teas present on the Polish market. The total content of polyphenolic compounds was determined using the spectrophotometric method where Folin-Ciocalteau reagent was used (Sielicka et al, 2010).

RESULTS

Based on the analyzes, it was found that the tested herbal teas, depending on their composition and method of processing, significantly different in contents of polyphenolic compounds. The highest content of these compounds was found in a lemon balm, and the lowest in chamomile. The addition of fruit to herbal teas has increased the total polyphenol content. Among the slimming teas the highest content of polyphenols was found in teas containing additive of red tea.

CONCLUSIONS

In concludion it is worth to say that the tested herbal and slimming teas may be a good source of polyphenols in the diet. Total polyphenol content in the tested teas was high and quite varied depending on the species of herbs and production methods used by different manufacturers. The fruit addition to herbal teas, and the red tea addition to slimming teas resulted in a significant increase in the content of polyphenols in the studied products.

Key words: herbs tea, slimming tea, polyphenols

How important are eggs in everyday diet?

Ewelina Siepka, Łukasz Bobak

Wroclaw University of Environmental and Life Sciences
The Faculty of Food Science
Department of Animal Products Technology and Quality Management
Chelmonskiego37 - 41, Wroclaw, Poland
Contact e-mail: ewelina_siepka@up.wroc.pl

INTRODUCTION

Human body, for proper functioning, needs many nutrients contained in good quality food. We should bear in mind that ingredients of natural origin are absorbed entirely by organism. Diet supplements, obtained often by chemical synthesis, have lower digestibility, which is why we should rationally approach to diet and choose foods rich in valuable ingredients. Eggs seem to be one of the best natural sources of important compounds.

AIM

Very significant element of the life quality is nutrition and a proper diet rich in key compounds for human health and life.

MATERIALS AND METHODS

Eggs are a rich source of biosubstances that play an important role in maintaining a healthy diet. Beyond its traditional nutritional function, can be used in the food, pharmaceutical, cosmetic and chemical industry. Egg as a base of a new life, is an excellent source of good quality lipids and proteins, provides significant amounts of other important nutrients including riboflavin, vitamin B6, vitamin B12, pantothenic acid, vitamin A, vitamin D, iodine and selenium.

RESULTS

Nowadays, more and more popular become eggs naturally enriched with bioactive substances.

CONCLUSIONS

These projected eggs are great for a direct consumption, as well as a starting material for the production of nutraceuticals and biomedical preparations.

Key words: egg yolk, phospholipids, nutrition

*Influence of frying on content of selected vitamins in (*Armillaria mellea *(Vahl) P. Kumm.) pilei*

Aleksandra Skrzypczak, Grażyna Jaworska, Emilia Bernaś

Agricultural University in Krakow
Department of the Raw Materials and Processing Fruit and Vegetables
Contact e-mail: askrzypczak@ur.krakow.pl

INTRODUCTION

In Polish cuisine wild mushrooms are terms of sensory valuable raw material for the production of silage, pickles and as an addition to soups, sauces and filling. They are characterized by low calories and high in fiber, so they are included in diet products type. Mushrooms also contain numerous of important to human health bioactive compounds - vitamins, proteins, amino acids, and polyphenols which are known for their antioxidant activity.

AIM

The aim of the work was to investigate the effect of frying and storage on the selected vitamins content in *Armillaria mellea* mushrooms piei.

MATERIALS AND METHODS

The test material was not blanched and blanched in water (90 s, 89-90°C) muschrooms, then fried until tender, with the 10% addition of rapeseed oil and 0,5% of NaCl.
Not storage and storage by 48 hours products at 20°C and by 48 i 96 hours at 4°C was assesed. In mushrooms products the level of dry matter and vitamins: B_1, B_2, B_3, B_6, C, E and vitamin E activity was determined. Analysis of vitamins was carried out with High Performance Liquid Chromatography (HPLC).

RESULTS

In 100 g of fresh *Armillaria mellea* pilei was 9,74 g dry matter, but after frying process and storage was 9,68 – 11,74 g dry matter. Fresh mushrooms characterized by content of vitamins B_1, B_2, B_3, B_6, C and vitamin E activity, per 100 g of dry matter, on the level 0,14 mg, 2,06 mg, 29,1 mg, 0,42 mg, 103,67 mg and 2,14 mg. Under frying in not blanched and blanched pilei, level of vitamins B_1, B_2, B_3, B_6 and C decreased by 2 - 18%, by 15 -41 %, by 17 - 25%, by 10 - 22% and by 40 - 45%, compared to raw material. Following the addition of the vitamin E activity increased fifteen.
In the case of vitamin B_6, both in fresh and fried mushrooms, were only the presence of pyridoxal and pirydoksamine. On account of frying *Armillaria mellea* storage has been proven decrease of content of all identified vitamins, compared to not storaged mushrooms. After 48 hours of storage at 20°C, contain of vitamins B_1, B_2, B_3, B_6 and C, and level of vitamin E activity declined by 30 - 33%, by 57 - 78%, by 19 - 45%, by 12 - 19%, by 5-18% and by 9 - 12%, while in mushrooms storage for 48 hours at 4°C by 28 -34%, by 39 - 67%, by 0 - 16%, by 14 -31%, by 9 – 11 % and by 5 - 12%.
After storage mushrooms for 96 hours at 4°C, in relative to not storaged mushrooms, noted similarly as in the earlier stage of the study, decreased of vitamin B_1 by 48 - 62%, B_2 by 61 - 82%, B_3 by 15 - 21%, B_6 by 30 - 36%, C by 24 - 32% and vitamin E activity by 10 - 13%.

CONCLUSIONS

After the frying process and storage of producs, greatest losses was noted for vitamin B_2. Regardless of the stage from products from blanched mushrooms products characterized a smaller losses of all examined vitamins, than products from not blanched pilei.

The work carried out on the basis of grant MNiSW number N N312 241739

Key words: *Armillaria mellea*, muschrooms, vitamins, HPLC, frying, storage.

Whey protein preparations as a source of a new type of fermented milk products

Waldemar Gustaw, Aleksandra Ciołkowska, Katarzyna Skrzypczak, Bartosz Sołowiej, Adam Waśko

University of Life Sciences in Lublin
Department of Biotechnology, Human Nutrition and Science of Food Commodities, Skromna 8, 20-704 Lublin, Poland
Contact e-mail: skrzypczakatarzyna@wp.pl

INTRODUCTION

Whey is a notable source of valuable nutrients such as milk proteins, lactose, calcium and soluble vitamins, what allows to consider this product as functional food. Bacterial exopolysaccharides (EPS) are a long-chain linear biopolymers, demonstrate various functions. Strains capable to EPS synthesis have an influence on a rheological properties, viscosity and texture. Whey powder and other protein preparations have a significant impact on EPS synthesis and greatly contributes to improving the rheological properties and nutritional value of fermented milk product. Combination of whey protein preparations and bacterial culture capable to EPS synthesis can lead to create new milk fermented products characterized by a unique and valuable features. Moreover, the addition of inulin as a prebiotic fosters the development of positive microflora and has a beneficial effects on consumers health. It impacts on higher functionality of the product.

AIM

The objective of this investigation was to obtain a milk beverages produced from a selected whey protein preparations fermented by bacterial cultures synthesizing exopolysaccharides and determine the rheological properties of such products.

MATERIALS AND METHODS

For the implementation of this study were used: WP-whey powder (Spomlek, Radzyń Podlaski), DWP-demineralized whey powder (Euroserum, France), LLWP whey with reduced lactose content (Foremost Farms, USA),WPC 35-whey protein concentrate (Laktopol, Warszawa), WPC 65, WPC 80 and WPI- whey protein isolate (Milei, Germany). As an inoculum were used bacterial cultures MYE 95 and MYE 96 (Danisco Biolacta in Olsztyn) capable to synthesize exopolysaccharides (EPS). The proper amounts of individual whey protein preparations were dissolved in distilled water in order to obtain the 5%, 6%, 7% content of dry matter. 7% of sucrose was added in to 7% solutions of whey protein preparations. To 7% solutions of whey protein preparations inulin was added at the level of 2%, 3% and 4%. pH was adjusted to 6.0 by 5% CH_3COOH and 0.1 M NaOH and thus prepared solutions were pasteurized at 90°C for 30 minutes. 50 ml samples of pasteurized medium at pH 6.0 were inoculated by bacterial cultures MYE 95 or MYE 96 and incubated in 42°C for 4 h. Prepared in this way inoculums were used to inoculate stationary cultures. The fermentation process was conducted at 42°C for 9 hours. Consistency factor (K) for each sample was determined on the basis of curves of flow, previously designated by using a RS 300 rheometer (Haake, Germany). Measurements were performed in duplicate for each additive. pH values were defined using a pHmeter CP-215 (Elmetron, Zabrze, Poland).

RESULTS

The highest values of K [$Pa \cdot s^n$] were achieved for 7% WPC 35 samples obtained by using MYE 95 as well as MYE 96. Contrary to this results, the lowest K value was observed for samples with 7%WP. With the increasing concentration of WP, DWP, LLWP, WPC 65 AND WPC 80 the value of consistency index is decreasing. The addition of saccharose as well as inulin has an influence on increase consistency index value of the products fermented by 95 MYE. For whey protein preparations fermented by using 96 MYE inoculum with the increasing concentration of insulin the value of K increases.

CONCLUSIONS

WPC 35 products demonstrated the highest K values and the most desirable rheological properties among all analyzed whey protein preparations . The weakest products were obtained with using whey powder.

Key words: exopolysaccharides (EPS), fermented milk products, whey protein preparations

The effect of locust bean gum on textural, rheological properties and meltability of acid casein processed cheese analogues

Bartosz Sołowiej[1], Waldemar Gustaw[2], Maciej Nastaj[1]

University of Life Sciences in Lublin, Faculty of Food Sciences and Biotechnology,
[1] Department of Biotechnology, Human Nutrition and Food Commodities
[2] Department of Fruits, Vegetables and Fungi Technology
Contact e-mail: bartosz.solowiej@up.lublin.pl

INTRODUCTION

Caseins, in either milk or dairy products (e.g. cheese), are important sources of biologically active peptides and have a great impact on human health and the manufacture of novel functional food ingredients. It is used in foods because of its functional characteristics e.g. giving food products a suitable structure and consistency, ability to emulsify fat and bind water. Locust bean gum, also known as Carob bean gum, is a natural derivative from the seeds of the carob tree cultivated in the Mediterranean area.It is used for texturizing a wide range of food products. Locust bean gum is the preferred texturizerfor various food applications due to its natural image, the neutral taste and the very creamy textureit provides. It also has a positive impact on the protein stability and does not interact with other ingredients in your food due to its neutral behavior.

AIM

The objective of this study was to obtain and evaluate the textural, rheological properties and meltability of acid casein processed cheese analogues with locust bean gum addition.

MATERIALS AND METHODS

The following materials were used: acid casein (AC) from Polsero (Sokolow Podlaski, Poland), anhydrous milk fat (AMF) from Mlekovita (Wysokie Mazowieckie, Poland), locust bean gum (LBG) (SIGMA Chemicals, St. Louis, USA), citric acid and disodium phosphate from POCH S.A. (Gliwice, Poland). The protein content in acid casein was determined by analyzing nitrogen using Kjeldahl method and calculating protein as N x 6.38. The hardness of processed cheese analogues was measured using the TA-XT2i Texture Analyser. A puncture test was used to measure the force needed to breakthe structure of the cheese sample. The textural properties such as adhesiveness, cohesivenessand springiness of processed cheese analogues were examined using the TA-XT2i Texture Analyser. The viscosity of processed cheese analogues was measured using the Brookfield DV II+ rotational viscometer with the Helipath Stand (F). The meltability of processed cheese analogues was examined using a modified Schreiber test. The statistical analyses were executed using the statistical packet STATISTICA 7.0 PL.

RESULTS AND CONCLUSION

An increase of the casein content (11-13 %) affected the physicochemical properties of processed cheese analogues. An increase of the locust bean gum content (0,05-0,3 %) caused a decrease in adhesiveness, hardness (0,05-0,1/0,2 %) and meltability of processed cheese analogues however their melting properties were still acceptable. The addition of locust bean gum (0,05-0,3 %) did not cause a deterioration of processed cheese analogues springiness, cohesiveness and viscosity. The combination of excellent nutritional and functional properties of casein and locust bean gum provides the perfect base for their use in processed cheese analogues production.

Key words: processed cheese analogues, acid casein, locust bean gum, texture, viscosity, meltability.

Nutritional characteristics of selected regional dishes of Warmia and Mazury

Jadwiga Anna Spiel, Jerzy Borowski

University of Warmia and Mazury in Olsztyn
Department of Human Nutrition
Contact e-mail: jadwiga.gutkowska@uwm.edu.pl

INTRODUCTION

Polish accession to the EU raised concerns about the loss of individuality and the disappearance of local traditions in favor of increasing globalization. The unification also permeates nutritional habits. Therefore documentation of quality can be a valuable guideline to the consumer, which would be assuredfor the authenticity of consumed food. Locals serving traditional cuisine could gain a reputation, food producers (farmhouses and small producers) could become competitive in today's Polish market.

AIM

The aim of this study was presentation of diet on Warmia and Mazury and modern quality assessment of selected foods. Studies were also conducted to formalize knowledge in this area, determinethe methods by which it will be possible to demonstrate the quality of regional food and the create "culinary business card" of the Warmia and Mazury.

MATERIALS AND METHODS

For studies three regional dishes were selected: Krupnik, Faworki, and the Masurian Carrot. Dishes were prepared from raw materials purchased in the regional agrotourism farms or ecological food stores. Then, chemical analysis, sensory evaluation and determination of the nutritional value of prepared meals were performed. Chemical analysis included determination of sodium chloride by Mohr's method, antioxidant properties manifested by ability to inhibit oxidation of DPPH and ability to inhibit LDL oxidation in vitro. Sensory analysis was carried out by methods of grading and flavor profiling. The nutritional value was estimated based on the tables of the composition and nutritional value.

RESULTS

Faworki provide the most energy and the least Krupnik. Despite the small energy value Krupnik is a good source of protein and well-balanced source of carbohydrates. Furthermore this soup is rich in calcium, magnesium, iron and vitamins E and C. Other foods are significantly deficient in these elements.But they are rich source of vitamin A. Amount of sodium chloride delivered by the examined dishes range from 0.63 to 1.07 g NaCl/100 g of dish, and do not exceed the recommendations of modern nutritionists. The highest antioxidant properties have the Masurian Carrot, then Krupnik and Faworki. The greatest ability to inhibit the oxidation of synthetic LDL cholesterol was observed in Masurian Carrot and Krupnik. Organoleptic highlights, differentiating the individual dishes were: in Krupnik – sour smell and taste and vegetable flavor; in the Masurian Carrot - cooked carrot and fatty smell and taste of, and sweet and sour taste; in Faworki - sweet, fatty and foreign smell, and taste - sweet, fatty and spicy burning (associated with a distinguishable taste of baking powder). By gradation method the lowest evaluated dish was Faworki (2.45 points on 3 maximum).

CONCLUSIONS

Despite natural, over the years, composition and properties modification of raw materials, dishes prepared from them are characterized by nutritional value, enabling compliance with the principles of rational nutrition and consumed occasionally can be a significant component of a well-balanced diet of modern man.

Research co-funded by the European Union under the European Social Fund application no 71/2010

Key words: traditional and regional food, nutritional value

Chemical composition and content of selected elements (essential and potentially toxic) in fresh and smoked rainbow trout (Oncorhynchus mykiss)

Agnieszka Staszowska, Mariusz Florek

University of Life Sciences in Lublin
Department of Commodity Science and Processing of Raw Animal Materials
Contact e-mail: agnieszka.staszowska@up.lublin.pl

INTRODUCTION

The nutritional properties of fish and fish products render them valuable foodstuffs that are beneficial for human health. Nutritionists consider these products to be an important source of high-quality proteins, minerals and essential fatty acids. The consumption of fish and fish products is recommended as a means of preventing cardiovascular and other diseases.

AIM

The aim of the current study was compare the content of macro- and microelements as well as heavy metals in the meat of fresh and smoked rainbow trout.

MATERIALS AND METHODS

The study included ten fresh and ten smoked rainbow trout *(Oncorhynchus mykiss)* collected from fish farm located in Lublin province where fishes were smoked in small manufacturing plant.
In the samples a basic chemical composition was determined including a protein content by the Kjeldahl method, a fat content by the Soxhlet method, a water content by means of a drying method, and an ash content by combustion in a muffle furnace. Fish samples following wet digestion were used to analyze the concentration of macro- (K, Na, Ca, Mg), and microelements (Zn, Fe, Mn, Cu), using the flame atomic absorption spectrometry (AAS), as well as heavy metals (Cd, Pb) using the flameless AAS. The statistical analysis was carried out using STATISTICA ver. 6.0 software. Data were subjected to one-way ANOVA test was applied for the comparisons among means, considering $P<0.05$ and $P<0.01$ as significant.

RESULTS

The significantly higher protein ($P\leq0.05$) and lipid ($P\leq0.01$) content was noted in the muscle tissue of smoked rainbow trout. As a result, smoked fish had a significantly ($P<0.01$) higher calorific value than fresh one. Analyzing macronutrients, a significantly ($P\leq0.05$) higher concentration of sodium, potassium and calcium ($P\leq0.01$) were found in the muscles of smoked fish, which also contained a significant ($P\leq0.05$) higher content of zinc in comparison with raw muscle tissue. It is noteworthy that lead and cadmium concentrations in all the samples were found to be a lower than legal limits proposed for human consumption by the European Commission.

CONCLUSIONS

The chemical composition of fresh and smoked rainbow trout was significantly different. Meat of smoked fish had a higher content of protein and fat.
Fish and fish products are characterized by the significant content of the minerals components. Significantly higher concentration of sodium, potassium, calcium, iron and lead were found in smoked fish. The muscles of fresh and smoked fish showed an equal level of zinc and copper. The important conclusion stemming from the present study is that fish, both fresh and smoked are very important part of human diet. Through this study could be seen that fresh and smoked fish are harmless for health of consumers and there are benefits of consuming fish and fish products.

Key words: rainbow trout, fresh fish, smoked fish

Metabolomics profile of bread and durum wheat

Kinga Stuper-Szablewska[1], Maciej Buśko[1], Tomasz Góral[2], Anna Matysiak[1], Juliusz Perkowski[1]

[1] Poznań University of Life Sciences, Department of Chemistry,
[2] Plant Breeding and Acclimatization Institute at Radzików, Department of Plant Pathology
Contact e-mail: kstuper@up.poznan.pl

INTRODUCTION

Wheat bread wheat (*Triticum aestivum*) and durum wheat (*Triticum durum*) are threatened by many fungal diseases reducing yields and grain quality. Infection by the above mentioned pathogens results in smaller grain and a reduced number of kernels per each, while fungi from genus *Fusarium* additionally cause a reduction of protein content in grain and produce several mycotoxins. It was shown that metabolites qualitative composition is significantly related with the profile of volatile compounds, being by-products formed on the mycotoxin synthesis pathway by microscopic fungi.

AIM

The aim of this study was to separate and indicate differentiating metabolites for two species of cereals being similar genetically, i.e. bread wheat and durum wheat. Next metabolomic profiles were investigated and presented for a representative sample of cereals grown at the same time and under identical conditions.

MATERIALS AND METHODS

Analyses were conducted on representative samples of grain: winter wheat (16 genotypes) and winter durum wheat (16 genotypes) obtained from the field experiments conducted in three replications under identical environmental conditions at the Plant Breeding and Acclimatization Institute, Radzików, Poland. The analyses were based on determinations of contents of mycoflora in grain (ERG and ATP), concentrations of trichothecenes (groups A and B), concentrations of fatty acids, contents of volatile metabolites as well as results collected with the use of an electronic nose.

RESULTS

On the basis of chemical analysis it was found that mean ERG concentration in samples of bread wheat was 3.41 mg/kg, and in durum wheat 2.29 mg/kg. Analyses of ATP showed that the concentration of this metabolite was significantly highest in samples of durum wheat, amounting to 233 015 URL. The highest mean DON concentration was found for samples of durum wheat (116.93 µg/kg), they were lower for bread wheat samples (55.68 µg/kg). On the basis of performed multivariate significance tests for these metabolites it was stated that among all acids the greatest discriminatory role was found for unsaturated acids C18:2 n6 and saturated acids C16:0, C12:0 and C22:0. At this stage of the study it was decided to verify the role of trichodiene, whether it may be a factor differentiating individual species of cereals.

CONCLUSIONS

Statistical analysis showed that it is the presence of volatile compounds that provides the clearest picture of the metabolomic profile, thanks to which analysed populations may be separated into individual groups, which are consistent with their actual affiliation. Obtained results are satisfactory, since an attempt to separate so closely related cereals on the basis of this analysis has not been made before.

The paper supported by the project No. 2704/B/PO1/2011/40 from Ministry of Science and Higher Education, Poland.

Key words: mycotoxins, ergosterol, bread wheat, durum wheat, fatty acids, volatile compounds

Antioxidant substances in different cultivar of wheat

Kinga Stuper-Szablewska[1], Tomasz Góral[2], Juliusz Perkowski[1]

[1] Poznań University of Life Sciences, Department of Chemistry
[2] Plant Breeding and Acclimatization Institute at Radzików, Department of Plant Pathology
Contact e-mail: kstuper@up.poznan.pl

INTRODUCTION

Several natural compounds in cereals, such as vitamin, provitamins, carotenoids, chlorophyll and its derivatives, phenolics, and selenium with antioxidant properties seem to be potentially very efficacious in protecting against the toxic effects of mycotoxins. The protective properties of antioxidants are probably due to their ability to act as superoxide anion scavengers, thereby protecting cell membranes from mycotoxin-induced damage and in some cases, antioxidant vitamins may play a role in preventing mycotoxicosis.

AIM

The aim of this the present study was to investigate the antioxidant capacities of 30 cultivars wheat grain samples collected in 2011.

MATERIALS AND METHODS

Analyses were conducted samples of 30 genotypes of wheat grain obtained from the field experiments conducted in three replications under identical environmental conditions at the Plant Breeding and Acclimatization Institute, Radzików, Poland in 2011. The analyses were based on determinations of the antioxidant capacities by FRAP, ABTS and DPPH methods.

RESULTS

Investigated cultivars had high levels of phenolics and exhibited high antioxidant capacity. The TEAC values of the spices ranged from 2679 to 3465 μM trolox/100 g dw, from 2151 to 2843 μM trolox/100 g dw, and 1385 to 2103 μM trolox/100 g dw for DPPH, FRAP and ABTS, respectively. The total phenolic content, measured using a Folin–Ciocalteu assay, ranged from 269 to 439 mg of gallic acid equivalents (GAE)/100 g dw. A positive relationship between TEAC (ABTS and FRAP) values, total phenolic and disease index FK content was found.

CONCLUSIONS

In the present study shows that level of all tested antioxidants in different wheat cultivars is significantly different. On the other hand in literature, development of an antioxidant defense system in plants protect them against oxidative stress damage and fungal disease.

The paper supported by the project No. 2704/B/PO1/2011/40 from Ministry of Science and Higher Education, Poland.

Key words: mycotoxins, antioxidants, wheat, fungal disease

Evaluation of microscopic fungi in table egg content

Tomasz Szablewski[1], Kinga Stuper-Szablewska[2], Renata Cegielska-Radziejewska[1], Ewa Gornowicz[3]

[1,2]Poznań University of Life Sciences, [1]Department of Quality Management, [2]Department of Chemistry
[3]National Research Institute of Animal Production, Experimental Station Kołuda Wielka, Waterfowl Genetic Resources Station in Dworzyska
Contact e-mail: tszablew@up.poznan.pl

INTRODUCTION

The poultry house environment may thus be a source of moulds and their toxic metabolites which to pose a threat for laying hens and the quality of table eggs. Microscopic fungi pose a threat to poultry, causing not only, mycoses, but also mycotixicoses. In the literature we can find some reports about penetration microscopic fungi hyphae penetration by shell into the egg content (Szablewski et al. 2010, Poult. Sci., Nowaczewski et al. 2011, Poult. Sci.).

AIM

The aim of the study was to determine the intensity of egg contents infestation in cold storage conditions with microscopic fungi.

MATERIALS AND METHODS

For the purpose of quantitative determination of mycoflora the chemical analysis was conducted on the content of ergosterol (ERG). The analyzed material comprised samples of 300 eggs produced by four conservative breeds of laying hens: Rhode Island Red, Sussex, Greenleg Partridge and Yellowleg Partridge, kept in an organic certified farm, and egg content from the laying hens included in the genetic resources conservation program: Barred Playmouth Rock, New Hempshire, Rhode Island Red and Rhode Island White. Contents of ERG as a specific marker of the amounts of microscopic fungi was determined by HPLC.

RESULTS

On the basis of analysis it was found that white of table eggs directly after lay is non-infected with microscopic fungi. After one week of storage ERG it was found on small level from 0,342 mg/kg in Rhode Island Red white to 1,32 mg/kg in Yellowleg Partridge egg white, and 0,41 mg/kg in Rhode Island White eggs to 1,15 mg/kg Barred Playmouth Rock eggs content from the laying hens included in the genetic resources conservation program.

CONCLUSIONS

On the basis of results it may be concluded that hyphae of microscopic fungi penetrate through shell pores to egg content. This suggests a serious problem, i.e. the probability of occurrence of moulds originating from the environment of the poultry house and as a consequence - mycotoxins in eggs.

Key words: microscopic fungi, ERG, table eggs

Scale-up of an anaerobic 1,3-propanediol production by Clostridium butyricum DSP1 from crude glycerol

Daria Szymanowska-Powałowska, Katarzyna Leja, Adrian Czerniak, Wojciech Białas

Poznań University of Life Sciences
Department of Biotechnology and Food Microbiology
Contact e-mail: darszy@up.poznan.pl

INTRODUCTION

Nowadays, a tendency to use alternative energy sources has resulted in a significant increase in biofuels production. However, an increase in biodiesel production generates a huge amount of waste glycerol. Thus, a technology to utilize this by-product should be developed. The best solution to utilize glycerol is its microbiological conversion to industrially useful metabolites, such as 1,3-PD. 1,3-PD is a valuable chemical compound, which can be used in many different fields, e.g. it is a valuable chemical for an intermediate use in organic synthesis; it is also used as a monomer for the production of biodegradable polymers, cosmetics, lubricants, medicines; as well as an intermediate for the synthesis of heterocyclic compounds. It may be also used in food industry, to packaging materials production. 1,3-PD does not react with food components so it is safe for consumers. A key problem of application the technology of 1,3-PD production by bacteria in industry is an up-scale. In a large-scale also other problems occurred, such as biomass flocculate, foaming, and overgrowth of bioreactors` walls. In the literature one can find only limited data about scale-up of biotechnological processes.

AIM

The main aim of that research was to investigate the efficiency of 1,3-PD production in increasing scale of cultivation.

MATERIALS AND METHODS

Cl. butyricum DSP1 has been collected in the Department of Biotechnology and Food Microbiology, Poznan University of Life Sciences Poland and also in the HEAD of Polish Collection of Microorganisms PCM. The fermentation medium was supplemented with crude glycerol (Wratislavia-Bio, Wroclaw, Poland) at a concentration of 70.0 ± 1.0 g/L in batch fermentation. The crude glycerol composition was (w/w) 85.6%, 6% NaCl, 11.2% moisture, and pH was equal 7.0.

RESULTS

The efficiency of this diol production from crude glycerol, during scale-up process, was investigated. For this aim bath fermentations in 5 L, 42 L and 150 L bioreactors were carried out. It was found out that scale-up process had no negative influence on both – microorganisms growth and 1,3-PD synthesis. The productivities of the diol in large scales were close to those achieved in a small reactor, and it was equal ca. 37 g/L. However, a significant difference was observed in the volumetric capacity of bioreactor. The highest value of this parameter was observed in fermentation carried out in 150 L bioreactor - 1.33 g/Lh. The profiles of by-products in different scale of fermentation were also comparable.

CONCLUSION

In effect, it was observed that cultivation of bacteria *Cl. butyricum* in a large scale did not decrease the efficiency of 1,3-PD production.

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This work was prepared within the framework of project no.01.01.02-00-074/09 co-funded by The European Union from the European Regional Development Fund within the framework of the Innovative Economy Operational Programme 2007-2013.

Key words: Batch culture, *Clostridium butyricum,* Glycerol, Scale-up, 1,3-Propanediol

Inhibition of foodborne spoilage microflora by bacteriocinogenic Lactobacillus coryniformis 9MŚ strain isolated from wheat-rye sourdough

Michał Świątek, Monika Kliszcz, Beata Chabłowska

Institute of Agricultural and Food Biotechnology
Department of Fermentation Technology
02-532 Warsaw, Rakowiecka 36
Contact e-mail: michal.swiatek@ibprs.pl

INTRODUCTION

Bacteriocin synthesis has been found in numerous species of bacteria, among which, due to their "Generally Recognized As Safe" (GRAS) status, bacteriocins produced by lactic acid bacteria (LAB) have attracted great interest in terms of food safety. LAB bacteriocins are proteins which have a bactericidal or bacteriostatic effect on other (usually closed related) species. However, many recently described bacteriocins are active against Gram-negative bacteria and a few are antifungal or even antiviral. Only few studies have demonstrated the effectiveness of *Lactobacillus coryniformis* to inhibit growth of microflora contributing to food spoilage process. Understanding of factors affecting bacteriocin production is required to develop applications of *L. coryniformis* as food preservative.

AIM

The aim of this study was to describe culture condition required for bacteriocin production in *L. coryniformis* strains in regard to efficient synthesis of antimicrobial proteins with broad spectrum and high activity as well. To evaluate applications of selected *L. coryniformis* as a potentially preservative and shelf-life improving component of earlier developed starters for bread production, bacteriocin activity against technologically interesting LAB used as a starter culture for sourdough propagation was studied.

MATERIALS AND METHODS

Production of antimicrobial peptides by five *L. coryniformis* strains (9MŚ, 11MŚ, 12MŚ, 21MŚ, 72MŚ) isolated from wheat-rye sourdoughs was investigated. Each strains were cultivated overnight in 30ºC in standard MRS broth or modified MRS broth without any carbon supplementation. The antimicrobial activity of LAB was detected in supernatants adjusted to pH 6,0 and treated with catalase to exclude inhibitory effect of organic acids and hydrogen peroxide respectively. To confirm the proteinaceus nature of inhibitory compounds, neutralized supernatants were treated with proteinase K independently. Screening of antimicrobial activity was carried out by well-diffusion method against LAB (*Lactobacillus* sp., *Weissella* sp.), Gram-positive (*Bacillus* sp., *Listeria* sp.), Gram-negative (*Escherichia* sp., *Salmonella* sp.) bacteria and moulds (*Aspergillus* sp., *Fusarium* sp., *Penicillium* sp.) under appropriate cultivation conditions for each indicator.

RESULTS

Three strains (9MŚ, 21MŚ and 72MŚ) were found to produce bacteriocin with different activity against indicator strains but theirs synthesis and activity was multiple higher in modified MRS broth. *L. coryniformis* 9MŚ showed a wider inhibitory spectrum than others counterparts and significantly inhibit growth of strains (*Bacillus subtilis* ATCC6633, *Escherichia coli* ATCC8339 haemolytic, *Listeria monocytogenes* IBPRS-ZF) and all tested moulds. None of selected bacteriocinogenic strains exhibited inhibitory activity against key LAB strains of sourdough starters.

CONCLUSIONS

Bacteriocin production in *L. coryniformis* strains is determined by culture conditions as well as is strain-dependent phenomenon. Indirect evidence for contribution of *L. coryniformis* 9MŚ as preservative cultures, which can lead to the stable persistence of technologically important starter culture during sourdough propagation for bread production with improved shelf-life, has been shown.

Key words: antibacterial, antifungal, bacteriocin, food safety, lactic acid bacteria

Electrochemical behavior of low molecular weight metabolites of flavonoids in relation to reducing activity

Danuta Zielińska, Marcin Turemko

University of Warmia and Mazury in Olsztyn,
Department of Chemistry
Contact e-mail: danuta.zielinska@uwm.edu.pl

INTRODUCTION

Plant polyphenols after consumption as food ingredients undergo a wide range of alterations caused by physico-chemical conditions in the alimentary tract. Only a small pool of polyphenols is absorbed in a small intestine whereas most of them rich the colon where they are degraded by colon microbiota into absorbable low molecular weight metabolites of a similar chemical structure dependent of the subclass of flavonoids. In last years a rising number of methods have been proposed for the evaluation of antioxidant/reducing activity based on electrochemical assays. Based on the fact that antioxidants can be easily oxidized at inert electrodes, a relationship between electrochemical behavior of the antioxidant and their resultant "reducing activity" was noted, where "low oxidation potential" corresponds to "high reducing activity".

AIM

This study addressed the comparison of the reducing activity of low molecular weight metabolites of quercetin and rutin evaluated by Fe(III)-ferrozine complex assay and by electrochemical methods (cyclic voltammetry and differential pulse voltammetry).

MATERIALS AND METHODS

Materials. Phenolic acids were purchased from Extrasynthese (Genay, France), and others compounds were from Sigma-Aldrich.
Methods. Reducing activity was measured by ferric-ferrozine assay according to Berker et al. [1] and by cyclic voltammetry (CV) and differential pulse voltammetry (DPV) techniques according to [2]. Three-electrode system with a working glassy carbon electrode was used in all electrochemical experiments. The tested phenolic acid solution was added to the buffered electrolyte solution (pH 2.5, 6.0 and 7.5) and CV and DPV voltammograms were acquired in the range of –0.1 to +1.2 V.

RESULTS

The following rank of ferric reducing antioxidant activity of the investigated phenolic acids was provided: 3,4-dihydroxyphenylacetic acid (3,4-DHPAA) > caffeic acid (CAF) > chlorogenic acid (CHL) > 3-(3,4-dihydroxyphenyl)propionic acid (3,4-DHPPA) > gallic acid (GAL) > protocatechuic acid (PRC) > ferrulic acid (FER) > homovanillic acid (HVAN) > vanillic acid (VAN). The ferric reducing antioxidant activity was negatively correlated (r=-0.95) with the first oxidation potential (derived as well as from CV's and DPV's) of these compounds which were both able to reduce Fe(III)-ferrozine complex and to be oxidized on glassy carbon electrode. In contrast, some other tested acids were electroactive on the glassy carbon electrode while no ferric reducing antioxidant power was noted.

CONCLUSIONS

In general, it may be concluded that the reducing activity of low molecular metabolites of quercetin and rutin is related to their structures and strongly dependents on the pH, and on the used assay.

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This work was supported by grant No. 5056/B/P01/2011/40 from the Polish National Science Centre.

Key words: reducing activity, oxidation potential, low molecular metabolites of flavonoids

The influence of way of production on the chosen properties of resistant starch RS3/4 type

Aleksandra Wilczak, Artur Gryszkin, Małgorzata Kapelko, Tomasz Zięba

Wrocław University of Environmental and Life Sciences
Department of Food Storage and Technology
Contact e-mail: aleksandra.wilczak@wnoz.up.wroc.pl

INTRODUCTION

Subjected the potato starch to physical and chemical modification allow to produce the preparations of changed physicochemical properties. The obtained starch modifications are widely used in food industry. The resistant starch is used as the prohealthy additive in food industry.

AIM

The aim of the study was to determine the influence of retrogradation and acetylation conditions of potato starch on properties of obtained preparations.

MATERIALS AND METHODS

Starch paste (10%, 12%, 14%, 16% and 18%) was obtained from native potato starch which was freezed, defreezed and dried. The native starch and retrograded starch preparations were acetylated with acetic acid (13 mL/100g of starch). The degree of substitution, resistance to amyloglucosidase, water absorption capacity and solubility in water at 80°C and thermal characteristic (DSC) as well as flow curves of starch pastes were determined.

RESULTS

Preparations of retrograded acetylated starch were characterized by higher degree of substitution, resistance to amyloglucosidase and lower gelatinization temperatures, water absorption capacity and solubility compared to native acetylated starch. Pastes obtained from retrograded acetylated starch were characterized by higher viscosity than paste obtained from native acetylated starch.

CONCLUSIONS

The applied physical and chemical modifications led to obtain starch preparations of changed properties compared to material before modification. The size and range of changes was subordinated with pastes concentrations and degree of acetylation.

Key words: potato starch, retrogradation, acetylation

Food choice motives of apple juices consumers

Katarzyna Włodarska, Katarzyna Pawlak-Lemańska, Ewa Sikorska

Poznań University of Economics
Department of Technology and Instrumental Analysis
Contact e-mail: katarzyna.wlodarska@ue.poznan.pl

INTRODUCTION

A consumers' food choice is a complex phenomenon affected by many factors. A various range of factors includes: (1) product-related such as physicochemical properties, sensory quality and product packaging, (2) consumer-related such as age, gender, education and psychological factors, and (3) environment-related including economic, cultural, social factors, etc. Improvement understanding of consumers' food choice motivation is essential in product development and market introductions and also in activities aimed at influencing healthier eating habits.

AIM

The aim of the research was to analyze the health and non-health related food choice motivations of apple juices' consumers.

MATERIALS AND METHODS

A total of 96 consumers of apple juices participated in the study. Food choice motives were measured with the use of the Food Choice Questionnaire (Steptoe et al.,1995). The FCQ consisted of 36 items designed to assess the importance of nine factors which may influence food choice on a 7-point scale with responses ranging from 1 = "extremely unimportant" to 7 = "extremely important". The nine factors appear as group of statements "It is important for me that the food I eat on a typical day …" related to *health, mood, convenience, sensory appeal, natural content, price, weight control, familiarity* and *ethical concern*. Pearson coefficients were calculated to evaluate correlation between studied parameters.

RESULTS

Consumers' rating indicated *sensory appeal, health, price* and *convenience* as the most important factors affecting food choice, for which average scores were respectively 5.3, 5.2, 5.1 and 5.1 and corresponds to the "rather important". Consumers evaluated *ethical concern* factor as "rather unimportant" (average score 3.3). The scores for other factors varied from 4.1 to 4.6 ("neither important nor unimportant"). Female consumers higher than male assessed the importance of factors: *health, mood, convenience, weight control* and *ethical concern*. The *health* factor was significantly correlated ($p < 0.05$) with the *natural content* and *weight control*, for which correlation coefficients were respectively 0.519 and 0.452. The *sensory appeal* and *familiarity* were significantly correlated with *mood* (0.499; 0.534) and *natural content* with *ethical concern* (0.646).

CONCLUSIONS

The Food Choice Questionnaire is a tool that enables the measurement of health and non-health related motives of food choice in a systematic way. Our research shows that *sensory appeal* is the most important and *ethical concern* is the least relevant food choice factor among the studied consumers of apple juices.

Key words: consumer, food choice motives, apple juices

Effect of production season on basic chemical composition and content of macro- and microelements in cow and goat milk

Joanna Barłowska[1], Anna Wolanciuk[1], Monika Kędzierska – Matysek[1], Zygmunt Litwińczuk[2]

University of Life Sciences in Lublin
[1] Department of Commodity Science and Processing of Raw Animal Materials
[2] Department of Breeding and Protection of Genetic Resources of Cattle
Contact e-mail: anna.wolanciuk@up.lublin.pl

INTRODUCTION

Milk is an important source of mineral substances, especially calcium, phosphorus, sodium, potassium, chloride, iodine, magnesium and small amounts of iron. The main mineral compounds of milk are calcium and phosphorus, which are substantial for bone growth and the proper development of newborns. The high bioavailability of these minerals influences the unique nutritional value of milk. In a modern European diet milk is the main source of calcium.

AIM

The aim of this study was to evaluate the chemical composition and content of macro- and microelements in milk obtained in two production seasons from cows and goats similarly fed, maintained in Podkarpacie region.

MATERIALS AND METHODS

The examination included 134 samples of cow milk and 168 samples of goat milk obtained in two production seasons (spring-summer and autumn-winter). Each milk sample was analyzed for basic chemical composition, with Infrared Milk Analyzer (Bentley), content of casein by Wolker's method, pH value, somatic cell count (SCC), with Somacount (Bentley), urea content (by ChemSpec, Bentley) and minerals (by Spectra AA 240FS and AA 240Z, Varian). The results were analyzed statistically with StatSoft Inc. STATISTICA 6 software.

RESULTS

The significantly ($p \leq 0.01$) higher dry matter (by 0.96% more), protein (by 0.38% more), casein (by 0.17% more), lactose (by 0.40% more) and fat (by 0.27% more) contents were noticed in the cow milk. However, significantly ($p \leq 0.01$) higher contents of essential elements (K, Ca, Fe, Cu and Mn) were found in the goat milk. Season of production was the important factor in differentiating efficiency and basic components in milk. Daily goat milk yield was significantly ($p \leq 0.01$) higher in the spring-summer season. However, the contents of basic elements were noticed in the autumn-winter season. Cytological quality of milk collected from both species was poorer in the autumn-winter season.

CONCLUSIONS

Despite the lower content of basic elements, goat milk was more valuable source of macro - and microelements, especially K, Ca, Fe, Cu and Mn. Because of this fact, it can be useful raw material for the food production, for infants and elderly, as well as for the certain groups of people with special dietary needs.

Key words: milk, production season, macro- and microelements, chemical composition

Black chokeberry as a potential ingredient for functional foods in the prevention of obesity - the effect on the activity of pancreatic amylase and lipase

Paulina Worsztynowicz[1], Marta Napierała[2], Wojciech Białas[1], Włodzimierz Grajek[1]

[1]Poznań University of Life Sciences
Department of Biotechnology and Food Microbiology; [2]Poznań University of Medical Sciences
Laboratory of Environmental Research
Department of Toxicology
Contact e-mail: paulina_worsztynowicz@wp.pl

INTRODUCTION

The high-calorie diet is a major cause of obesity and the diseases known as metabolic syndrome. The highest energy value are characterized for lipid nutrients. However, high excess of carbohydrates in the diet contributes to the deposition of fat in the body. The components are not absorbed in the intestine until be treated with appropriate hydrolytic enzymes. It is important to pay attention for many components with ability to inhibit the hydrolysis of lipids and carbohydrates in the digestive tract which help to prevent obesity.

AIM

The aim of this study was to investigate the effect of the extract from black chokeberry (*Aronia melanocarpa*) on the activity of α-amylase and pancreatic lipase (*in vitro*) and isolation the substances responsible for it.

MATERIALS AND METHODS

Freeze-dried fruits of black chokeberry (*Aronia melanocarpa*), pancreatic α-amylase (Sigma-Aldrich A3176) and pancreatic lipase (Sigma-Aldrich 126-25-6 L3). The ability of chokeberry extract to inhibit enzymatic hydrolysis was tested by method based on the assumption that inhibitors reduce the quantity of product released during the enzymatic hydrolysis. For this purpose was used modified spectrophotometric methods described by the Somogyi-Nelson (1952) - for amylases and Winkler & Stuckmanna (1979) - for lipases. In order to identify inhibitors of pancreatic α-amylase and lipase, chokeberry extract was analyzed through preparative reverse phase chromatographe and LC-MS.

RESULTS

Three kinds of extracts: methane, water and acid caused inhibition of pancreatic α-amylase and lipase. The extent of inhibition of enzymes was proportional to the concentration of extract in the examined test. Chromatographic analysis combined with the LC-MS showed that the most effective inhibitor of pancreatic α-amylase is chlorogenic acid (IC50 = 0.57 ± 0.16 mg/ml). In the group of the anthocyanins, cyanidin-3-glucoside is the most potent inhibitor of pancreatic amylase (IC50 = 1.74 ± 0.04 mg/ml). The ability to inhibit the reaction catalyzed by lipase showed cyanidin-3-glucoside (IC50 = 1.17 ± 0.05 mg/ml).

CONCLUSIONS

These studies has shown that both the anthocyanins and phenolic acids are compounds which inhibit the ability of the reaction catalyzed by pancreatic amylase and lipase. It creates the possibility of using black chokeberry as a functional food ingredient, contributing to a specific pro-health action.

Key words: α-amylase, pancreatic lipase, inhibitor

A spectroscopic and chemometric study of cold pressed and refined rapeseed oils subjected to thermal stress

Krzysztof Wójcicki

Poznań University of Economics
Faculty of Commodity Sciences
Contact e-mail: krzysztof.wojcicki@ue.poznan.pl

INTRODUCTION

In recent years rapeseed has taken the third place in world production of vegetable oils after palm and soybean oils. Rapeseed oil is traditionally consumed in EU countries, being a viable alternative to the olive oil in a healthy diet. The relation between linoleic (omega-6) and linolenic (omega-6) acid in this oil is 2:1, which is extremely beneficial from nutrition point of view. Rapeseed oil can be consumed in refined or unrefined cold-pressed form. The popularity of the latter has increased in recent years due to the tendency of consumer to avoid deeply processed foods. However, as opposed to refined oil, minor constituents with either prooxidative or antioxidative activity are preserved in cold-pressed oil, affecting its oxidative stability.

AIM

The present work investigates the use of Visible spectroscopy for monitoring autooxidation of cold-pressed and refined rapeseed oils.

MATERIALS AND METHODS

Cold-pressed and refined rapeseed oils were submitted to oxidation at 60° C during 15 days in the dark. Oxidation process were monitored by Visible spectroscopy. Changes observed in visible data were related to changes observed in peroxide and acid values, which were determined by classic chemical methods.

CONCLUSIONS

The result showed that Visible spectroscopy may be able to substitute classic oxidation indices in the determination of oxidative stability due to its simplicity and time saving.

Grant NN312428239, 2010-2013, from the Polish Ministry of Science and Higher Education is gratefully acknowledged.

Key words: oil stability, rapeseed oil, refined oil, Vis spectroscopy

Efficiency of extraction and its influence on antioxidant activity of preparation from soybean

Dorota Wyspiańska, Alicja Z. Kucharska, Anna Sokół-Łętowska, Paulina Mizgier

Wrocław University of Environmental and Life Science
Department of Fruit and Vegetables Technology
Contact e-mail: dorota.wyspianska@op.pl

INTRODUCTION

Soybean (*Glicyne max. Mer*.) belongs to the family Fabaceae. It is an annual plant with strong root system and short shoots. It derives from the regions of East Asia, where it has been cultivated for thousands of years. Soybean appeared in Europe in the seventeenth century. Currently it is used as the raw material base for components such as soy flour, groats, grits and soy protein concentrates.

Soybeans contain 12 isoflavones. Those are classified into four main forms: aglycon, glycoside, acetylglucosides, malonylglucosides. They have anti-oxidative, anti-angiogenic and anti-carcinogenic effects. It has been proven that a diet rich in these compounds decreases the risk of cardiovascular disease and osteoporosis. It was also observed that structural compounds similar to estrogen reduce the incidence of breast cancer and relieve symptoms associated with menopause. Therefore they play a key role in the prevention and treatment of hormone-dependent diseases.

AIM

The aim of this study was to compare the efficiency of single and double extraction of isoflavones from soybeans and evaluation of obtained preparation.

MATERIALS AND METHODS

In the study we used soybeans commercially available. To extract anti-oxidative compounds the solution of 70% ethanol was used. The ethanol extract was concentrated and purified by column of Amberlite XAD 16 resin. The collected fractions were compacted, and then dried. In the preparations the total content of polyphenols was determined using the Folin-Ciocalteu'a, power, DPPH free radical scavenging, reducing power by FRAP and ABTS method for antioxidant activity. The preparation composition was identified by LC-MS and HPLC methods.

RESULTS

From 1 kg of soybean after single extraction it was obtained 5,84 g of the product, in the form of powder. The antioxidant activity of the preparation against DPPH radical-cations was 1,15 mmol T/ g, 0,54 mM T/g (ABTS) and 0,48 mM T/g (FRAP).

After second extractions it was obtained additional 2,38 g of the product and DPPH free radical scavenging was 0,84 mM T/g, 0,27 mM T/g (ABTS) and 0,47 mM T/g (FRAP). Isoflavones included in the preparation were responsible for antioxidant activity. Among the main active compounds were malonylgenistin and malonyldaidzin. In the preparation we identified also genistin, daidzin, glycitin and daidzein.

CONCLUSIONS

These results suggest that double extraction of isoflavones from soybeans is advantageous for efficiency and antioxidant activity of preparation.

Project was supported by National Centre of Science, project nr N N312 279240

Key words: extraction, soybean, antioxidant activity, efficiency

Fluorescence in situ hybridization and VIDAS®UP tests as a rapid screening method for Salmonella detection in meat

Anna Zadernowska, Wioleta Chajęcka-Wierzchowska, Lucyna Kłębukowska

University of Warmia and Mazury
Faculty of Food Science, Chair of Industrial and Food Microbiology
Contact e-mail: anna.zadernowska@uwm.edu.pl

INTRODUCTION

Salmonellosis is the second most frequently reported human zoonotic disease in the EU. Poultry and its products play a significant role in transmission of this pathogen Meeting the standards of preserving food and managing the risk in nutritional chain (Regulation [EC] 2160/2003 of the European Parliament and of the Council of 17 November 2003 on the control of *Salmonella*) compels to elaborate new, fast and reliable methods of biological threats identification. At present, the conventional culture methods for detection of *Salmonella* in food are culture-based methods and require performing numerous steps.These procedures are labor intensive, time- and material-consuming. Therefore, there is a need for alternatives methods that provide results more rapidly with sensivity similar, or even greater than the conventional methods.

AIM

The studies included the determination of usefulness of the VIDAS *Salmonella* UP tests and fluorescence *in situ* hybridization (FISH) method for detection of *Salmonella* in chicken meat and its comparison with a standard cultural method International Standards Organization-6579.

MATERIALS AND METHODS

The material for investigation was 30 chicken meat samples bought retail. Total number of aerobic mesophilic bacteria and the number of *Enterobacteriaceae* were checked in samples. The meat was also examined in respect of *Salmonella* spp. presence, according to ISO 6579. Meat samples were contaminated with a mixture of *S.* Enteritidis, *S.* Typhimurium and *S. bongori* at two levels of contamination. It was also checked whether the tests do not produce cross-reactions with *P. vulgaris* and *C. freundii* strains. After *Salmonella* inoculated the samples were pre-enrichment at 41.5°C, for 24 h. Then they were analyzed using mini VIDAS apparatus and in further stages, according to ISO-6579. The FISH protocol includes four major steps Three oligonucleotide probes were used: Sal3, Eub338 and Non338. Probes were mounted in Vectashield Mounting Medium containing 4'-6-diamidino-2-phenylindole. The hybridized bacteria were visualized by fluorescence microscopy at 1000x magnification (OLYMPUS BX51) on a CellSense microscope equipment with a 100W mercury lamp.

RESULTS

No contamination with *Salmonella* sp. was determined in chicken meat bought retail. In both FISH and Vidas methods no false negative results were obtained. However, Vidas indicated several false positive results which compels this technique confirm the results with the standard method. The hybridization signals of *Salmonella* in FISH method were positive. No cross hybridization was observed to any of the other non-*Salmonella* strains.

CONCLUSIONS

The results indicate the potential of alternative technique as a rapid screening method for detecting *Salmonella* in chicken meat.

This study was supported by the grant N N312 491340 from the National Science Centre, Poland.

Key words: fluorescence *in situ* hybridization (FISH), *Salmonella,* VIDAS UP, food safety

The influence of prebiotics addition on the growth and survival of probiotic bacteria in fermented soy beverage

Dorota Zielińska, Monika Romankiewicz

Warsaw University of Life Science – SGGW
Department of Food Gastronomy And Food Hygiene
Contact e-mail: dorota_zielinska@sggw.pl

INTRODUCTION

Probiotic is originate from the Greek, meaning "for life". It is defined, according to FAO/WHO (2002) as a live microorganisms that may confer a health benefit on the host. Providing health-related activities of the body requires the use of at least $10^8 – 10^{10}$ cells of probiotic bacteria in our daily diet. Therefore, probiotic products should contain a large dose of live bacteria, and their number should be at least 10^5 cells / g or ml by the end of shelf life. Prebiotic term defines the food ingredients group, which is not digested, but have positive impact on its performance. Prebiotics for selectively stimulating the growth and activity of the probiotic bacteria found in the colon. In this way, contribute to the improvement of human.

AIM

The objective of the study was investigate the survivability of an *Lactobacillus casei* ŁOCK 0900 and *Bifidobacterium animalis spp. lactis* Bb-12 strains in the fermented soy beverage, depending on the prebiotics and glucose additon.

MATERIALS AND METHODS

The research material was a natural soy beverage UHT (FRIAS) consisting of: water and 13% of soybeans. We used two probiotic strains - *Bifidobacterium animalis* ssp *lactis* Bb-12 (Chr Hansen) and *Lactobacillus casei* LOCK 0900 comes from the collection of the Institute of Fermentation Technology and Microbiology, Technical University of Lodz (Motyl et al, 2011), and two types of prebiotics - oligofructose (HORTIMEX) and inulin (FRUTAFIX) and also glucose. Samples were prepared by inoculation with 5% (v/v) of 24-hour culture of probiotic bacteria and addition of the 5% (w/v) a suitable prebiotic, a mixture of prebiotics, or a glucose. Control samples did not contain prebiotics. Thus prepared samples were fermented at 37 °C for 24 h, then stored for 22 days at 5 °C. The experiment was performed in three independent replications. The following methods we used: microbiological tests (pure plate method using MRS selective agar), the study of active acidity (pH measured).

RESULTS

We have found that oligofructose, inulin, mixture of them and glucose stimulates the growth and survival of *Bifidobacterium animalis* ssp *lactis* Bb-12 and *Lactobacillus casei* LOCK 0900 in soy beverage compared to the controls samples. Despite the different effects of prebiotics on the tested bacteria, in all cases sugar addition to the soy beverages induced the survival of *Bifidobacterium* Bb 12 over 7 log cfu/ml, and *Lactobacillus casei* LOCK 0900 above 6 log cfu/ml throughout the storage period.
The pH of the soy beverage with *Bifidobacterium* Bb-12 addition decreased in all samples, which were highly correlated with the growth of bacteria. However, the pH of samples with *Lactobacillus* addition did not change significantly. The best source of carbon for growth of *Bifidobacterium* Bb-12 and *Lactobacillus casei* LOCK 0900 was glucose. The number of *Bifidobacterium* cells in samples with the addition of glucose increased by about 2 logarithmic orders, and with the addition of *Lactobacillus* of about 1.5 logarithmic order after fermentation process. Bacteria of the *Bifidobacterium* genus showed a better survival in the soy beverage from *Lactobacillus* regardless of the addition of sugars.

CONCLUSIONS Application of prebiotics and probiotics in the soy beverage increases the lifetime of the bacteria and stimulates their growth, which prolongs the effect of these type functional foods.

Key words: prebiotic, probiotic, fermentation, soy beverage

The usefulness of residual and commercial oat flour for baking pastries

Gabriela Zięć, Halina Gambuś, Dorota Litwinek, Dorota Gumul

Agricultural University in Kraków
Department of Food Technology
Contact e-mail: gabriela.ziec@ur.krakow.pl

INTRODUCTION

Cookies are a popular foodstuff, which are widely consumed due to varied taste, long shelf life and relatively low cost. Owing to the increasing consumption of pastries it seems to be appropriate to develop healthy recipes for pastry.

AIM

The main goal of presented research was to use residual and commercial oat flour to baking cookies taking into account the quality and chemical composition of the final product.

MATERIALS AND METHODS

The research material was wheat flour (type 650), residual oat flour obtained as a waste in the production of concentrated β-D-glucan called Betaven® and commercial oat flour purchased in Bogutyn mill. The research material was also cookies baked according to the recipe culled from ”A collection of recipes pastry”(2002) book. All cookies were baked using 100% of given flour (wheat, commercial and residual oat). The unique chemical composition of flours and cookies was determined according to AOAC methods, that includes: proteins, fat, fiber (both soluble and insoluble fractions), minerals content as well as total polyphenol content by Swain and Hillis (1959) and antioxidant activity by Re et al. (1999). Also fatty acid composition and content of acrylamide (Paleologos and Kontominas, 2005) and an acid number and peroxide after baking and after 4 months of storage were determined in analyzed cookies. Sensory and texture evaluation was performed too.

RESULTS

It was obtained that cookies from commercial and waste flour have similar results of organoleptic evaluation just after baking as well as after four months of storage. Cookies baked with both types of oat flour showed a significantly lower hardness comparing to the wheat cookies in baking day and after 4 months of storage. The analyzed oat cookies contained more total dietary fiber than wheat cookies. The oat cookies also indicated a significantly higher protein content than wheat cookies. The cookies baked with both commercial and residual oat flour contained more total ash, especially Fe, Zn, Cu, Mn, Ca, Mg, and P, and also a higher content of fat and fatty acids. The oat cookies characterized a higher content of polyphenols and greater activity antioxidant compared to the standard cookies. After 4 months of storage, better quality of fat was determined in oat cookies, which was expressed as the number of acid and peroxide for standard wheat cookies. Both types of oat cookies characterized twice less acrylamide content than wheat cookies.

CONCLUSIONS

The results of research show that there is a possibility of rational management of residual oat flour, which is resulting in large quantities in the production of concentrated β-D-glucan.

This work was partially financially supported by National Science Center (research project NN312331640).

Key words: cookies, residual oat flour, content of acrylamide

Analysis of the use of health claims on fatty products

Magdalena Zychnowska, Krzysztof Krygier

Warsaw University of Life Sciences in Warsaw
Department of Food Sciences
Contact e-mail: mzychnowska@wp.pl

INTRODUCTION

The information on food packaging is one the most important tools of communication between the producer and the consumer. The food manufacturers are allowed to put the health claims on packaging to emphasize specific properties of their products for example essential for consumer health. Despite the fact that the inclusion of such information is not compulsory, producers are obliged to apply provisions in accordance with the requirements of the Commission Regulation (EU) No 432/2012 and Regulation No 1924/2006. The aim of health claims is to help consumers in decision making process in purchasing the product based on provided information.

AIM

The aim of this study is to analyze the occurrence of health claims on packages of selected fat products in the market in Warsaw.

MATERIALS AND METHODS

Analysis of the occurrence of health claims was carried out on the example on 55 fat products available in Warsaw stores:

- 17 packs of margarine,
- 10 jars of mayonnaise,
- 28 oils bottles (including 8 bottles of rapeseed oil, 7 bottles of sunflower oil, 12 bottles olive oil and1 bottle of soybean oil).

RESULTS

Health claims were at on 16% fat product packs. All found the statements were on margarine packs. More than half of margarine packages include at least one health claim (mainly margarine containing 40 and 60% of fat). The most frequently used health claims are: alpha - linolenic acid (ALA), linoleic acid (LA) and plant sterols / stanols to help maintain normal blood cholesterol levels. There was not found a single health claim on products such as mayonnaise and oils (rapeseed, sunflower, olive oil, soybean oil). The analyzed data indicate that despite producers meet the requirements they do not include information about health claims on fat product. This applies especially vitamins A and vitamins D and mono- or polyunsaturated fatty acids.

CONCLUSIONS

All health claims on fat packs were consistent with the requirements of Regulation No 1924/2006 and Commission Regulation (EU) No 432/2012. The health claims published on fatty products packages were usually in a visible place, clearly written text. The obtained results indicate that despite the fulfilled conditions, manufacturers do not include information of health statements on their products' packaging, which relates mainly to edible oils and mayonnaise

Key words: health claims, oils, fat, margarine

Firm presentation

Marcin Radecki, Rusłana Krzemińska
WESSLING Polska
30-348 Kraków, ul. Bobrzyńskiego 14
60-476 Poznań, ul. Jasielska 7a
04-063 Warszawa, ul. Białowieska 14/27
Contact e-mail: marcin.redecki@wessling.pl, ruslana.krzeminska@wessling.pl

WESSLING – QUALITY OF LIFE

WESSLING is an international company which operates according to an integrated approach to quality, safety, health and environment protection. We have about 1000 employees in Europe who specialize in consulting, environment and food analytics. Our activities focus on improving the standard and safety of life and consequently on caring about the environment and the quality of products that we get from it.
The purpose of this presentation was to present the spectrum of WESSLING activities and identify area of cooperation.
Quality of life is the theme of the company WESSLING. We want to create a second profile of the company: quality of cooperation.

Blanka Mellová
Kierownik działu Serwisu Konsumenta oraz Centrum ds. Żywienia i Wellness
Nestlé Polska S.A.

NESTLÉ THE HIGH QUALITY PRODUCTS ENABLING TO MAKE CONSCIOUS NUTRITIONAL CHOICES

Jedz smacznie, żyj zdrowo

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QUO VADIS ALIMENTUM?