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ABSTRACTS

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**8th Edition of the International Conference, 5th November 2021
BIOTECHNOLOGIES, PRESENT AND PERSPECTIVES**

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BIOTECHNOLOGIES, PRESENT AND PERSPECTIVES**

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SECTIONS

1. Biotechnologies in Food Industry
2. Applied Engineering Sciences
3. Food Products Quality and Safety
4. Equipment for Food Industry
5. Ecology and Environment Protection
6. Multidisciplinary Science

Section 1.
Biotechnologies in Food Industry

CHEMICAL ANALYSIS OF DIFFERENT WHEAT VARIETIES CULTIVATED IN ROMANIA

*Camelia GOLEA, Georgiana Gabriela CODINĂ
*Faculty of Food Engineering,
University Ștefan cel Mare University, Romania*
[*mcgolea78@gmail.com](mailto:mcgolea78@gmail.com)

Abstract: The chemical components of wheat varieties were determined in terms of its composition humidity, ash, protein, wet gluten, lipid, starch, falling number and starch damage. There are significant ($p < 0.05$) differences in protein and wet gluten of wheat grains which varied between 9.8 and 16.9 % and between 23.2 and 39.7% respectively. The highest protein and wet gluten content were recorded to the *Triticum spelta* samples between those parameters being obtained a high significant correlations ($p < 0.01$). According to the wet gluten content all the grain samples can be used in bakery for bread making. The lipid content presented a significance differences ($p < 0.05$) between *Triticum aestivum* species samples and between *Triticum monococcum* and *Triticum spelta* ones. The lowest lipid content were recorded for the *Triticum aestivum* grains samples where as the highest ones for the *Triticum spelta* species. The starch content of the samples varied between 45.3 and 64.5% whereas the falling number values varied from 98 to 404 s indicating the fact that these grains samples presented a different amount of alpha amylase activity from a high to a low one for bread making. The falling number values of the grains samples are highly significant ($p < 0.05$) negative correlated with starch damage namely the highest the falling number was the lowest the starch damage was. The highest ash content of the grain samples were recorded for the *Triticum spelta* species meaning that these samples presented the highest amount of minerals from all the analyzed grains samples ones. The humidity of the grain samples was not very high ones no grain sample exceeding the value of 13% which indicates that they can be stored for a longer period of time.

Key words: *chemical content, wheat, Triticum aestivum, Triticum spelta, Triticum monococcum*

ALTERNATIVE IN VITRO METHODS TO POTENTIATE THE PRODUCTION OF SECONDARY METABOLITES FROM SAFFRON (*Crocus sativus L.*)

Soukaina ABOU-WAKIL¹, *Vasilica BARBU², Mihaela TURTURICA²,
Fatima HOUSTI¹, Mohamed ROCHD¹.

¹Faculty of Science, Moulay Ismail University of Meknes Morocco,
s.abouwakil@edu.umi.ac.ma

²Faculty of Food Science and Engineering, "Dunarea de Jos" University of Galati, [*Vasilica.Barbu@ugal.ro](mailto:Vasilica.Barbu@ugal.ro)

Abstract: Saffron (*Crocus sativus L.*) is the most valuable medicinal food product, is currently used by several industries, in the food industry, pharmaceuticals and cosmetics. This is due to its richness in active compounds, crocin (responsible for color), picrocrocin (responsible for taste) and safranal (responsible for odor). The aim of this study is to compare the effect of plant growth regulators on secondary metabolites production in saffron callus. Saffron callus was obtained by *in vitro* culture on Murashige and Skoog's medium containing 3% sucrose, 8g/l agar and supplemented with 1mg/l and 2mg/l (2,4-D) or (NAA) in combination with 1mg/l and 0.5 mg/l (Kin) or (BAP). After 25, 45 and 65 days of culture a sample of callus from each combination was collected and the composition of secondary metabolites was measured by UV/VIS spectrophotometer at wavelengths 440nm, 330nm and 257nm respectively which correspond to the maximum absorbance for crocin, safranal and picrocrocin respectively. Total polyphenols, total flavonoids and antioxidant activity for all experimental variants were also measured comparatively. Tissue culture represents an imperative potential to efficiently propagate saffron and also for the production of its secondary metabolites.

Key words: *Callus; In vitro culture; Plant growth regulators; Saffron (Crocus sativus L.); Secondary metabolites; UV/VIS spectrophotometer.*

***FUNCTIONAL POTENTIAL AND POSSIBILITIES OF
USE THE BEE PRODUCTS IN THE MEAD PROCESSING***

****Maria Emilia COVACIU, Elena MUDURA,**

***Teodora Emilia COLDEA, Laura STAN**

Faculty of Food Science and Technology,

*University of Agricultural Sciences and Veterinary Medicine of Cluj-
Napoca, Romania*

**teodora.coldea@usamvcluj.ro, **mariacovaciu1998@gmail.com*

Abstract: Mead is an alcoholic beverage produced by the fermentation of a mixture of honey and water with the help of yeasts. Even if mead is not a popular beverage in Romania, it can be successfully marketed towards export in Western European countries. In this case study, sunflower honey was used to obtain a value-added product. As for yeasts, *Saccharomyces cerevisiae* var. *bayanus* were used. They possess high resistance to ethanol and sulfur dioxide, tolerance to temperature variations, vigorous fermentation activity, low nitrogen requirement, and can flocculate easily after fermentation. This paper aimed to analyze the performance of two species of yeasts used in mead processing. In this sense, eight experimental variants were prepared, subjected to fermentation under the same conditions. The variants used two types of fermentation yeasts, *Saccharomyces bayanus*, that was successfully used at the industrial level to obtain sparkling wine. The fermentation process was monitored, and antioxidant activity, chromatic characteristics, total phenolic content, and sensory analysis were evaluated in the final product.

Key words: *mead, fermentation, yeast, sunflower honey, bee bread, nutrients, sensory analysis*

STUDY ON THE OPPORTUNITY TO IMPROVE THE QUALITY OF FLOUR FOR PASTRY BY ADDING CHEMICAL LEAVENING AGENTS

**Gabriela CONSTANTINESCU (POP)¹, Monica DINU²,
Petru ALEXE³, Amelia BUCULEI¹*

*¹"Stefancel Mare" University of Suceava, Faculty of Food Engineering,
Suceava, Romania, * gabriela.constantinescu@fia.usv.ro*

²"Colegiul Economic Viilor", Soseaua Viilor, nr 38, Bucuresti, Romania

*³"Dunarea de Jos" University of Galati, Faculty of Food Science and
Engineering, Galati, Romania*

Abstract: *Consumers has shown great interest in food products that do not require processing practices and are easy to be prepared. Premixes formulations for cake mixes are an example of this type of food product which can be made easily and quickly. Therefore, consumers' expectations to get such a high quality and uniform product after having followed the instructions are justified. There are many different chemical leavening agents available to the baker such as: baking soda (sodium bicarbonate), ammonium bicarbonate, potassium bicarbonate, baking powder (baking soda, calcium phosphate and sodium aluminum sulfate) and leavening acids. The primary role of leavening agents resides in generating CO₂ and neutralizing sodium bicarbonate, however, it is important to keep in mind as well their secondary role and their effects. Having in view these facts, the aim of experiments was to establish the connection between quantity and quality of leavening agents and the quality of bakery products Taking into consideration the fact that these chemical leavening agents are being incorporated in flour, it is also important to comprehend how they influence the rheological parameters of flour with direct implication in the quality of the products made.*

Key words: *baking powder cake, leavening agents, rheological parameters*

SPENT GRAIN FROM BREWING AND MALT WHISKY PRODUCTION. A COMPARATIVE ANALYSIS

*Ancuța CHETRARIU, Adriana DABIJA
*Faculty of Food Engineering, Ștefan cel Mare University, Suceava,
Romania*

*ancuta.chetrariu@fia.usv.ro

Abstract: Spent grain is the major by-product of the brewing industry or from the malt whisky production, a little used by-product because of its high moisture content. By-products from the food industry can be an important source of complex carbohydrates, proteins, lipids, and nutraceuticals and their capitalization brings benefits both for the environment and for use in industry, by turning them into valuable products, thus reducing the production costs of food, but also ensuring a circular economy. Spent grain is the solid residue left after filtration of the wort, being the insoluble part of the wort and is composed mainly of polysaccharides, lignin, proteins and low lipid fractions. These two by-products were evaluated in terms of individual polyphenols, fatty acids, and amino acid content. Phenolic compounds have numerous scientifically proven benefits, and the consumption of foods rich in bioactive compounds with antimicrobial and antioxidant properties bring health benefits. In spent grain p-coumaric, chlorogenic, and vanillic acids were founded. From 37 fatty acids examined 22 were quantified in spent grain from distillery and 17 from brewery industry, the most abundant being linoleic and palmitic acids in both samples. Spent grain is a source of protein because it contains essential amino acids like valine, leucine, isoleucine, phenylalanine, and tyrosine and non-essential amino acids like glutamic, aspartic, and proline.

Key words: *by-product, circular economy, capitalization, bioactive compounds*

Acknowledgements: This work was performed within the framework of the “DECIDE - Development through entrepreneurial education and innovative doctoral and postdoctoral research, project code POCU/380/6/13/125031, supported by project co-financed from the European Social Fund through the 2014 – 2020 Operational Program Human Capital”.

DAIRY-FREE FUNCTIONAL ICE CREAM BASED ON VEGETABLE RAW MATERIALS

*Ionela IACOBAN, Anuța CHETRARIU, Adriana DABIJA
*Faculty of Food Engineering, Ștefan cel Mare University, Suceava,
Romania*

**ionela.iacoban1@gmail.com*

Abstract: Ice cream is one of the world's most popular frozen dairy desserts today among people of all ages, and global consumption is on the rise because of its delicious, wholesome, and nutritious properties. Currently, the dairy industry is exploring new ways to redesign existing products by adding healthy ingredients, free of additives, obtained through gentle processing, and having a clean label. Though conventional ice cream is made by using dairy milk, over the last years, dairy-free milk such as soy, almond, coconut, sesame, oat milk, etc. has become more common. These milk substitutes provide plant proteins and lipids in ice cream, by incorporating the nutritional values and health-promoting effects of plant compounds into ice cream. The use of milk substitutes also leads to the production of novel lactose-free products, which could be attractive and practical for consumers. Adding fruits and vegetables in different forms (i.e., fresh, dried, powder, juices, puree, pulp, fibre, and extract) provide means for producers to improve the health benefits of ice cream. The increased demand for dairy-free products is associated with high prices for this raw material, limited availability of milk in specific geographical locations (arid regions), and outbreaks related to the consumption of dairy products containing pathogens. The search for new ingredients and creating new assortments of dairy free functional ice cream is important since consumers demand new flavours, healthier options, and lactose free ice cream products that can render "mouthwatering appeal". This paper presents a mini-review about a different assortments dairy-free functional ice cream studied by researchers.

Key words: *new assortments, milk substitutes, nutritional values, health benefits*

***BUCKWHEAT AS RAW MATERIAL FOR BREWING
A MINI-REVIEW***

*Marius-Eduard CIOCAN, Anuța CHETRARIU, Adriana DABIJA
*Faculty of Food Engineering, Ștefan cel Mare University, Suceava,
Romania*

*marius_ec@yahoo.com

Abstract: Beer manufacturing is among the oldest biotechnological processes, in which barley malt and wheat malt is used as conventional raw materials. Currently other cereals such as rice, teff, sorghum, millet and pseudo-cereals, such as quinoa, amaranth, buckwheat, are also used. The process of replacing barley or wheat malt in beer industry is increasing nowadays; several factors have contributed to this: rebirth of craft beer, demand interest for functional beer, development of gluten-free brewing, consumer demand for unique experiences, authentic products, high quality, distinctive taste and aroma, etc. Among pseudo-cereals, buckwheat has attracted attention as a new raw material for gluten free beer, as it has shown over the years excellent results in terms of productivity, enzymatic activity and chemical composition for the manufacture of fermented beverages. Bioactive and functional properties of gluten-free beer can be improved by using buckwheat malt in the mashing process. In addition to bioactive compounds such as flavonoids, phenolics, and sterols, buckwheat grain is known to contain relatively high concentrations of inositols and myoinositol. These compounds have been found to have a positive impact on the glycemic index, and cell growth-stimulating properties. This mini-review will detail the buckwheat, which is currently used in brewing, emphasizing the characteristics that recommend it in this regard.

Key words: *gluten-free beer, pseudo-cereals, authentic products, bioactive compounds*

THE EFFECT OF SEA SALT WITH A LOW SODIUM CONTENT ON DOUGH RHEOLOGY AND BREAD QUALITY

*Andreea VOINEA, Silviu-Gabriel STROE, Sorina ROPCIUC,
Georgiana Gabriela CODINĂ
*Faculty of Food Engineering,
University Ștefan cel Mare University, Country Romania*
*andreea.musu@fia.usv.ro

Abstract: The aim of this study was to analyze the effects of the sea salt (SS) addition on dough rheological properties during mixing, extension and pasting and bread quality in terms of texture, porosity, elasticity, loaf volume, color and sensory properties. The sea salt used in this study was a salt with a low sodium content from the Dead Sea with a sodium chloride of max. 7% in its composition which was added in levels of 0.3, 0.6, 0.9, 1.2 and 1.5% in a wheat flour of a very good quality for bread making. According to the data obtained the water absorption capacity and the degree of softening decreased with the increase level of SS addition whereas the energy, resistance to the extension up to 50 mm, extensibility and maximum resistance increased. All the Amylograph data namely gelatinization temperature, peak viscosity, temperature at peak viscosity increased with the increase level of SS addition. According to the Rheofermentometer data the total volume of carbon dioxide produced during fermentation and volume of the gas retained in the dough at the end of the test presented higher values for the samples with SS addition compared to the control sample. From the bread quality point of view the best samples were those with high levels of SS addition in wheat flour. The sodium content in the bread samples analyzed by using atomic absorption spectroscopy were less than 0.04 g/100 g all samples being classified according to the European Commission (EC) Regulation no. 1924/2006 as food products with a low sodium content because they have values lower than 0.12 g / 100 g product.

Key words: *bread quality, seasalt, sodium content, technological process*

EFFECT OF DRY HOPPING METHOD ON MYRCEN DISSOLUTION EFFICIENCY

*Rozalia Veronika SALAMON¹, Ferencz ÁGOTA¹,
Tankó GYÖRGY², Adriana DABIJA⁴

¹*Sapientia Hungarian University of Transylvania, Faculty of Economics,
Socio-Human Sciences and Engineering, Miercurea Ciuc, Piața Libertății
nr.1, Romania, * salamonrozalia@uni.sapientia.ro*

²*Magyar Agár- és Élettudományi Egyetem, Doctoral School of Food
Science, 1118 Budapest, Villányi street 29-43, Hungary,*

³*Faculty of Food Engineering, Ștefan cel Mare University, Suceava,
Romania*

Abstract: In recent years, the production of Indian Pale Ale (IPA) style of beers and the dry hopping process is becoming increasingly popular, especially among micro-breweries. In our research, we investigate the dissolution rate of main volatile component of hop (myrcene) during modified dry hopping method. Following the primary fermentation, we applied the dry hopping process, where the weighed hops were chopped and blended into a container with 0.5 L of beer and later added to the young beer. During the fermentation of the beer, we determined various important parameters regarding the young beer and then we repeated the same measurements for the bottled beer. In the first 96 hours of the of dry hopping process, we monitorized the concentration of myrcene, so that we managed to determine the dissolution rate constant ($k=0.1946 \text{ h}^{-1}$) of myrcene. The myrcene concentration stabilizes after 44 hours in the fermenter. At the same time, we followed the bitterness, pH, CO₂ and alcohol content, extract and density during the process. Our experiment demonstrates that our method of dry hopping provides a much higher concentration of myrcene (215.1 μg/L) than other methods indicated in the literature. Our modified process was successful and we were able to determine the dissolution rate of myrcene, which is a completely new scientific result.

Key words: *Indian Pale Ale beer, hop, fermentation, bitterness*

PHYSICO-CHEMICAL CHARACTERIZATION OF BANANA PEEL AND FRUIT VINEGARS BEFORE AND AFTER IN VITRO DIGESTION

*Ancuța Elena PRISACARU, Cristina GHINEA, Laura Carmen APOSTOL, Sorina ROPCIUC, Vasile Florin URSACHI

*Faculty of Food Engineering,
University Ștefan cel Mare, Country Romania*

* ancuta.prisacaru@fia.usv.ro

Abstract: The production of vinegars from fruits and fruit waste is an option used by the food industry in order to reduce food waste and obtain quality final products. Vinegar has been used since ancient times as a preservative, aromatizer and condiment. This study was carried out to evaluate production and quality of vinegar from banana peel vinegars obtained by different technologies as compared to commercial vinegars. Analyses carried out on the products include colour and physico-chemical properties of the samples before and after gastric and intestinal digestion. Vinegar obtained from banana peel aged for 1 year (produced without boiling the peels) and vinegar from banana peel aged for 2 years (produced with boiling the peels) have high values of L*, which means they are clearer than the other types of vinegar. Total dry extract values are lower for the samples with vinegar obtained from banana peel compared with the samples with commercial vinegars and it was observed that TDE values decreased after gastric and intestinal digestion for all vinegar samples. Vinegar obtained from banana peel aged for 1 year (produced without boiling the peels) and Modena commercial vinegar, based on the investigation of the data regarding specific gravity, before digestion are in the same category. After gastric digestion, the SG values of vinegar obtained from banana peel samples slowly increased compared with the SG values of the Modena commercial vinegar samples. Banana peel vinegars have higher antioxidant activity and total polyphenol content quite similar to commercial balsamic vinegars. Banana peel vinegar is generally richer in Na, Mg, and Ca content than other commercial vinegars.

Key words: *banana peels, fermentation, in vitro digestion, physico-chemical characteristics, vinegar*

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BIOTECHNOLOGIES, PRESENT AND PERSPECTIVES
**MONITORING OF VISCOSITY CHANGES OF WHEAT
SOURDOUGH: A PILOT STUDY**

*Ivan ŠVEC, Eliška BĚLÍKOVÁ, Pavel SKŘIVAN,
Marcela SLUKOVÁ

*Faculty of Food Chemistry and Technology,
University Chemistry and Technology, Prague, Czech Republic*

*Ivan.Svec@vscht.cz

Abstract: Wheat sourdough with yield 220% or 250% was prepared from white wheat flour, tap water, commercial mixed sourdough starter, using an industrial pilot production fermentor (8 h fermentation time). In addition to common quality parameters of the sourdough, such as the titratable acidity and pH, the viscosity was measured stepwise using the viscometer Rapid Viscosity Analyzer and the pre-set measuring profile. Viscosity was evaluated as the Peak and the Final Viscosity during a 13-minute test at 30 °C and 160 rpm. After 8 hrs fermentation, higher FinalVisc than the initial one observed Wehrle & Arendt (1998), using dynamic oscillatory test on the rheometer. The correlation analysis confirmed the known relationship between the fermentation time of the sourdough, the pH and the titratable acidity without the effect of the sourdough yield ($P = 99\%$). A further logical connection was found between the Peak and the Final viscosity, when a difference between these two points depended on the Peak Viscosity ($r = 0.94$ and 0.93 , $P = 99\%$). The viscosity difference mentioned was negatively correlated to pH and reversely with titratable acidity ($r = -0.46$ and 0.45 , respectively; $P = 99\%$). Broader exploration of these finding should be done, using also fine granulated wholemeal rye flour.

References

Wehrle K., & Arendt E.K. (1998): Rheological changes in wheat sourdough during controlled and spontaneous fermentation. *Cereal Chem.* 75: 882-886. doi: [10.1094/CCHEM.1998.75.6.882](https://doi.org/10.1094/CCHEM.1998.75.6.882).

Key words: *controlled fermentation; correlation analysis; Rapid Visco Analyser; sourdough yield; titratable acidity; viscosity; wheat sourdough*

SACCHAROMYCETES AS BIOLOGICAL AGENTS FOR THE MEDIATED BIOSYNTHESIS OF SILVER NANOPARTICLES

*Yevhen KHARCHENKO, Oksana SKROTSKA

*Department of Biotechnology and Microbiology,
National University of Food Technologies, Ukraine*

*yugin171094@gmail.com

Abstract: Silver nanoparticles (AgNPs) have great potential for use in the food industry due to a wide range of antimicrobial activity against foodborne pathogens which makes it possible to use AgNPs for the production of packaging materials for food products. The use AgNPs in nanobiosensors makes it possible to increase the sensitivity of detecting bacterial pathogens in food and drinking water. Another areas of AgNPs application are their use as nanocatalysts and use in winemaking as concervants. The most commonly used are chemical and physical methods of AgNPs synthesis, but there is also biological synthesis, which is a promising and more environmentally friendly method. Synthesized using the supernatant *Saccharomyces cerevisiae* M437 AgNPs had a spherical shape with a diameter of about 15 nm. The polydispersity index (PdI) of t AgNPs solutions was 0,3, and the zeta potential was -13,6. After storage for 45 days at 4 °C, the PdI value increased 1,6 times, and the zeta potential increased by 11,7%. Obtained data indicates a possible change in the shape of AgNPs, the formation of an agglomerate, or other processes that takes place in a colloidal solution during storage. AgNPs that were obtained using a cell-free aqueous extract of *S. cerevisiae* M437 had an oval shape with a size of 21,3×14,2 nm. The PdI and zeta potential values were similar to the nanoparticles obtained using the supernatant. However, after storage, these values differed significantly: the value of PdI increased 1,3 times, and the zeta potential decreased by 29%. So, the solution of silver nanoparticles obtained in this way is more stable after storage under the specified conditions.

Key words: *nanoparticles, silver, yeast, biosynthesis, Saccharomyces cerevisiae*

***STUDY ON CHANGES IN PHYSICO-CHEMICAL AND
SENSORY PROPERTIES OF NATURAL JUICES APPLES
AND RASPBERRIES***

*AmeliaBUCULEI, GabrielaCONSTANTINESCU,
LilianaARGATU

*Faculty of Food Engineering, Stefan cel Mare University of Suceava,
Romania*

ameliab@fia.usv.ro

Abstract:Recent studies have reported that the processing industry of natural fruit and vegetable juice is starting to grow among consumption trends.

The aim of this study is to check the quality of new varieties of natural juices (-natural apple juice (Jonatan apple variety); natural raspberry juice (90% Ionian apple variety and 10% red raspberries, *Rubus idaeus* variety)

The experimental studies carried out have shown that both the soluble substances (12.7°Bx), polyphenols (57.54 mg/100ml), flavonoids (866.67mg/100ml) and the pH value (3.42) have more favorable values than single apple juice, i.e 12°Bx, 37.54mg/100ml, 583.33mg/100ml and pH3.7. From a sensory point of view, following the hedonic method with 10 tasters, the natural apple juice has obtained the rating “pleasant” while the apple and raspberries “very pleasant”, which shows us our appreciation for the consumption of a new kind of natural juice. The physico-chemical comparative analysis of natural apple juice and of apples and raspberries suggests that the latter has improved quality ratios.

Even if apple and raspberries juice has 90% and raspberries 10% respectively, considerable variations in these properties are observed.

Key words: *consumers, health, industry, trends, processing, quality*

***STUDY OF RĂCHIȚICA (VACCINIUM OXYCOCCUS)
ACTIVE PRINCIPLES FOR POTENTIAL USE AS A
MEDICINAL PLANT***

*Ofelia ARVINTE,

Coordinating Professor: Prof. Ph. Sonia AMARIEI

*Faculty of Food Engineering, University Stefan cel Mare, Suceava,
Romania*

*ofeliarvinte@yahoo.com

Abstract: Răchițica de tinov (*Vaccinium oxycoccus*) is a plant of the Ericaceae Family, *Vaccinium* genus, *Oxycoccuspalustri* (*oxycoccusquadripelatus*) and *Oxycoccusmicrocarpum* species. This plant grows in peat bogs in cold areas. Also, this plant can be found in the peat bogs of Dorna area.

The small fruits of this plant have a red color, a strong peel, a sour and flavoured taste. The seeds are small.

The locals use this fruits as a vitamin source, detoxifying, digestive tonic, but also in order to regulate blood pressure.

The aim of this study is to determine the therapeutic potential of the plant by determining its antioxidant capacity and its polyphenol content.

It was determined the antioxidant potential, respectively polyphenol content and antioxidant activity of the Răchițica, contents of metals and metalloids from the plant in order to assess a possible toxic effect.

Keywords: *vaccinium oxycoccus, antioxidant capacity, polyphenol*

**WASTE MINIMIZATION AND UTILIZATION IN THE FOOD
INDUSTRY: EXTRACTION OF VALUABLE COMPOUNDS FROM
BERRY JUICEPROCESSING BY- PRODUCTS**

*Cristina DAMIAN¹, Ana LEAHU¹, Sorina ROPCIUC¹,
Nicolae CARPIUC²

¹Faculty of Food Engineering, University „Ștefan cel Mare” of Suceava,
Romania

²Colegiul Alexandru cel Bun din Humor, Romania

*cristinadamian@fia.usv.ro

Abstract:This research work is centered on the processing of berries into fruit juices from the point of view of waste minimization and environmental best-practice technologies. Environmental bestpractice technologies have as main goal the satisfaction of consumer demands, while the production process is optimized in order to have the least impact on the environment. The optimization includes the reduced utilization of raw materials, less energy and water use, while, as a result less process waste and effluent is generated. However, in the process design or re-design, special attention must be given to safety. As a part of the best-practice technologies the more cost-effective and environmentally friendly preservation of the fruit juices by pressure driven membrane processes will be introduced.

Taking into account the waste management options, at the top of the hierarchy stands waste minimization that includes: • waste prevention i.e. reduction of waste by application of more efficient production technologies; • internal recycling of production waste; • source-oriented improvement of waste quality, e.g. substitution of hazardous substances; • re-use of products or parts of products, for the same or other purpose.

Berries contain different bio-active components, such as phenolic phytochemicals (flavonoids, phenolic acids, polyphenols).

Key words: *berries, byproducts, flavonoids, polyphenols, waste minimization*

**FERMENTATION OF SURPLUS BREAD:
UPCYCLING STRATEGIES FROM GROWTH MEDIUM
TO FOOD INGREDIENT**

Michela VERNI

Department of Soil, Plant and Food Sciences, University of Bari, Italy

michela.verni@uniba.it

Abstract: The amount of bread wasted daily worldwide throughout its entire lifecycle, from production to consumption, is estimated to be hundreds of tons, leading to the disposal of products otherwise still fit for human consumption, causing environmental burdens. At present, most of the not consumed bread is disposed as waste, and alternative pathways such as donation, ethanol production or re-use as feed are being considered. It is crucial, however, to achieve more sustainable food systems, that future upcycling solutions focus on keeping bread waste still safe for human consumption within the food chain. We investigated several biotechnological processes focused on lactic acid bacteria fermentation to repurpose bakery side streams. A medium to be used for the cultivation of food industry microbial starters was obtained from sandwich bread cuttings. Hydrolysis of bread with proteolytic and amylolytic enzymes and the supplementation with nitrogen and/or carbon sources were used to provide a suitable medium for the cultivation of lactic acid bacteria, yeasts and fungi from dairy, bakery, and wine industry, with microbial growth comparable to that of reference media.

Furthermore, enzymatic hydrolysis and fermentation were further developed to upcycle bread as ingredient for bread making. Surplus bread hydrolyzed with proteases and fermented by *Levilactobacillus brevis* AM7 showed broad inhibitory spectrum against fungal species often contaminating bread, with antifungal properties ranging from 20 to 70%. Nine antifungal peptides, encrypted in wheat proteins sequences, released during fermentation and identified via LC-ESI-MS/MS, were found to be responsible for such activity. Breads containing the fermented hydrolysate showed the longest mold-free

shelf-life compared to the other breads, lasting up to 10 days before mold appearance.

Besides increasing the shelf-life, a blend of surplus bread and wheat bran (30% of bread weight) was used as substrate to synthesize γ -aminobutyric acid (GABA). *Lactiplantibacillus plantarum* H64, selected among 33 LAB strains for the GABA-producing properties, yielded the highest GABA content (*circa* 800 mg/kg). The fermented bread/bran slurry was used to produce a GABA-enriched bread with better nutritional quality compared to common white bread. These results represent a proof-of concept of effective strategies based on tailored fermentation to repurpose food industry side- streams as ingredients for food applications.

Key words: *Bioactive peptides, bioprocessing, fortified bread, γ -aminobutyric acid, lactic acid bacteria, surplus bread, sustainability*

**BREWERS' SPENT GRAIN AS SUBSTRATE FOR SYNTHESIS
OF DEXTRAN BY LACTIC ACID BACTERIA: REGULATION
OF DEXTRANSUCRASES AND FERMENTATION
PERFORMANCE**

Prabin KOIRALA

Department of Food and Nutrition, University of Helsinki, Finland
prabin.koirala@helsinki.fi

Abstract: Dextran is a homopolysaccharide synthesized by lactic acid bacteria (LAB) by the action of extracellular dextransucrases in the presence of sucrose. Dextran offers texturizing, viscofying, and emulsifying functionality to food. For these reasons, dextran synthesis in situ during fermentation is a valuable means to enhance the technological functionality of food matrices. Food material or side streams with poor technological performance but with high nutritional properties, like legumes, bran or brewers' spent grain (BSG) could be upgraded via dextran formation. Despite the increased use of this technology, the regulatory mechanisms involved in dextran biosynthesis have not been deeply studied yet in industrially relevant conditions, e.g., during food transformation. Different environmental factors (e.g., substrate composition and cultivation conditions) can influence the biosynthesis of dextran, significantly affecting their yield and composition. Thus, understanding the mechanisms behind dextran formation can reveal factors enabling the tailored synthesis of dextran in food systems. In this study, the influence of BSG on the synthesis of dextran by *Weissellaconfusa*A16 and *Leuconostocpseudomesenteroides*DSM 20193 was investigated. The performance of the strains and the primary metabolites formed during fermentation were also analyzed. Kinetics of bacterial growth, acidification, and viscosity change were followed during 24 h of BSG fermentation with and without 4% sucrose (w/w). A pH drop was observed after 10 h with significant changes at 16 and 24 h. Viscosity increased with the addition of sucrose, and particularly at 10, 16 and 24 h.

Thus, these time points were selected for further analysis. Three different dextransucrase genes were identified in *L. pseudomesenteroides* DSM 20193 and one in *W. confusa* A16. Differential expression of dextransucrases was observed at the time points considered and the presence of both dextran and isomaltooligosaccharides was confirmed.

The synthesis of dextran *in situ* in BSG using LAB fermentation is a promising technology which could contribute to reintroduce an underutilized food side streams into the food chain. Understanding how dextran is formed during fermentation could help to improve the fermentation process and outcome, it could also allow us to develop molecular approaches in food technology, enabling a more efficient use of the resources.

Key words: *Brewers' spent grain, Dextran, Dextransucrase, Fermentation, Food technology, Lactic acid bacteria*

Section 2

Applied Engineering Sciences

THE DEVELOPING OF THE HIGH QUALITY LOCAL FISH FEEDS IN UKRAINE

Liudmyla FIHURSKA

*Department of grain and grain business, Odessa National Technological
University, Ukraine
fihurska@gmail.com*

Abstract: Aquatic food products represent one of the world's most nutritious food sources. Ukrainian businessmen are interested in the production of catfish, trout, tilapia, and shrimp fish. It's impotent to tell these species are new for Ukraine, for some of them the requirements have changed. The most famous aqua plants that grow these breeding objects are «Lauren Aquaculture», «Aqua System Organic», «Catfish from Pavlysh», «First City Fish Farm». In Ukraine, there are more than 4 thousand business entities in aquaculture (2018). They produced 20193 tons of aquatic biological resources. The leaders in the cultivation of marketable products in aquaculture were Sumy (2869 tons), Cherkassy (2520 tons), Vinnitsa (1934 tons), Kirovograd (1369 tons), Zhitomir (1216 tons) and Kiev (1156 tons) regions. The purpose of the study is to develop feeding programs for different fish species, analyze features of production of compound feeds for fish. At the first stage of work, works of foreign scientists were analyzed and fish needs in nutrient and biologically active substances were formed, as well as amino acid requirements, mineral requirements, water and fat soluble vitamins, which are essential to ensure the optimal quality level of fish feed and improve the performance of the different fish age groups. On the next step we have analyzed fish feeding programs of different fishfeed producers. Based on the analysis of feeding programs and recommendations from foreign sources, we developed our own feeding program for sturgeons, tilapia, shrimp, trout and catfish.

Key words: *Aquatic food products, sturgeons, tilapia, shrimp, trout and catfish.*

**RESEARCH REGARDING BY-PRODUCTS
CAPITALIZATION FROM THE *LYCOSPERICON
ESCULENTUM* TOMATOES PROCESSING**

*Dumitrița FLAIȘ, Mircea OROIAN
Faculty of Food Engineering,
Ștefan cel Mare University, Romania
[*dumitritaflais96@gmail.com](mailto:dumitritaflais96@gmail.com)

Abstract: The experimental study aimed to extract the lycopene from the by-products of the tomato heart (*Lycopersicon esculentum*), by maceration in refined sunflower oil. Following the extraction, it was possible to perform the carotenoid analysis, color reading and the determination of the acidity by titration in the presence of an indicator.

After reading the color, it was observed that the S / L ratio is the one that influences the physico-chemical characteristics of the finite product and also the temperature is influenced because with its increase the extractability increases. The highest amount of carotenoids could be noticed in the samples macerated at a temperature of 80 ° C and a ratio of 1.8 S / L (% , w / v) where they had the highest amount of lycopene. This happened because the amount of the introduced substance was higher and the temperature favored the extractability of the compounds in the sunflower oil. The samples that had the highest acidity were the samples treated at a higher temperature and whose solid / liquid ratio was 1.8 S / L (% , w / v). The acidity increasing may be caused by the existence of the acidic substances that have migrated from the pomace to the sunflower oil.

The importance of the source of lycopene in the *Lycopersicon esculentum* is justified because the studies have shown that lycopene is a powerful antioxidant and has antitumor effects.

The human body cannot produce lycopene and must be obtained from the food, and the research and the analysis show that the *Lycopersicon esculentum* is a rich source of lycopene and it could cure these diseases.

Key words: *lycopene, tomato, color, carotenoids, acidity.*

Section 3.
Food Products Quality and Safety

HONEY ADULTERATION DETECTION USING INSTRUMENTAL TECHNIQUES

*Mircea OROIAN, Florina DRANCA, Sorina ROPCIUC, Paula
CIURȘĂ, Daniela PAULIUC

Faculty of Food Engineering, Ștefan cel Mare University, Romania

**m.oroian@fia.usv.ro*

Abstract: Honey is the ancient sweet substance use by humankind for its nutritional and pharmacological effects. One of the biggest concern regarding the honey is if it is adulterated. The honey adulteration is an old fraudulent practice and involve the addition of other substances (e.g. fructose, glucose, inverted sugar, corn syrup, rice syrup) for the substitution of the product. Honey adulteration can be seen from three different point of view: (1) Public health, the addition of different substances into honey may have toxic or allergenic potential, (2) legal, in Romania and in the UE if forbidden the addition of any substance into the honey, and (3) economic, because the substitution of honey or the addition of different compounds may create an unfair market for all the stakeholders. Recently there is a high interest in developing instrumental methods for the detection of honey adulteration, many methods developed were based on FT-IR spectroscopy, e-tongue system, chromatography.

Key words: *adulteration, instrumental techniques, FTIR spectroscopy, e-tongue system*

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***EDIBLE FILMS BASED ON PECTIN AND CELLULOSE:
MICROSTRUCTURE ANALYSIS***

*Florina DRANCA, Mircea OROIAN
*Faculty of Food Engineering,
Ștefan cel Mare University, Romania*
**florina.dranca@usm.ro*

Abstract: Worldwide, food packaging from petroleum-based plastic accounts for million tons of waste in landfills every year, having a major impact on the environment. In this context, wrapping materials based on biopolymers emerged as an alternative mostly due to their biodegradability. Research on the matter was focused on the film-forming properties of biopolymers used to produce edible films and their applications on different food products. This study reports on edible films based on a blend of two biopolymers, apple pectin and modified cellulose, which were obtained by the casting method. The aim of this study was to analyze the microstructure of these edible films in order to obtain some understanding regarding the way apple pectin blends with modified cellulose by comparison to commercial citrus pectin and its possible influence on the physical properties of the films. The microstructure of pectin-modified cellulose films and control films (films without pectin, containing modified cellulose and glycerol as plasticizer) was observed in cross-section and surface using scanning electron microscopy (SEM). The differences observed between samples were remarkable and correlated with physical properties such as the tensile strength.

Key words: *apple pectin, cellulose, edible film, microstructure, scanning electron microscopy*

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NATURAL EXTRACTS FOR PLANT CROPS - CHALLENGE FOR FOOD QUALITY ASSURANCE

*Gabriel Mihaita DARABAN¹, Raluca Maria HLIHOR²,
Marinela BADEANU², **Daniela SUTEU¹

¹, „Cristofor Simionescu” Faculty of Chemical Engineering and
Environmental Protection, „Gheorghe Asachi” Technical University of Iasi,
Romania

² Faculty of Horticulture, „Ion Ionescu de la Brad” University of Life
Sciences of Iasi, Romania

**danasuteu67@yahoo.com, *darabangabrielmihaita@yahoo.com

Abstract:The principles of sustainable development together with the need to ensure the quality of people's life have outlined a number of new trends in modern agriculture, related to ensuring the proper quality of a food product which must be pursued from the cultivation of raw materials (farm) to the consumer. In this context, in recent years more and more researchers have focused on partially replacing, in a first phase, chemical synthesis pesticides with biopesticides, products obtained from plants, using extraction methods with non-toxic solvents. These bioproducts have a number of advantages such as: multiple action effects, are environmentally friendly, have no toxicity, are highly effective in controlling certain classes of pests, and the probability of pests gaining resistance is lower compared to industrial pesticides.

The aim of this paper is to present a comparison between several liquid-solid extraction techniques (maceration, hot reflux in the Soxhlet apparatus and ultrasound-assisted extraction) using solvents approved by agriculture and the food industry (96% ethyl alcohol and hydro- alcoholic solutions of different concentrations: 30%, 50% and 70%). Whole plants of *Primula veris*, *Achillea millefolium*, *Origanum vulgare* and *Artemisia absinthium* were subjected to extraction. The obtained vegetal extracts were tested for the deworming, repellent and / or germicidal effect on field pests, such as the Colorado potato beetle (*Leptinotarsa decemlineata* Say.) and the ladybug bean (*Acanthoscelides obsoletus*).

Key words: *Acanthoscelides obsoletus*, *biopesticide*, *extraction techniques*, *food quality*, *Leptinotarsa decemlineata* Say., *spontaneous flora*.

***THE INFLUENCE OF CONVENTIONAL EXTRACTION
ON THE YIELD AND GALACTURONIC ACID CONTENT
OF PECTIN FROM GRAPE POMACE***

*Mariana SPINEI, Mircea OROIAN
*Faculty of Food Engineering,
Stefan cel Mare University of Suceava, Romania
[*mariana.spinei@fia.usv.ro](mailto:mariana.spinei@fia.usv.ro)*

Abstract: Recently, there are several unconventional sources of pectin coming from food, vegetables and fruits which have a different pectin content and physico-chemical characteristics. The grape pomace is one of the most important by-products obtained in the wine industry and represents about 20-25% of the grape weight which contains skin, seeds and other solid parts by pressing process. This by-product represents a complex substrate composed of neutral polysaccharides, pectic substances, insoluble proanthocyanidins, lignin, structural proteins and other phenolic compounds. In this context, the use of a heat treatment for the extraction of pectin from Fetească Neagră grape pomace was investigated. The extraction yield and galacturonic acid content were optimized by varying the temperature (70, 80 and 90 °C), pH (1, 2 and 3) and time of extraction (1, 2 and 3 h). Box-Behnken design was used to investigate the effect of process variables on the conventional extraction. The results showed that for yield and galacturonic acid content the optimal condition was obtained at a temperature of 90 °C, pH 2 for 3 h of extraction.

Key words: *extraction, galacturonic acid, grape pomace, influence, pectin, yield.*

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QUALITY AND HEALTH RISK ASSESSEMENT OF HEAVY METALS IN BOTTLED BABY DRINKING WATER

*Elena UNGUREANU^{1,2}, Gabriel MUSTATEA¹, Alexandru SOARE¹,
Andreesa MOCANU¹, Mona Elena POPA²

¹ *National Research & Development Institute for Food Bioresources, 6 Dinu
Vintila Street, Bucharest, Romania*

² *University of Agronomic Sciences and Veterinary Medicine, 59 Marasti
Blvd., Bucharest, Romania*

***elena_ungureanu93@yahoo.com**

Abstract: Heavy metals are very dangerous to human health, especially for babies and children. Several studies revealed the presence of heavy metals in food products and drinking water consumed by these individuals. In this case, the exposure to heavy metals is achieved by ingestion. For this reason, the main objective of this study is to determine the levels of heavy metals, such as Ba, Co, Cu, Zn, Mn, Ni, Li, Fe, Pb, Cd, Cr, Sb, by ICP – MS, from 19 samples of bottled water intended for consumption by babies and children. Based on the levels of heavy metals obtained, an assessment was made of the risk caused by exposure to them, as well as an analysis of the quality of these samples, by determining the degree of contamination and the heavy metals evaluation index. Except for iron, all other metals were below the limits imposed by the national and European legislation in force. The ascending trend for Exposure Dose, based on heavy metals concentration, is the following Cd > Cr > Sb > Co > Mn > Pb > Cu > Ni > Li > Zn > Ba > Fe. Regarding the Hazard Index values, only one sample was below this control limit, ranking in Risk Class 1, with a very low Hazard Level. The order of Cancer Risk values is as follows, Cd < Cr < Ni < Pb. As concerning Contamination degree, the values were between – 1.38 and – 9.64, with a mean value of – 7.40. From the point of view of the tested parameters, we can say that the samples can be intended for consumption by children and babies, since the values obtained were located in the required parameters, except for Fe.

Key words: *baby drinking water, contamination degree, heavy metals, ICP – MS, risk assessment, water quality*

***TECHNOLOGY AND QUALITY CONTROL OF
PRODUCTS FOR CHILDREN BY CAPITALIZING ON 10
VARIETIES OF APPLES***

*Alexandra Madalina MATEESCU, VladMUREȘAN, SevastițaMUSTE

**Andruta Elena MUREȘAN

*Department of Food Engineering, Faculty of Food
Science and Technology, University of Agricultural Science and Veterinary Medi-
cine Cluj-Napoca, 3-5 Calea Manastur, 400372, Cluj-Napoca, Romania.*

***andruta.muresan@usamvcluj.ro, *alexandra.mateescu@usamvcluj.ro*

Abstract: The purpose of this study was to develop and analyze a product for children, obtained by capitalizing on 10 varieties of apples, to which was added a mixture of vegetables consisting of carrots, pumpkin and celery. Apples are eaten both fresh and in the form of cooked food. The nutritional and gustatory value is due to the fact that apples are the most complex and complete fruits, with a high content of fiber, vitamins (vitamin C, A, B3) and mineral salts. At the same time, they have a high content of antioxidants and phenolic compounds that contribute to the prevention of cardiovascular diseases, have anticancer effects and contribute to the proper functioning of the digestive system. Both apples and vegetables are an important source of nutrients for children's development in the first years of life. In order to develop the product, 10 experimental variants were made that correspond to the 10 varieties of apples. After several attempts, the manufacturing recipe was established. The product was analyzed from a physico-chemical point of view both fresh and after being subjected to heat treatment, in order to highlight the effects it has on the components of the product.

Key words: *apples, children, nutrition, phenolic compounds, vegetables, vitamins*

HONEY AUTHENTICATION AND ADULTERATION DETECTION BY FTIR

*Florina DRANCA, Sorina ROPCIUC, Paula CIURȘĂ,
Daniela PAULIUC, Mircea OROIAN

*Faculty of Food Engineering,
Ștefan cel Mare University, Romania*

*florina.dranca@usm.ro

Abstract: A major concern of honey producers and consumers is to ensure that honey is authentic in respect to international and national food regulations. When evaluating the authenticity of honey, two major aspects are considered, the origin of honey and the mode of production. With the increase in worldwide honey consumption, this natural product became a target of adulteration through the addition of foreign substances, and particularly the addition of less expensive carbohydrates. As a method to assess the authenticity of honey and to detect its adulteration, this study was focused on the use of Fourier transform infrared spectroscopy (FTIR) as a non-destructive method for honey analysis. Samples of monofloral authentic honeys (acacia, tilia and sunflower) were adulterated by addition of syrups (agave, corn, and inverted sugar) in percentages of 5, 10 and 20%. The spectral region covered by the FTIR analysis of honey was 4000 and 650 cm^{-1} , and contains information from molecular vibrations specific to the chemical composition of the product. It was observed that the authentic honeys and the syrups used for adulteration had identical peak features and strong spectral overlaps, with some differences in the intensity of specific peaks as the only difference. Therefore, to achieve a suitable model for the discrimination of authentic honeys from adulterated ones, FTIR data was submitted to support vector machines (SVM) and partial least squares discriminant analysis (PLS-DA).

Key words: *adulteration, authenticity, discrimination, FTIR spectroscopy, honey, quality*

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BIOTECHNOLOGIES, PRESENT AND PERSPECTIVES
***PLANT-BASED MILKS: ALTERNATIVES TO THE
MANUFACTURE AND CHARACTERIZATION OF ICE
CREAM***

*Ana LEAHU, Sorina ROPCIUC, Cristina GHINEA

¹ Faculty of Food Engineering, Stefancel Mare University, Universitatii
Street 13, 720229 Suceava, Romania

*analeahu@fia.usv.ro

Abstract: This study investigated the potential use of dietary fibers (Psyllium and pectin fibers added in different proportions 0-6%) to improve the rheological, textural and sensory characteristics of vegetable ice cream using vegetable milk (almond and hemp milk). Hemp milk was obtained from the peeled seeds of the industrial hemp plant, which includes varieties of *Cannabis sativa*, which have a low content of the psychotropic substance tetrahydrocannabinol (THC) and are grown for food. The rheological characteristics of the mix and ice cream were determined using the Haake Mars rheometer. Compared with the control sample, the viscosities of the mix in all samples analyzed were enhanced with the addition of dietary fibers, due to the occurrence of interactions and stabilizations. The viscoelastic modules G' G'' were determined on ice cream samples at a temperature of -10 °C. The elastic and viscous modulus showed high values with the increase of the addition of 6% dietary fibers. The textural characteristics were assessed by the shear strength of a layer of ice cream at a temperature of -4 °C. Hardness, firmness and adhesiveness were influenced by the size of their ice crystals, the fat content and the percentage of dietary fibers added.

Key words: *dietary fibers, rheological properties, sensorial properties vegetable ice cream.*

EFFECTS OF DRY HEAT TREATMENT AND MILLING ON SORGHUM CHEMICAL COMPOSITION, FUNCTIONAL AND MOLECULAR CHARACTERISTICS

*Ana BATARIUC¹, Mădălina UNGUREANU-IUGA^{1,2}

Silvia MIRONEASA¹

¹ *Faculty of Food Engineering*

² *Integrated Center for Research, Development and Innovation in Advanced Materials, Nanotechnologies, and Distributed Systems for Fabrication and Control (MANSiD)*

„Ștefan cel Mare” University of Suceava, Romania

*ana.batariuc@usm.ro

Abstract: Sorghum grains are one of the most cultivated crops in the world, being an alternative for people suffering of gluten intolerance. This study aimed to highlight the effects of grains dry heat treatment, flour particle size and variety on sorghum flours nutritional, functional and molecular characteristics. The results obtained showed that dry heat treatment led to fat and water absorption capacity increase, while the moisture, protein, ash, water retention capacity, solubility index, foaming capacity and FT-IR absorption bands characteristic to phytic acids decreased with temperature applied raise. Particle size reduction determined lower protein, carbohydrates content and emulsifying activity and higher fat content, oil absorption capacity, swelling power, solubility index and foaming capacity. White sorghum flour fractions presented higher protein and fat content and lower carbohydrates compared to those made of red sorghum. These results showed the importance of particle size and dry heat treatment on sorghum flours functionality, being helpful for further optimizations and choices for bakery products use.

Key words: *chemical composition, dry heat treatment, functional properties, molecular characteristics, particle size, sorghum flour*

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***WHEAT-AMARANTH COMPOSITE FLOUR FOR
BREAD PRODUCTION DEPENDING OF
AMARANTH FLOUR PARTICLE SIZE***

*Ionica COȚOVANU¹ and Silvia MIRONEASA¹

¹*Faculty of Food Engineering*

„Ștefan cel Mare” University of Suceava, Romania

*ionica.cotovanu@usm.ro

Abstract: Amaranth flour (AF) is recognized as high-quality raw material regarding nutrients and bioactive compounds, essential in supplying human health benefits, compared with white flour (WF). In this study, the effect of factors, different particles sizes (large, medium and small) and levels of AF (5, 10, 15 and 20%) added in WF on the responses, empirical and dynamic dough rheological properties, and some quality parameters of bread was successfully modelled using predictive models. Finally, the optimization of formulation to maximize the AF level whilst maintaining bread quality for each type of particle size (PS) was performed based on response surface methodology models generated. The rheological properties of composite flour formulated were evaluated using mixolab, alveograph, rheofermentometer and dynamic rheometer. In addition, bread quality parameters, loaf volume and instrumental texture feature, firmness were evaluated. The anticipation of the optimal value for each response in terms of dough rheological properties during mixing, protein weakening, starch gelatinization and retrogradation, biaxial extension, fermentation, viscoelastic moduli, creep and recovery compliance depending on PS and optimal addition level is allowed by multi-objective optimization approach. The optimal addition level was 9.41% for large, 9.39% for medium and 7.89% for small PS. The results would help the manufacturers to develop bread products with the desired particle size with optimal technological and nutritional features.

Key words: *amaranth, bread characteristics, dough rheology, particle size, wheat flour*

EVALUATION OF WHEAT FLOUR DOUGH FERMENTATION PROPERTIES WITH DIFFERENT TYPES OF OILSEED FLOURS ADDITION

***Ana-Maria ISTRATE, Ioan GONTARIU,
Georgiana Gabriela CODINĂ**

Faculty of Food Engineering, Ștefan cel Mare University, Romania

***anamariagontariu@yahoo.com**

Abstract: The aim of this study was to analyze the wheat flour dough rheological properties with different types of oilseed flours addition during fermentation by using a Rheofermentometer (Chopin Rheo, type F4, Villeneuve-La-Garenne, France) device. The oilseeds used were golden flaxseed (GSF), pumpkin seed (PSF), hemp seed (HSF), and sunflower seed (SSF) in a partially defatted flour form provided by MarbacherÖlmühle GmbH in order to be used in bakery products. As wheat flour a refined one of a very good quality for bread making and a low alpha amylase activity was used. According to the data obtained all oilseed flour in a level addition of 5, 10, 15 and 20% in wheat flour significant ($p < 0.05$) influenced dough rheological properties during fermentation. The GSF and PSF addition conducted to the lower values for the maximum height of gaseous production compared to the control sample. The total CO₂ volume production increased for the dough samples with oilseed flour addition up to 10% for GSF, PSF, HSF and 5% for SSF after which its value decreased. The volume of the gas retained in the dough at the end of the test presented the highest value for the dough samples with 5% PSF, SSF and 10% GSF, HSF. The retention coefficient presented the higher values for the dough samples with high levels of oilseed flour addition. All data obtained indicate that oilseed flour addition in a partially defatted form improved dough rheological properties during fermentation. The best results were obtained when GSF, HSF were added in 10% and SSF, PSF in 5% in wheat flour. However, compared to the control sample it may recommend that all oilseed in a partially defatted form flour to be added up to 10-15% in wheat flour.

Key words: *dough fermentation, flaxseed flour, hemp seed flour, pumpkin seed flour, sunflower seed flour, wheat flour*

ADVANCE ON THE CAPITALIZATION OF GRAPE PEELS BY-PRODUCT IN COMMON WHEAT PASTA

*Mădălina UNGUREANU-IUGA^{1,2} and Silvia MIRONEASA¹

¹*Faculty of Food Engineering*

²*Integrated Center for Research, Development and Innovation in Advanced
Materials, Nanotechnologies, and Distributed Systems for Fabrication and
Control (MANSiD)*

„Ștefan cel Mare” University of Suceava, Romania

*madalina.iuga@usm.ro

Abstract: Capitalization of winery by-products has received high interest among scientists, producers and consumers aware of healthy diet and environment protection. Grape peels are rich in fiber and polyphenols and can be used as ingredients in pasta matrix to increase its nutritional and functional value. The aim of this paper was to investigate the effects of grape peels added in various amounts (1 - 6%) on common wheat pasta dough viscoelasticity and texture and on pasta chemical composition, color, cooking behavior and texture, revealing at the same time the relations between characteristics. Grape peels induced the increase of the elastic (G') and viscous (G'') moduli, dough hardness, springiness, cohesiveness, pasta crude ash, crude fat, crude fiber, total polyphenols and resistant starch contents, pasta water absorption, cooking loss, breaking force as the addition level was higher and compared to the control. On the other hand, dough resilience, pasta luminosity, chewiness and firmness decreased as the amount of grape peels raised. Significant correlations ($p < 0.05$) were obtained between the chemical composition and color parameters, while crude fiber, protein and fat were correlated with dough and pasta texture, total polyphenols with resistant starch content, cooking loss with crude fiber and dough textural parameters. The obtained results underlined the opportunity to use a valuable by-product such as grape peels in novel pasta formulations, being helpful for processors to extend the product variety and to optimize the processes in order to better satisfy consumer's demand for functional foods.

Key words: *common wheat, dough rheology, physico-chemical properties, texture, vinification by-product.*

***PHYSICOCHEMICAL PARAMETERS, SUGARS
CONTENT AND RHEOLOGICAL BEHAVIOUR
OF AUTHENTIC HONEY***

*Daniela PAULIUC, Florina DRANCA, Sorina ROPCIUC,
Paula CIURȘĂ, Mircea OROIAN
Faculty of Food Engineering, Ștefan cel Mare University, Romania
[*daniela.pauliuc@fia.usv.ro](mailto:daniela.pauliuc@fia.usv.ro)

Abstract: The aim of this study was to evaluate the physicochemical properties of honey collected from different regions of Romania. For four authentic honey samples (rape, sunflower, acacia and tilia) the following parameters were determined: moisture, pH, free acidity, electrical conductivity, hydroxymethylfurfural content, color, sugars content, and rheology in the negative temperature domain. The results obtained for color, free acidity and electrical conductivity varied depending on the botanical origin. The limit set for HMF content was not exceeded by any sample of honey (3.44-19.16 mg HMF/kg), while the moisture content varied between 15.80-20% and did not exceed the moisture content set by Codex Alimentarius (20%). Fructose, glucose, sucrose, maltose, turanose, trehalose, melezitose, and raffinose were identified and quantified in all samples. The rheological behavior was studied from -15 °C to -40 °C, region where the elastic components show increase ($G' > G''$). The glass transition temperature of acacia honey was -19.8 °C, for rape honey was -22.82 °C, for sunflower honey -30.94 °C and fortilia honey was -23.2 °C.

Key words: *authentic, honey, physicochemical, quality, rheology*

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BIOTECHNOLOGIES, PRESENT AND PERSPECTIVES
***THE EFFECT OF ASPARAGINASE ON BREAD MAKING
AND ACRYLAMIDE CONTENT IN BREAD***

*Cristina SARION, Adriana DABIJA, Georgiana Gabriela CODINĂ
Faculty of Food Engineering, Ștefanel Mare University, Romania
[*cristina.sarion@fia.usv.ro](mailto:cristina.sarion@fia.usv.ro)

Abstract: The aim of this study was to analyze the effects of the asparaginase (commercial product Acrylaway) in different doses of 500 ASNU, 650 ASNU and 800 ASNU additions in wheat flour of a high extraction rate on dough rheology, bread quality and acrylamide (AA) content in bread. The dough rheological properties analyzed using Mixolab and Alevograph devices shown an increase of water absorption value, starch gelatinization torque, dough tenacity, baking strength and the configuration ratio of the Alveograph curve for the samples with asparaginase addition compared to the control one whereas the torques for protein weakening, stability of hot starch paste, final starch paste viscosity, dough extensibility and index of swelling decreased. On bread quality parameters asparaginase presented a positive effect by increasing the loaf volume, porosity, elasticity and by decreasing it textural parameters firmness and gumminess with the increase level of Acrylaway addition in wheat flour. The color parameters of bread presented significant differences ($p < 0.05$) for the samples with asparaginase addition in bread recipe compared with the control one. For both crust and crumb the lightness (L) and green-red opponent colors (a^*) increased whereas the blue-yellow opponent colors (b^*) decreased. From the sensory point of view, the best evaluated sample were those with the lowest level of asparaginase addition in wheat flour but also the rest of the bread samples were well appreciated by the consumers. The AA content of the bread samples were significant ($p < 0.05$) lower for the samples with asparaginase addition compared to the control one. More, for the bread samples with the highest level of asparaginase addition in wheat flour, the AA level were under the device detection limit for AA (LOD = 20 $\mu\text{g}/\text{Kg}$; LOQ = 25 $\mu\text{g}/\text{Kg}$).

Key words: *acrylamide, asparaginase, bread quality, dough rheology*

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DOUGH RHEOLOGICAL PROPERTIES AS AFFECTED BY ADDITION OF GERMINATED CHICKPEA FLOUR

*Denisa ATUDOREI, Georgiana Gabriela CODINĂ

Faculty of Food Engineering, Ștefan cel Mare University, Romania

*denisa.atudorei@fia.usv.ro

Abstract: The dough rheological properties with different levels of germinated chickpea flour (GCF) were analyzed during mixing, extension and fermentation by using the Consistograph, Alveograph and Rheofermentometer devices. The GCF was germinated, lyophilized and milled before it was used in wheat flour. Before using in wheat flour the GCF was analyzed from the microbiological point of view (yeast and molds, *Bacillus cereus*, mycotoxins) according to these analyzes this being appropriate as an ingredient for bread making. The germinated chickpea flour addition was made up to a level which decreased the falling number value up to an optimum one. The wheat flour used in this study was a refined one of a strong quality for bread making and a low alpha amylase activity. The wheat flour falling number value of 350 s decreased in a significant ($p < 0.05$) way by GCF addition up to 261 s when 20% of GCF were added in wheat flour. The Consistograph data shown a decreased of the water absorption value, dough consistency after 250 s and 450 s when low levels of GCF were incorporated in wheat flour. The Alveograph data showed a decrease of dough extensibility, index of swelling and baking strength with the increase level of GCF addition in wheat flour. The Rheofermentometer analysis indicates an increase of the maximum height of gaseous production and total CO₂ volume production up to a 10% GCF addition in wheat flour.

Key words: *alpha amylase activity, extension, fermentation, germinated chickpea flour, mixing*

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THE EFFECT OF GERMINATED LENTIL FLOUR ON BREAD MAKING

*Denisa ATUDOREI, Georgiana Gabriela CODINĂ

*Faculty of Food Engineering,
University Ștefan cel Mare University, Country Romania*

*denisa.atudorei@fia.usv.ro

Abstract: Lentil flour in a germinated form was added in white wheat flour in order to improve its quality from the technological and nutritional point of view. Red lentils (*Lens culinaris Merr.*) were germinated for 4 days, freeze-drying and milled in order to be used as ingredient in wheat flour. Wheat flour substitution was made up to a level of germinated flour addition (GLF) of 10% for which the falling number value decreased from 350 s (control sample) to 229 s. Therefore, the GLF addition levels were established as 2.5, 5, 7.5 and 10% in wheat flour. The GLF effects on bread making were analyzed by using the Consistograph, Alveograph and Rheofermentometer devices. According to the data obtained the GLF decrease the water absorption value, tolerance to mixing and increased the dough consistency after 250 s and 450 s indicating a weakening effect on the dough. From the Alveograph data it seems that GLF decreased the baking strength value, tenacity and extensibility when high levels were incorporated in wheat flour. At low levels of GLF addition in wheat flour dough tenacity and extensibility increased. During fermentation, GLF stimulates yeast activity by increasing the total CO₂ volume production, maximum height of gaseous production up to 7.5% GLF addition in wheat flour. However, the Rheofermentometer retention coefficient decreased with the increase level of GLF substitution in wheat flour.

Key words: *dough rheology, germinated lentil flour, extension, fermentation, mixing*

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**STUDY REGARDING THE QUANTITATIVE OF THE
ACTIVE COMPONENT OF SILYMARIN IN THE
POWDER OF SILYBUM MARIANUM FROM
DIFFERENT GEOGRAPHICAL AREAS**

MariaPOROCH - SERIȚAN¹, *MihaelaJARCĂU¹,
Narcisa MihaelaCORNEA²

¹Faculty of Food Engineering, Stefan cel Mare University, Suceava,
Romania

²SC Laropharm SRL, Sos. Alexandriei 145 A, Bragadiru, Ilfov, Romania
*mihaela.jarcau@fia.usv.ro

Abstract: Many studies have proved that bioactive components of *Silybum marianum* powder have an excellent hepatoprotective action. The silymarin is a mixture of mainly three flavonolignans, for example, silybin, silidianin and silychristine, with silybin being the most active. The active substances work upon the membrane of the liver cell preventing its destruction and favoring the reconstruction of the cell which is already in the process of destruction.

In this study, we measured the quantitative of total silymarin in the powder of *Silybum marianum* during different geographical areas. Results showed that, silymarin content varied according to the geographical location. The quantitative dosing of the silymarin extract existing in the *Silybum marianum* powder samples from the analyzed geographical areas was performed by the UV spectrophotometric method on soxhlet extract and they fall within the parameters described in the European Pharmacopoeia.

Key words: *bioactive components, hepatoprotection, quantitative, Silybum marianum, silymarin, UV spectrophotometric method.*

***SENSORY PROPERTIES OF WAFFLES
WITH ACORN FLOUR AND SPENT GRAIN***

*Ancuța CHETRARIU, Adriana DABIJA

*Faculty of Food Engineering, Ștefan cel Mare University, Suceava,
Romania*

*ancuta.chetrariu@fia.usv.ro

Abstract: Spent grain is the main by-product from the process of obtaining malt whisky with a complex heterogeneous structure, resulting from the process of filtering the wort, an initial and essential operation in distilleries. For each liter of alcohol produced results about 2.5 kg spent grain (assuming that the alcohol yield is 407 L of alcohol produced per tons of malt) and the humidity of the spent grain is 74-80%, which makes it have a limited use and a short shelf life. Acorn flour is obtained from *Quercus* sp. fruits from ancient times through drying, maturation, milling, detanization processes used in the manufacture of various bakery products, beverages, pasta, biscuits, as a coffee substitute etc. Acorn flour is an important source of antioxidant substances, has high fat content, protein and a considerable amount of calcium, magnesium, potassium, phosphorus, iron, copper and zinc, vitamins from the complex B. Crispy waffles are crispy or sweet bakery products that are like biscuits but had a crispy texture. In order to obtain a recipe of crispy waffle with the addition of acorn flour and spent grain, several recipes were tried. All ingredients were mixed using a kitchen mixer until complete homogenization, and then crispy waffles were baked for 4 minutes at 180 °C in an electric oven. Waffles were allowed to keep at room temperature for 30 min for cooling. The optimal version was chosen after the sensory analysis. The sensory analysis was performed based on color, taste, crispiness, aroma, harness and total acceptance. The developed product represents an opportunity to use spent grain and acorn flour to obtain new innovative products with high nutritional value.

Key words: *whisky technologies, by-product, valorization, nutritional value*

**RESEARCH ON THE INFLUENCE OF THE ADDITION
OF HEMP OIL ON THE RHEOLOGICAL PROPERTIES
OF DOUGH AND THE QUALITY OF BREAD**

*Sorina ROPCIUC, Anuța Elena PRISACARU,
Cristina DAMIAN, Ana LEAHU

*Faculty of Food Engineering
Stefan cel Mare University of Suceava, Romania*

*sorina.ropciuc@fia.usv.ro

Abstract: The use of hemp seed oil (OSH) in a percentage of 0-15% as an ingredient in the preparation of bread was aimed at improving the physico-chemical parameters and obtaining a product with beneficial effects on consumer's health. The aim of this research was to determine the rheological properties and quality of bread with the addition of hemp oil. The oil used in this study met the requirements for the maximum accepted level of THC and the baking flour used was type WF-550, WF-650 and BF-1350. The rheological characteristics of the dough were determined using Alveograph Chopin and Haake Mars dynamic rheometer. The results obtained show that the absorption of water decreases with increasing percentage of added oil. The stability and elasticity of the dough were not significantly influenced until the addition of 10% while the percentage of addition of 15% oil led to a significant increase in the elasticity of the dough. The viscous modulus (G'') decreases as the percentage of OH added increases and the elastic modulus (G') increases progressively with the percentage of OSH added. The sensory analysis using the scoring method showed that the most appreciated bread samples obtained from wheat flour with OSH were those with proportions of 5% and 10%. The textural properties of the bread were determined on the bread samples two hours after baking and cooling during three days of storage using the Pertentexturometer. The determined textural parameters were elasticity, chewability and gumminess.

Key words: *bread, dough, rheological properties, sensory characteristics, textural properties, visco-elastic modules*

***STUDY ON CONTAMINATION WITH SOME
MYCOTOXINS IN MAIZE AND MAIZE-DERIVED
FOODS***

*Alina MIHALCEA, Sonia AMARIEI

*Faculty of Food Engineering, University Stefan cel Mare, Suceava,
Romania*

*alina.filip@fia.usv.ro

Abstract: Mycotoxins are toxic secondary metabolites produced by various types of fungi that infect susceptible plants around the world. Crops can be infected with several species of mycotoxigenic fungi, and most fungal strains produce more than one type of mycotoxin. So far, over 400 different types of mycotoxins have been identified with different chemical structures and properties, produced by several different existing fungal species. Among these, there are well-characterized mycotoxin groups, such as aflatoxins, fumonisins, type A trichothecenes (e.g., T-2 and HT-2 toxin), type B trichothecenes (e.g., deoxynivalenol), nivalenol, zearalenone, ochratoxin A, patulin, ergot alkaloids, as well as emerging toxin, respectively citrinin. Dietary exposure to mycotoxins is a global problem, due to direct intake of contaminated food, or indirectly, intake of products from animals fed with contaminated feed. The phenomenon of mycotoxin contamination of food is widespread, from European countries to Korea, China, Brazil, Kenya, Africa, Pakistan. The aim of the study is to make an evaluation of the mycotoxins prevalent in corn grains and derived food products, produced in Romania or coming from the community market.

Keywords: *aflatoxins, corn, deoxynivalenol, food, micotoxins, zearalenone*

STABILIZERS IN TECHNOLOGY OF GLUTEN-FREE PRODUCTS

***Anna HRYSHCHENKO, Yuliia BONDARENKO**

Department of Bakery and Confectionery Goods Technologies,

National University of Food Technologies, Ukraine

**grischenko_anna@ukr.net*

Abstract: In the technology of gluten-free dietary products, food additives are used in order to increase the viscosity of semi-finished products, stabilize and modify the structural and mechanical properties of semi-finished products and finished products.

The most common additives are guar and xanthan gum, modified cellulose, and various types of modified starch. According to research data, the required amount of such additives can be from 0.1...0.2% to 1.5% by weight of bulk components. At the same time, scientists substantiate different optimal dosages, which may be due to both the ratio of the components in the product formulation and the properties of hydrocolloids-additives. According to our research, different food additives can exhibit different properties, depending also on the methods we added them, the parameters of preparation of semi-finished products. The results of the study also indicate the effectiveness of mixing different food additives hydrocolloids in one formulation, which helps to increase the viscosity, improve the structural and mechanical properties due to synergistic interaction.

At the same time, there are no studies or recommendations in the direction of reducing the content of the total amount of food additives in gluten-free diet products, or researching their effect on the health of people with celiac disease. Thus, the assessment of the total content of food additives in the diet of celiac patients should be taken into account at the stage of developing gluten-free products.

Key words: *celiac disease, gluten free diet foods, guar gum, xanthan gum, food additives.*

***STUDY ON KINETICS OF TRANS-RESVERATROL,
TOTAL PHENOLIC CONTENT AND ANTIOXIDANT
ACTIVITY INCREASE IN VINE WASTES DURING POST-
PRUNING STORAGE***

*Alina CRĂCIUN, Gheorghe GUTT

Faculty of Food Engineering, Ștefan cel Mare University, Romania

*alina.craciun@usm.ro

Abstract: Increasing evidence for the health benefits of E-resveratrol has triggered interest in stilbenoids in grapes, wine and by-products. On the one hand there is an enormous amount of underutilized vine waste rich in bioactive substances during wine production, while on the other hand there is a growing demand for promising phytochemicals for dietary and pharmaceutical purposes. Vine shoots are a promising source of stilbenoids and have economic potential because they are a source of high-value phytochemicals. Recent researches reported that due to biosynthesis pathway genes, especially STS (forming trans-resveratrol), who are abundance induced during storage period of vine shoots, trans-resveratrol accumulates up to 40 fold. The objective of this research was to determine the most economical part of vine waste to be exploitate and to study kinetics of resveratrol increase in 90 days to determine the optimal storage period to reach a maximum trans-resveratrol content. Total phenolic content (TPC) and antioxidant activity (AA) was studied to determine possible correlation. In Fetească Neagră vine shoots variety stored at laboratory temperature trans-resveratrol content increased at a maximum (2712.86 mg/kg D.W.) at day 70, and then slightly decreased until day 90. TPC remain constant and the AA recorded a slight increase. Vine shoots contained the largest amount of trans-resveratrol (1658.22 mg/kg D.W.), followed by tendrils (169.92 mg/kg D.W.) and leaves (43.54 mg/kg D.W.).

Key words: *antioxidant activity, post-pruning storage, trans-resveratrol, total phenolic content*

SUBSTANTIATION OF DIETARY SUPPLEMENT TECHNOLOGY BASED ON SUBLIMATED VEGETABLE RAW MATERIALS

*Olena PODOBIY, Ihor ZHYTNETSKII, Maryna MALYK
National University of Food Technologies, Kyiv, Ukraine
*o.podobiya@gmail.com

Abstract: A significant disadvantage of traditional methods of processing plant raw materials for storage and use is the destruction and oxidation of vitamins, aromatic and other biologically active substances.

One of the most advanced technologies for processing vegetable, including vegetable and fruit raw materials is freeze-drying.

To create a framework formulation of a dietary supplement were analyzed: food and dietary supplements - sources of biologically active substances, as well as drugs with targeted pharmacological action.

Manufactured dietary supplement according to this framework recipe can act as an additional source of BAR, in particular, vitamin C, phenolic compounds, flavonoids and anthocyanins, as well as dietary fiber; these substances are characterized by antioxidant and radioprotective action.

It was used sublimated vegetable raw materials, the method of dry granulation was chosen, which is currently considered a promising alternative to wet granulation.

Advantages: there is no need to use water, which eliminates the need for drying. When using this method, you can easily perform scaling, as the yield of granules depends only on the speed of rotation of the rolls.

It is recommended perspective direction – using multistage technology with of granulation.

Key words: *BAR, Dietary supplements, Functionality, Granulation, Sublimation, Vegetable.*

THE ADDITION OF COLLAGEN TO PROBIOTIC GOAT MILK - AN INNOVATIVE METHOD FOR YOUNG SKIN

*Karolina MROCZEK, Agata ZNAMIROWSKA

*Faculty of Department of Dairy Technology, Institute of Food
Technology and Nutrition University of Rzeszow, Country Poland*

*karolina22em@gmail.com

Abstract: Collagen, depending on the place of its occurrence, performs various functions in the body. Among other things, it has a number of beneficial properties for the healthy appearance of the proper skin condition. It is responsible for its elasticity, flexibility and appropriate tension. Its primary task is to connect cells with each other. It allows you to maintain the continuity and cell renewal processes taking place in the skin and ensures that the level of its hydration is maintained at the right level. The aim of the study was to develop a product containing collagen and probiotic as well as to evaluate its physicochemical and sensory properties. The control sample was goat's milk fermented with *Lactobacillus acidophilus* LA-5 without the addition of collagen. The addition of collagen at a dose of 3% significantly shaped the quality features of the fermented milk gel obtained. The addition of collagen increased the survival rate of *Lactobacillus acidophilus* LA 5 in goat's milk, which significantly reduced the pH value of the milk. Probiotic goat milk fermented with collagen was characterized by lower whey leakage, which significantly improved the consistency of fermented milk. The fermented milk with the addition of collagen was characterized by a denser and more coherent curd, as well as a sweeter milk-cream taste and a milder sweeter smell than the control milk. The functional food market, which includes goat milk fermented with collagen, increases its range every year. Products with collagen are becoming more and more popular and in demand among consumers who care about the healthy appearance of their skin. The conducted research is in line with the current subject of functional food and market expectations.

Key words: *goat's milk, collagen, fermented milk, probiotic drinks*

INFLUENCE OF THE RAW MATERIALS ON THE QUALITY OF FROZEN PASTRY PRODUCTS

Florina ANDRUȘCĂ, *Amelia BUCULEI, Sonia AMARIEI
Faculty of Food Engineering, Ștefan cel Mare University, Romania
*ameliab@fia.usv.ro

Abstract: The trend of the last years on the domestic market of frozen pastry has been the conversion from traditional pastry products to ready-to-bake frozen products, keeping the overall trend of comfort consumption and on-the-go products.

The purpose of this study is to highlight the importance of using quality raw materials for the production of frozen products. The present study investigated the effect of materials used: wheat flour type 480 or flour type 550, and 19% margarine and 23% butter with used on the technological process of making croissants. The determinations carried out demonstrate that the type of fat used influences the tenderness, consistency and flavor of the finished product.

Key words: *dough, frozen pastry, optimize, quality, raw materials,*

***AMARANTH SEEDS (AMARANTHUS CAUDATUS L.) A
SOURS OF BIOACTIVE COMPOUNDS***

*Ovidiu-Nicu PROCOPET, Mircea OROIAN

Faculty of Food Engineering, Ștefan cel Mare University, Romania

*ovidiu.procopet@fia.usv.ro

Abstract: Amaranth is one of the oldest cultivated plants, which had a great importance for the Aztec, Mayan, and Incas. Amaranth was grown as staple crop together with corn, but was banned during the Spanish Conquest. Since the 70's amaranth resurged as an alternative crop not only due to its high nutritional value (high lysine and methionine content). In this study was analyzed the content of bioactive compounds (total polyphenols and total flavones) from amaranth seed flour using spectrophotometric methods (at 750 nm for total polyphenols and 510 nm for total flavones). According to the spectral analyzes performed, a total flavone content of 359.94 mg equivalent of quercetin / 100 g amaranth was obtained and a content of 109,12 mg gallic acid equivalent / 100 g amaranth for the total polyphenol content. The maximum extraction yield was set at 0.563% dry matter and the result was influenced by the drying exposure time.

Key words: *amaranth, polyphenol, flavone, extraction yield, antioxidant capacity*

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STABILITY ASSESSMENT OF SUNFLOWER OIL ENRICHED WITH BIOACTIVE COMPOUNDS FROM SEA BUCKTHORN MARC

*Anca-Mihaela GÂTLAN, Mircea Adrian OROIAN,
Florin URSACHI, Ancuța CHETRARIU

*Faculty of Food Engineering, Ștefan cel Mare University of Suceava,
Romania*

* anca.gatlan@fia.usv.ro

Abstract: Recent trends in scientific food and nutrition research showed a great interest for using natural food antioxidants instead of synthetic ones, especially those obtained by extraction from food industry by-products. Sea buckthorn (*Hippophae rhamnoides* L.) by-products are valuable resources, as the healing power of sea buckthorn is well known and exploited from ancient times, for its complexity in terms of content in biologically active substances like carotenoids, tocopherols, phytosterols, organic acids, phenolic compounds, unsaturated fatty acids etc. In this study, bioactive compounds from sea buckthorn by-products were extracted in sunflower oil through an ultrasound-assisted technique. Enriched oil was compared with commercial oil after analyzing their total carotenoid content and DPPH scavenging activity by spectrophotometric methods and their chromatic characteristics according to CIELab method. Also, the evaluation of the stability of lipophilic bioactive compounds (carotenoids) extracted from sea buckthorn marc after freezing and thermal treatment was conducted by analyzing the spectroscopic imprint of the extracts, highlighted by UV-VIS analysis and the profile of carotenoid pigments by high performance liquid chromatography. The light stability of the oil containing the extracted carotenoids was assessed by comparing its peroxide value with the commercial one, after exposure to controlled light. The ultrasound-assisted extraction of bioactive compounds from sea buckthorn marc in sunflower oil improved its chromaticity and its antiradical activity, but had a slightly negative impact on its oxidative stability.

Key words: *bioactive compounds, carotenoids, color, scavenging activity, sea buckthorn marc, stability, sunflower oil, ultrasound-assisted extraction*

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BIOTECHNOLOGIES, PRESENT AND PERSPECTIVES
***VOLTAMMETRIC DETERMINATION OF TRACES OF
NICKEL(II) FROM FOODS***

Liliana ANCHIDIN-NOROCEL
*Faculty of Medicine and Biological Sciences,
Stefan cel Mare University of Suceava, Country Romania*

Abstract: Nickel (Ni) is a natural element present in many foods. Because it can have harmful health effects, particularly in individuals with Ni allergies, measuring Ni concentration is important for food safety. Several analytical techniques deployed to measure [Ni] in foods, reference methods such as flame atomic absorption spectrometry and inductively coupled plasma mass/emission spectrometry, are functional but have slow process times, high costs, and require specialized personnel to operate. At present, a simpler, faster and less expensive method is needed to expedite food safety analysis. The aim of this work was to develop and characterize sensors to accurately and rapidly detect Ni ions and measure concentrations. I examined the electrochemical behavior of the nickel ethylenediamine complex by linear sweep voltammetry (LSV) and cyclic voltammetry (CV) with a bipotentiostat and screen-printed electrodes (carbon and bismuth). I used standard reference measures of Ni to test the analytical performances (sensitivity, limits of detection and selectivity) of these sensors in a sample of different foods (i.e., chocolate, dill, sea buckthorn and onion). These results were back-tested with concentration results obtained by a reference method (Atomic Absorption Spectrometry). My results were similar between the methods indicating that linear sweep voltammetry and bismuth screen-printed electrodes can be reliable and effective techniques for nickel analysis in food safety.

Key words: *allergies, electrochemical methods, nickel detection, screen-printed electrodes*

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VISCOSITY OF AQUEOUS SOLUTIONS OF THE FOOD MONO- AND POLYSACCHARIDES

Sergiy BORUK¹, *Igor WINKLER²

¹Institute of Biology, Chemistry and Bioresources

Yu. Fedkovych National University of Chernivtsi, Ukraine

*²Department of Medical and Pharmaceutical Chemistry, Bucovinian State
Medical University, Chernivtsi, Ukraine*

**winkler@bsmu.edu.ua*

Abstract:It is one of the common today's trends in food processing industry to use various food additives and sugar substitutes instead of sucrose. In the context of substituting sugar, it is important to control not just taste qualities but the rheological parameters of the products and raw materials. Indeed, sugar provides not just sweetness but the required viscosity and/or uniform distribution of the components within the bulk of the end product. The latter characteristic is caused by the ability of sucrose to form and maintain more or less stable structuring in the disperse systems. Monosaccharides are less viscous and do not provide the required stability to secure this structuring. This problem can be lifted by adding some amounts of polysaccharides to restore the needful viscosity.

It has been found that the effect of adding the carbohydrates on the system's viscosity depends on their molecular mass. For the concentrations 1-30 %, the viscosity increases with the hydrocarbons' concentration, and this effect enhances with an increase in the solute's molecular mass. The efficiency of adding the carbohydrates decreases in the sequence sucrose>glucose>fructose for the entire range of concentrations. The system's density also increases with its concentration.

It was found that the 0.1-0.4 % aqueous solutions of pectin exhibit the properties of regular Newtonian's fluids. However, when pectin and some mono- or polysaccharide are simultaneously present, their cumulative effect on the solution's viscosity is greater than just a sum of the separate effects of each component. It was found that only 0.05

% of pectin was sufficient to keep the system's viscosity at the values that are characteristic of the working solutions with sucrose.

Therefore, it can be concluded that a mixed additive of pectin and some monosaccharides can maintain the rheological characteristics of the system even if does not consist of sucrose. An additive of 0.05-1% of pectin and 10-40 % of glucose (fructose) provides the needful sweetness and maintain the system's viscosity at the level that is required to keep the stability of the semi-finished confectionery and food.

Key words: *food additives, monosaccharides, pectin, polysaccharides, semi-finished food stability, viscosity*

INFLUENCE OF THE ADDITION OF CHAMOMILE ON THE CONTENT OF TANNIN IN TEA

*Anna MAKARENKO, **Mariya VOROBETS,
Iryna KONDRACHUK, Anastasia SACHKO
*Institute of Biology, Chemistry and Bioresources
Yu Fedkovych National University of Chernivtsi, Ukraine*
*an.sachko@chnu.edu.ua, **m.vorobets@chnu.edu.ua

Abstract: Tea is the most common beverage in the world. It consists of more than 300 components and provides a strong positive effect on human health conditions. Such additions as berries, leaves, ginger root, jasmine, lemon, etc. can further increase its value and the content of vitamins. Chamomile (*Matricāriachamomīlla*) is one of the most valuable medicinal plants. It is used widely because of its strong antiseptic, anti-inflammation, antimicrobial, sedative, regenerative and astringent activity. Some anticancer herb compositions, including chamomile, are also being investigated.

In this work, the influence of chamomile on the content of tannin in the blended green and black teas is investigated by the titrimetric oxidation of tannin by potassium permanganate with the indicator indigo carmine.

The standard procedure of titration was altered in such a way that the dilution of filtrate used during the investigation was decreased by 10 times. This modification made it possible to use the regular 250 mL flasks instead of big and inconvenient porcelain bowls. This way, identification of the point of equivalence became easier and more accurate.

Application of this modified method to the determination of tannin in a series of blended teas showed results that are in good agreement with those obtained by the standard methods. They proved that the content of tannin in tea does not depend on the added chamomile and, therefore, this herb does not depress the medical value of the investigated blended teas.

Key words: *blended tea, chamomile, medical values, modified titration, tannin, permanganatometry*

***DEVELOPMENT OF A NEW HIGHLY NUTRITIONAL
FERMENTED MILK PRODUCT FROM THE EXTRUDED
SUNFLOWER SEEDS***

Joanna ILYUK, Oksana SEMA, *Anastasiia SACHKO,
Victoria EVLASH, Ihor KOBASA

*Institute of Biology, Chemistry and Bioresources
Yu Fedkovych national University of Chernivtsi, Ukraine*

*an.sachko@chnu.edu.ua

Abstract: The extruded sunflower seeds are rich in proteins, fats, palmitic, stearic, linoleic and oleic acids, some macro- and microelements, including Selene, which are in high demand in the food industry. That is why this material is used widely in many food processing technologies.

In this work a recipe of the fermented milk yoghurt consisting of whole milk, dry bacterial leaven and some extruded sunflower seeds is discussed. The recipe and technology of the yoghurt production were modified to improve its taste and keep the required organoleptic qualities.

As seen from the analysis of organoleptic and some physicochemical characteristics (titrated acidity, viscosity) of the beverage, the best nutritional and organoleptic values are reached for the 0.5-1.0 wt % of the seeds.

The results of the blind customer values investigation prove that the modified beverage is assessed positively and, therefore, it can be recommended for the local retail trade network.

Key words: *customer values assessment, extruded sunflower seeds, fermented milk beverages, healthy food, nutritional values, yogurt*

THE USE OF ESSENTIAL OILS (LEMON AND ROSEMARY) TO EXTEND THE MICROBIOLOGICAL QUALITY OF DUCK'S BREAST

*Karol PIETRZYK, Maciej KLUZ

College of Natural Sciences, University of Rzeszow, Poland

*karol_pietrzyk@wp.pl

Abstract: The aim of this work was to microbiological analysis of duck breast meat and to determine the effect of essential oils (EO): lemon and rosemary on the natural microflora of the tested meat depending on the method of packaging and storage time. The samples were compared to air-stored carcasses, vacuum-packed and also packed with the tested essential oils. The tested duck meat revealed the presence of lactic acid bacteria, *P. aeruginosa*, coliform bacteria, as well as mesophilic anaerobic bacteria. The analyzes were carried out at regular intervals on days: 0, 4, 8, 12 and 16, and the water activity was also tested in the trials, which has a significant effect on the growth of the microflora of poultry meat. VBRL and MRS agar as well as agar for anaerobic bacteria and for the *Pseudomonas* group were used for the inoculation. The tests showed that the growth of lactic acid bacteria and *P. aeruginosa* was inhibited after the use of 0.2% of EO. However, the effect of EO on coliform bacteria cannot be clearly stated. In the samples where the growth of anaerobic bacteria was tested, the antimicrobial effect of lemon oil and rosemary oil was not observed. By monitoring the microbiological quality of duck breast meat, it can be concluded that lemon essential oil and rosemary oil have a certain effect on the growth of microorganisms in raw meat. Thus, plant extracts can be used as food preservatives due to their antibacterial properties.

Key words: *duck breast meat, essential oil, microbiological analysis, microbiological quality*

Section 4.
Equipment for Food Industry

TRENDS AND EXPECTED BENEFITS OF INNOVATION IN PROCESSES AND EQUIPMENT OF BAKERY PRODUCTION

Volodymyr TELYCHKUN, Oleksandr GAVVA

*Oleksii GUBENIA, Yuliia TELYCHKUN

Vitalii RACHOK

*Department of machines and apparatus of food and pharmaceutical
productions, National University of Food Technologies, Kyiv, Ukraine*

**gubena@meta.ua*

Abstract: It is presented some innovations in processes and equipment of the bread production technological line, which were developed by scientists of the National University of Food Technology (Kyiv, Ukraine). The proposals concern the following processes and equipment:

- Kneading machines with cam working bodies.
- Combination of dough fermentation operations and forming pieces under pressure in one unit;
- Combination of baking and drying processes for some varieties of bread products, in particular, rusks and chopsticks;
- Rational use of heat of steam of hygrothermal processing and heat of secondary steam which is formed during baking of bread;
- Vacuum cooling of bread products;
- Stream cutting of different types of bread;
- The use of packaging equipment based on integrated technical complexes created on the basis of mechatronic functional modules.

Proposed innovation is examined by competent experts and substantiated. The total result is an increase in product quality, productivity and safety, ensuring hygienic requirements, reducing the number of equipment and ensuring its versatility.

Key words: *baking, cooling, cutting, fermentation, forming, kneading, packaging, recuperation.*

***DIFFICULTIES OF THE SIMULATION MODELING OF
THE ULTRAFINE GRINDING PROCESS BY WET
METHOD IN A BEAD MILL***

*Kateryna HRININH, Olena CHEPELYUK, Igor LITOVCHENKO
National University of Food Technology, Ukraine
[*neackriss@gmail.com](mailto:neackriss@gmail.com)

Abstract: It was conducting the modelling of the grinding process in a laboratory bead mill with a standard working elements configuration using simulation software. The purpose of the study is to determine the speed of movement of the system "beads-product", the stress-strain state of the structure, pressure and temperature in the working chamber. As a model body was used a suspension of castor oil and cosmetic pigment in a ratio of 60% oil and 40% pigment. The properties of the suspension were previously investigated to determine the rheological properties. It is clearly seen the areas where mixing, friction and grinding are most effective when running a simulation in the laboratory bead mill using simulation software. In these zones, the contact of the working elements (beads) with the ground product in the suspension is maximum, which is expressed in the release of a large amount of heat.

Key words: *beads, grinding, energy, mill, modelling, suspension.*

***FEATURES OF THE PROCESS OF ULTRAFINE
GRINDING OF MEDICAL AND COSMETIC
COMPONENTS IN A BEAD MILL***

Oleksandr KHARCHENKO, Kateryna HRININH,

*Oleksii GUBENIA

National University of Food Technology, Ukraine

*gubena@meta.ua

Abstract: The process of ultrafine grinding of medical and cosmetic components in a laboratory bead mill is considered. The purpose of the study is (1) to determine the energy parameters of the process of ultrafine grinding of medicinal and cosmetic components in a bead mill, as well as (2) to determine the dependences of changes in technological parameters. As a model body was used a suspension of castor oil and cosmetic pigment in a ratio of 60% oil and 40% pigment. A series of experiments was carried out, where the temperature was measured with temperature sensors, the degree of grinding was determined using a microscope with a built-in camera and software, the power was measured with a three-phase wattmeter. The power decreases, the temperature of the "beads-product" system increases, and the particle size decreases when grinding the pigment "red 120" for a period of time from 0 to 45 minutes. This process occurs most intensively in the first 7 minutes. Most of the energy is spent on the work, which is spent on mixing the system "beads-product", and the work, that is spent on heating the structural components of the product and the parts of the mill interacting with them, which, in turn, depend on rheological properties of the suspension.

Key words: *beads, grinding, energy, mill, power, suspension, system.*

Section 5.
Ecology and Environment
Protection

RECOVERY OF RESIDUAL BIOMASS OF *Saccharomyces pastorianus* IMMOBILIZED IN ALGINATE FOR THE RECOVERY OF REACTIVE DYE FROM AQUEOUS MEDIA

*Daniela SUTEU, Alexandra Cristina BLAGA,
Carmen ZAHARIA, Ramona Elena TATARU FARMUS
„Cristofor Simionescu” Faculty of Chemical Engineering and
Environmental Protection, „Gheorghe Asachi” Technical University of Iasi,
Romania, *danasuteu67@yahoo.com

Abstract: Biomass from various industries (eg food or biosynthesis industry) can be considered an important source of valuable compounds, which can be used as raw materials for the production of a wide range of new products (animal feed, biosorptive materials, and extraction of bioactive compounds). This responds to the new "zero waste" directives, in line with the principles of sustainable development and the circular economy. The aim of this study is to investigate the biosorptive properties of a new residual biomass of *Saccharomyces pastorianus* (*S. pastorianus*), an interspecies hybrid between *Saccharomyces cerevisiae* and *Saccharomyces eubayanus*, resulting in the technological process of obtaining beer. The waste biomass of *S. pastorianus*, resulting from a process of obtaining beer, was immobilized in sodium alginate and used for biosorption of the reactive Orange 16 textile dye from aqueous solution in a batch system. The effects of various experimental parameters, such as temperature, pH solution, amount of biosorbent, dye concentration and phases contact time were investigated. The experimental biosorption data were modelled by using different (bio)adsorption equilibrium isotherm in order to estimate the quantitative characteristic parameters, thermal effect and possible action mechanism in this biosorptive treatment of dye-containing watery effluents. The obtained results confirm that the studied residual biomass can be considered as a good biosorbent and it can be used in the treatment of wastewater containing small quantities of organic dyes.

Key words: *aqueous medium, biosorption, Saccharomyces pastorianus immobilized, reactive dye*

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HEAVY METALS REMOVAL FROM WASTEWATERS BY MICROBIAL BIOMASS – AN ANALYSIS OF SORPTION- DESORPTION CYCLES

AuCătălina FILOTE^{1,2*}, Raluca-Maria HLIHOR^{1*}, Mihaela ROȘCA¹,
Isabela Maria SIMION¹

¹ Faculty of Horticulture, “Ion Ionescu de la Brad” Iasi University of Life
Sciences, Romania, e-mail address:

catalina.filote@uaiasi.ro, raluca.hlihor@uaiasi.ro

² “Cristofor Simionescu” Faculty of Chemical Engineering and
Environmental Protection, “Gheorghe Asachi” Technical University of
Iasi, Romania

Abstract: Biomass-based sorbents emerged as a potentially feasible alternative to the conventional sorbents which are known to be expensive to produce and apply and less inefficient when the uptake of small heavy metal concentrations from wastewaters is concerned. Microorganisms encompass microalgae, bacteria and fungi and their high metal removal capacity has been successfully observed in various studies, mostly at lab-scale. The functional groups present on the microbial cell wall surface and the application of optimum parameters play a key role in obtaining high performances with this class of sorbents. Furthermore, the life cycle of the microbial sorbents can be extended by applying different eluents for the unbinding of the metal ions from the cell wall surface. This aspect is important for ensuring the sustainability of the microbial remediation process, as well as the recovery of the removed metal for its reuse in industry. Thus, the aim of the current work, is to perform an overview of the results obtained in various studies regarding the sorption-desorption of heavy metals by microbial biomass, considering the type of eluent used, operational parameters and the type of microorganism.

Key words: *biosorption, desorption, heavy metals, microorganisms, sorbent recyclability, wastewater remediation*

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RECENT ADVANCES IN MICROBIAL REMOVAL OF EMERGING POLLUTANTS: PROCESS EVALUATION FOR SCALING-UP

*Mihaela ROȘCA¹, **Raluca Maria HLIHOR¹, Petronela COZMA^{1,2}, Isabela Maria SIMION¹, Cătălina FILOTE^{1,2}, Maria GAVRILESCU^{2,3}

¹Faculty of Horticulture, "Ion Ionescu de la Brad" Iasi University of Life Sciences, Romania,

²"Cristofor Simionescu" Faculty of Chemical Engineering and Environmental Protection, "Gheorghe Asachi" Technical University of Iasi, Iasi, Romania

³Academy of Romanian Scientists, Bucharest, Romania
*mihaelarosca@uaiasi.ro, **raluca.hlihor@uaiasi.ro

Abstract: The diversity of anthropogenic activities led to the release into the aquatic environment of a wide range of chemicals such as: pharmaceuticals, personal care products, UV filters, non-persistent pesticides, industrial chemicals etc. classified as emerging pollutants. As these pollutants are not easily removed in a conventional wastewater treatment plant, the researchers evaluated the effectiveness of various chemical, photochemical, electrochemical and biological processes. Thus, the present paper aims to highlight the ability of microorganisms to remove the emerging pollutants and to evaluate the process in order to identify strengths and weaknesses, for their future large-scale exploitation. To achieve the proposed objective, the studies regarding the biodegradation of emerging pollutants published in the last 10 years were carefully analyzed and the optimal conditions and influencing factors were identified.

Key words: *biodegradation, influencing factors, microorganisms, optimal condition, process advantages/disadvantages*

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BIOTECHNOLOGIES, PRESENT AND PERSPECTIVES
***STUDIES ON THE EFFECT OF LEAD CONTAMINATED
ENVIRONMENT FOR *Lavandula angustifolia*
“HIDCOTE BLUE”***

Isabela Maria SIMION, Laura HAGIU ZALESCHI,
Dana ASIMINICESEI, Maria APOSTOL, **Raluca Maria HLIHOR
"Ion Ionescu de la Brad" University of Agricultural Sciences and
Veterinary Medicine of Iasi, Faculty of Horticulture, Department of
Horticultural Technologies,
*simion.i@uaiasi.ro, **raluca.hlihor@uaiasi.ro

Abstract: Lead is one of the heavy metals that gained the attention of researchers as being a persistent toxic pollutant, especially due to the influence of increasing anthropogenic pressure on the environment. This paper focuses on our preliminary findings related to *Lavandula angustifolia* "Hidcote Blue" (lavender) germination in stress conditions caused by Pb(II). We established as main objective for our research to investigate the influence of Pb(II) contaminated environment on the early growth and development of seedlings by assessing the germination rate, germination percentage, tolerance and toxicity indexes. All experimental tests were made under laboratory conditions, in Petri plates for 21 days in a SANYO germinator, at optimum growth conditions and were conducted in triplicate. Results showed that the increase of Pb(II) concentration from 5 to 500 mg/L affected the seedlings growth and their tolerance to Pb(II) stress decreases from 80% to 10%, respectively. Further studies will investigate the toxicity and tolerance of lavender to Pb(II) contaminated soil, and will focus especially on the heavy metal concentrations in leaves, which are usually used in different preparations and could affect the human health.

Key words: *heavy metal stress, human health, Lavandula angustifolia* Hidcote Blue, *pollution, toxicity, tolerance*

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A COMPARATIVE STUDY OF THE GROWTH AND DEVELOPMENT OF *Origanum sp.* SEEDLINGS IN CADMIUM CONTAMINATED ENVIRONMENT

*Laura Hagiu – ZALESCHI, **Raluca Maria HLIHOR,
Isabela Maria SIMION, Maria APOSTOL
Faculty of Horticulture, “Ion Ionescu de la Brad” Iasi University of Life
Sciences, Iasi, Romania
*laura.zaleschi@yahoo.com, **raluca.hlihor@uaiasi.ro

Abstract: The presence of heavy metals in the biosphere, mainly due to the anthropogenic activities, poses a major threat to all life forms, including plants and humans. They are very reactive and toxic due to their oxidation levels. For plants, heavy metals are responsible for the oxidative cellular damage and high production of reactive oxygen species (ROS). Nowadays, the interest in consuming clean food, color and preservatives free is in continuous growth, therefore, people started to focus on using aromatic herbs to give a healthy taste and color to the food. Aromatic plants such as *Origanum sp.* (oregano) are incorporated in culinary recipes, as additive in cosmetic and pharmaceutical and are also used in medicinal plant therapy. The aim of the present study was the investigation of the effects posed by Cd(II) contamination to the early growth of two different types of *Origanum sp.*, the culinary one and the ornamental one. We focused on the influence of Cd(II) on seed germination, sprouting rate, and growth and development of *Origanum sp.* to assess several indexes: tolerance, toxicity and plant vigor. The results showed that Cd(II) has an increased toxic effect for the culinary oregano compared to the ornamental oregano. The germination rate and the growth length were visibly affected at higher concentrations than 30-50 mg/L Cd(II). The toxicity increases with increasing metal concentration. These results are the basis for further investigations to assess risk to human health posed by heavy metals found in contaminated soils.

Keywords: *environmental pollution, heavy metals, medicinal plants, Origanum sp., toxicity, stress.*

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OILCAKES- A POTENTIAL SOURCE OF DIETARY FIBER

*Ancuța PETRARU, Sonia AMARIEI
*Faculty of Food Engineering,
University Stefan cel Mare, Suceava, Romania*
*ancuta.petraru@fia.usv.ro

Abstract: Every year, large amounts of waste and by-products are generated from the oil industry. These are primarily used as landfills, animal feeds or energy sources but are rich in valuable compounds (proteins, dietary fibers, antioxidants, vitamins, minerals), with numerous beneficial proprieties for health, which can be recovered and reused in the production of value-added products. Dietary fibers (DF) are defined as a group of carbohydrates that make up the plant cell wall and are resistant to digestion and absorption in the human gastrointestinal tract. Depending on their solubility in water, they can be soluble (lignin, cellulose and hemicellulose) or insoluble (pectin, β -glucans, galactomannan gums and inulin). The first, decreases the cholesterol and triglyceride levels in blood and the glucose absorption by the small intestine. On the other hand, insoluble dietary fibers help in the intestinal regulation. Dietary fibers can be extracted with different methods, namely traditional (dry, wet and gravimetric processing techniques) and green/innovative (low environmental impact and high recovery rate). The press-cakes represent a potential low-cost DF sources, that can be further used in foods and pharmaceuticals as functional ingredients, supplements or additives.

Key words: *dietary fibers, oilcakes, extraction methods, bioactive compounds*

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LIFE CYCLE ASSESSMENT OF WINE PRODUCTION

*Cristina GHINEA, Ana LEAHU
*Faculty of Food Engineering,
Stefan cel Mare University of Suceava, Romania
cristina.ghinea@fia.usv.ro

Abstract: In Romania, there is a long tradition in grapes harvesting and wine production, for example in 2018 a record production of 5.1 million hectoliters of wine was achieved. Therefore, life cycle assessment, a powerful instrument, was used for determination of environmental impacts associated with wine production. In this study, the system boundaries included the following steps: viticulture, vinification, packaging and distribution phases, solid waste landfilling and wastewater treatment. The functional unit chosen was a 0.75 L bottle of red wine. In the inventory analysis stage, the input and output data such as materials, energy, emissions in air, water and soil were collected especially from a Romanian wine producer. The environmental impact assessment stage was performed by using GaBi software. Electricity production and consumption for the wine production is one of the main contributor for the most of impact categories considered. Fuel, fertilizer and pesticides consumption are considered the main hotspots associated with the viticulture phase. The diesel consumption in the viticulture process and bottled wine distribution contributes particular to the global warming potential. According to our results, wastewater treatment stage has the highest contribution to the eutrophication potential. Also, the results showed that the distribution process of bottled wine contributes to the acidification and photochemical ozone formation potentials.

Key words: *environmental evaluation, food industry, GaBi software, impact categories, waste, wine sector*

***MICROBIOLOGICAL DIVERSITY OF SOIL ORGANISMS
UNDER THE INFLUENCE OF FERTILIZATION WITH
VARIOUS DOSES OF UNCONVENTIONAL FERTILIZER***

Miłosz PASTUSZCZAK

*Institute of Agricultural Sciences, Environmental Protection and
Management, University of Rzeszow, Poland*

*miloszpastuszcak@wp.pl

Abstract: Wood ash is the residue left from the combustion of wood. It often has a high pH (above 7) and a relatively high content of base cations and phosphorus, even though properties are very variable. Due to the chemical composition, it can be used to raise pH in soils. The wood ash contains many important plant nutrients so can be used as a fertilizer or soil improvement. Soil microbiology is essential for the proper functioning of the soil ecosystem, it affects the growth and yield of plants. The influence of ash on soil quality is still poorly understood. The study investigated the effect of ash addition in the amount of 100 to 500 kg/ha on the composition of microorganisms in 2 different types of soil. Preliminary studies showed an increase in the diversity of microorganisms with the ash dose and a positive effect of ash fertilization on soil microbiology compared to the control test and NPK fertilizer. Bacteria of particular types were identified by the MALDI TOF MS Biotyper method, including *Bacillus*, *Paenarthrobacter*, *Pseudomonas* and *Rhodococcus*.

Key words: *agriculture, ash, bacteria, fertilization, MALDI TOF microbiology, soil*

NEW APPLICATIONS OF STARCH IN THE FOOD INDUSTRY: THE DEVELOPMENT OF EDIBLE PACKAGING MATERIALS

*Roxana GHEORGHITA¹, Gheorghe GUTT²

¹*Faculty of Medicine and Biological Sciences, ²Faculty of Food Engineering
Stefan cel Mare University of Suceava, Romania*

**roxana.puscaselu@usm.ro*

Abstract: When selecting the optimal packaging for a product, it must fulfill some roles: to protect the product, to prevent its damage due to environmental factors, and to represent a marketing strategy. It must also be easy to process in industry and inexpensive for the manufacturer. Because starch is a cheap product, a renewable resource, accessible, non-toxic and easy to handle, the present study aimed to develop films based on starch and glycerol. They can be used as packaging materials for the food industry, and the technology can be transposed to other fields, especially pharmaceuticals and cosmetics. Thus, three types of starch, from different sources (corn, wheat and potatoes) were tested. Materials were developed from different masses of starch (0-5 g) and glycerol (0-2.75 g). Physical, microbiological properties and solubility characteristics were tested. According to the results, the films obtained from potato starch, plasticized with 10-25% glycerol were fine, with high transmittance, but insoluble and difficult to handle in the final form. Similar to conventional plastic, they can be processed before complete drying. The foils obtained from wheat starch were finer, softer, smoother, but with high solubility, and those based on corn starch were fragile, uneven and with pores in the structure. The results highlight the possibility of using starch for the development of edible materials and the importance of the type. According to the results obtained, wheat or potato starch facilitates the development of edible films with improved characteristics.

Key words: *corn, glycerol, environmental, innovative, potato, wheat*

CIRCULAR ECONOMY APPLIED TO AGRI-FOOD WASTE WATER

Luis Miguel AYUSO GARCIA, Sofia MARTINEZ LOPEZ
*National Technological Centre for the Food and Canning Industry, CTNC,
Spain, angel@ctnc.es*

Abstract: Currently, the treatment of waste effluents generated as a result of human activity is a necessary action to avoid both environmental pollution and health problems. However, and due to the strong water stress, increasing in recent years due to climate change, as well as the increase in water demand due to population growth, proper wastewater treatment is becoming increasingly necessary and important not only to ensure health and prevent environmental pollution but also to allow the safe reuse of treated effluents, thereby reducing the negative impact on water resources.

Emerging pollutants (EPs), so called because their detection is relatively recent, thanks to the development of increasingly sensitive analytics capable of detecting them, are discharged into sanitation systems on a daily basis. The result is that WWTPs have become the main recipients of these pollutants, but also one of the main sources of emission of these compounds into the environment, given that the plants are not capable of removing them completely.

The main objective of the LIFE CLEAN UP project is to improve wastewater treatment through the implementation of an innovative, efficient and environmentally friendly technology in order to obtain treated water free of EPs. For this purpose, the project proposes the validation of a combination of technologies based on a cyclodextrin (CD) polymer adsorption system coupled to advanced oxidation processes (AOP), which not only separates and degrades EPs, but also removes pathogenic microorganisms from wastewater.

In addition to emerging pollutants, water quality can be affected by contamination caused by microorganisms, heavy metals, toxic chemical compounds, introduction of non-endemic species, changes in acidity, temperature or salinity, among others.

A clear example is the waste brine generated in the pickling and olive processing process, which is a major environmental problem because it is a complex organic liquid whose characteristics make it difficult to treat, since there are no technically effective technologies for its treatment, or at best, these are economically unfeasible.

Thus, the most common management carried out by companies in this sector consists of direct discharge of their waste into open evaporation ponds, which causes problems of direct and diffuse contamination, bad odours, soil salinization, among others. In addition, the difficulty of treatment and management generates problems with the administration that limit the activity of the companies.

The main goal of LIFE SOLIEVA is to demonstrate the technical, environmental and economic feasibility of the technology based on membrane, concentrator vacuum and spray dryer (OCR) and advanced solar evaporation (ASE) to face the environmental challenges of the table olive sector (TO) in the treatment of the table olive processing wastewater (TOPWW) and update the environmental legislation related to use of water.

Key words: *environmental challenges, waste water, circular-economy*

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***SYNTHESIS OF BIOSORBENTS BASED ON
SACCHAROMYCES PASTORIANUS RESIDUAL BIOMASS BY
IMMOBILIZATION AND ENCAPSULATION. COMPARATIVE
EVALUATION OF PHARMACEUTICALS BIOSORPTION***

Lăcrămioara RUSU^{1*}, Cristina-Gabriela GRIGORAȘ¹, Elena-Mirela
SUCEVEANU¹, Andrei-Ionuț SIMION¹, Bogdan ISTRATE²

¹ Faculty of Engineering, "Vasile Alecsandri" University of Bacău, Romania, *
lacraistrati04@yahoo.com

² Mechanical Engineering Faculty, "Gheorghe Asachi" Technical University from
Iasi, Romania

Abstract: The pharmaceuticals are considered persistent organic pollutants with negative impact especially on aquatic environment, which can affect water quality and human health. Biosorption can represent an alternative to conventional treatment methods if efficient, cheap, non-toxic and easily available biosorbents can be found or synthesized. The aims of this study are to investigate the drugs removal potential of *Saccharomyces pastorianus* residual biomass alginate beads obtained by immobilization and encapsulation and to realize the comparative evaluation of biosorptive capacities for the synthesized biosorbents. Ethacridine Lactate (EL) was chosen as a target molecule. Synthesized biosorbents were characterized by SEM and FTIR analysis. Point of zero charge was also examined. Biosorption studies were carried out in a batch system. The effects of the main parameters on the biosorption process were investigated. The main differences between the biosorbents are represented by the size and shape of the granules. The SEM analysis shows that the obtained biosorbent beads have a spherical shape in the case of immobilization and an irregular shape for encapsulation and mesoporous structure in both cases. The obtained results show that for both types of biosorbents the removal efficiency is over 85% and the biosorption capacity is over 25 mg/g under the given experimental conditions. Based on the obtained results, we can conclude that both methods can be successfully used for the synthesis of biosorbents based on microbial biomass with remarkable adsorptive properties which can be applied in removal of persistent organic pollutants from water.

Key words: *Saccharomyces pastorianus* residual biomass, composite alginate beads, biosorption, ethacridine lactate, immobilization, encapsulation

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BIOPOLYMERS: A SOLUTION FOR REPLACING POLYETHYLENE IN FOOD PACKAGING

*Sonia AMARIEI, Ionut AVRAMIA, Florin URSACHI,
Ancuta CHETRARIU, Ancuta PETRARU
Faculty of Food Engineering, Stefan cel Mare University of
Suceava, Romania, *sonia@usm.ro

Abstract: The food industry is one of the major generators of plastic waste derived from conventional synthetic petroleum-based polymers which are non-biodegradable, used especially for packaging. These packaging materials after the food is consumed accumulate serious environmental concerns due to the materials but also to the organic residues that adhere to them. It is the concern of specialists, researchers to eliminate problems related to conventional materials that are not biodegradable or unnecessary plastic and replace them with biodegradable and edible materials, supporting the common effort to protect the environment. Even though environmental and health concerns will cause more consumers to switch to a plant-based diet, most people will continue to add more meat to their diet. The paper presents the possibility of replacing the polyethylene packaging from the surface of the trays for meat preparations with biodegradable packaging obtained from biopolymers. During the storage of meat products may occur deterioration by lipids oxidation, and microbial spoilage, as well as the modification of the organoleptic characteristics. For this reason, different compositions of polymer mixtures and film conditions for obtaining must be studied to choose the best packaging material to achieve food safety. The compositions proposed for packaging are obtained from alginate, agar, starch, and glycerol as plasticizer. The tensile strength, elasticity, modulus of elasticity, thickness, density, microscopic images of the samples, roughness, opacity, humidity, water activity, the amount of water transferred as well as the speed of water transfer through these packaging materials were analyzed.

A number of 28 samples with various compositions were analyzed, and the results showed that the sample with the highest values for hardness, density, and opacity, as well as the smallest water vapor permeability, of $1.2903E-4 \pm 4.79E-6$, has the ratio of components as alginate: agar: glycerol (3:1.25:0.75). The water activity of the analyzed films varied between 0.2886 and 0.3428 ($a_w < 0.6$) demonstrating that all the compositions ensure the preservation of the products in the absence of microorganisms.

All the determined parameters allow the appreciation of the quality of the packaging films in terms of mechanical resistance, its protection against the influence of light, the transfer of water through the packaging.

Key words: *meat products, alginate, agar, starch, glycerol.*

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Section 6.

Multidisciplinary Science

PROPERTIES OF SAMBUCUS NIGRA FRUIT

*Mirela ISAC, Sonia AMARIEI

Faculty of Food Engineering

Stefan cel Mare University of Suceava, Romania

*mireis1803@gmail.com, gutts@fia.usv.ro

Abstract: In the current context, when more and more unknown pathogens appear, healthy eating and supplementing it with natural products, play an increasingly important role in maintaining the health of the body.

The European black elder (*Sambucus nigra*), being found in abundance in the spontaneous flora of Suceava county, can provide us as a raw material the elderberries, which have been known for thousands of years as having nutritional and healing properties. The phytotherapeutic principles found in elderberries give them antiviral, antibacterial and antidiabetic properties, antitumor potential, antioxidant, antidepressant and immune boosting, as well as a certain impact on obesity and metabolic dysfunctions. Polyphenols and lectins give elderberries the ability to inhibit Corona viruses, which is a topic of great interest in our times.

This article summarizes the existing data regarding the chemical composition, active principles and biopharmaceutical properties of elderberry fruits as well as their use.

Key words: *Sambucus nigra*, antioxidant, antiviral; black elder; elderberry; polyphenols

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COMPETITION DISTORTIONS AND MEASURES

Dan HOFFMAN

*Faculty of Food Engineering,
Ștefan cel Mare University, Romania
dan.hoffman@fia.usv.ro*

Abstract: The opening of markets is possible only through free competition, a circumstance that requires the careful application of competition rules.

In order to achieve this goal, the institutions with responsibilities in this matter ensure the proper functioning of market mechanisms and the maintenance of a competitive climate, conducive to consumers.

In principle, competition procedures include antitrust rules, provisions aimed at the supervision of economic concentrations, regulations on the manner of granting state aid, so as to prevent support being granted only to some of the enterprises.

Key words: *competition, Competition Council, Competition Commissioner, Intercompany agreements, European Commission*

THE COVID-19 IMPACT ON FOOD CONSUMPTION AMONG YOUTHS IN N-E OF ROMANIA

**Cristina – Elena HREȚCANU¹, Despina SAGHIN²*

*¹Faculty of Food Engineering, Ștefan cel Mare University of Suceava,
Romania, * Cristina.hretcanu@fia.usv.ro*

*²Faculty of History and Geography, Ștefan cel Mare University of Suceava,
Romania*

Abstract: The main objective of this study is to observe how COVID-19 lockdown period and the next year have affected the diet patterns among youths in N-E of Romania.

This study evaluated possible changes in youths' eating behaviors during the lockdown, compared to the period before the lockdown and post - lockdown periods. This study is based on a survey distributed via social media platforms during 20 – 31 October 2021, where more than 356 youth participants from six counties from Romania have voluntarily reported their routine diet patterns in the months before, while COVID-19 lockdown and after that period of time. The survey was conducted exclusively online using Google Forms and was distributed via mailing lists. The partial results show that since schools and universities were closed and most people had to work from home, many youths had to consume all their meals at home. Parents were responsible for their youth's food intake almost throughout the whole day, and this could be challenging in terms of time (food shopping, food preparation). The psychological states (stress, fear, boredom etc.) linked to the COVID-19 pandemic possibly also affected youths' eating behaviors. The number of meals consumed at home, with the whole family, during the lockdown was significantly higher than before the pandemic and after the end of the lockdown period. In this study we found some factors that can induce changes in families' eating, feeding and cooking behaviors, such as: more time spent at home, the impossibility to have the meal in town, with friends, the desire to eat something good under conditions of stress and / or boredom. The present research illustrates the evolution of a consumption behavior among the younger generation, both during and after the lockdown period. This aspect requires to professionals from food industry to coordinate their ways of coping with this new challenge.

Key words: *Consumers, Food, Food choice questionnaire, Eating behavior*

PHYSICO-CHEMICAL PROPERTIES AND PROSPECTS OF USE OF CASEIN MICELLES IN MEDICINE

*Yuliana LUKAN¹, Anastasiia SACHKO², Yuriy KHALAVKA³

*¹Department of Medical and Pharmaceutical Chemistry
Bukovynian State Medical University, Ukraine*

*² Dept of Chemical Analysis, Examination and Food Safety, uriyFedkovych
Chernivtsi National University, Ukraine*

*³ Dept of General Chemistry and Chemical Materials Science, Yu.
Fedkovych Chernivtsi National University, Ukraine*

**y.lukan@bsmu.edu.ua*

Abstract:The micelles of caseine are used in the food, pharmaceutical, cosmetic industries for production of various types of food additives, drugs, paints, etc. On the other hand, the casein-benzethonium chloride (BTC) should be used with some precautions since it exhibits some toxicity when significant amount is taken orally and may cause nausea.

Aggregation between benzethonium chloride and casein in aqueous solutions was investigated by the following methods: measurement of surface tension, conductivity, viscosity, and optical density studies.

It is shown that the casein – BTC interaction process passes through four stages and involves the formation of polymer-surfactant associates/complexes, which causes the non-monotonic nature of changes in the physicochemical properties of systems in a narrow concentration range of surfactants.

The first two stages of binding of BTC with casein occur due to electrostatic interaction, resulting in the formation of insoluble aggregates, which strongly affect the features of the phase separation of the system. At the same time, both the viscosity and specific conductivity of binary mixtures increase rapidly as a result of the release of large amounts of anti-ionic substances by binding BTC cations with casein macromolecules.

In the last two stages, the formation of hydrophilic highly structured systems, in which the surface tension of the studied mixtures is weakly

dependent on the concentration of BTC. This indicates the possibility of coexistence of BTC-casein complexes with the free BTC micelles. Pyrene was chosen as the solubilizing substance. It is shown that with increasing concentration of components of a binary mixture its solubilizing ability increases. It should be noted that the ability of BTC-casein systems to solubilize pyrene is higher than the solubilization ability of solutions of individual components under similar conditions.

Key words: *benzethonium chloride, casein, micelle, pyrene, solubilization, viscosity*

MATHEMATICAL PLANNING IN THE SYNTHESIS OF BIOLOGICALLY ACTIVE Cu NANOPARTICLES

Elena KRUPKO

*Department of Medicinal and Pharmaceutical Chemistry,
Bucovinian State Medical University, Ukraine
krupko.o@bsmu.edu.ua*

Abstract: At the beginning of the XXI century, the development of research in the field of nanomaterials aimed at obtaining and applying nanoparticles as new materials in various fields of science increased significantly. In most countries of the world, research and implementation of the results of nanotechnology in practical activities are intensively carried out. The use of nanoparticles in medicine and pharmacy is a rather promising direction of modern science. Considerable attention among the researched nanoparticles in the field of medicine and pharmacy, are occupied by metal nanoparticles (Ag, Au, Pt, Su and others), which are used as antimicrobial, bactericidal and antitumor drugs. Especially promising and economically profitable (compared to nanoparticles silver), for these purposes are nanoparticles copper.

The purpose of the work: selection of conditions for the synthesis of colloidal copper nanoparticles stabilized by the bio-containing amino acid L-cysteine in an oxidized medium at a synthesis temperature of 20 °C. Study of the effect of nanoparticles Cu on the test culture of microorganisms *P.aeruginosa*, *C.albicans*.

Colloidal solutions of copper nanoparticles were obtained in an aqueous solution without prior deaeration. In order to obtain a general picture of the additive effect of concentrations on the properties of the obtained nanoparticles, the method of mathematical planning of the experiment - the method of simplex grids Sheffe used in the work.

Based on the experimental studies, the optimal ratio between the solutions of precursors L-Cys, NaBH₄ and Cu²⁺, whose colloidal solutions of nanoparticles, remained stable for 120 days, was determined. The formation of copper nanoparticles and their stability in the solution was determined by the spectra of optical absorption, controlling the presence of a strip of surface plasmon resonance.

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The compositions of solutions that have a higher effect on the test culture of microorganisms *P.aeruginosa*, *C.albicans* in comparison with other colloidal solutions have been established and retain their effect when diluting 1 to 4. However, such systems are time-unstable.

Key words: *bio-containing, biologically active particles, colloidal solutions, Cu nanoparticles, oxidized environment, mathematical planning.*