Proiect de Stat 20.80009.5107.09 Ameliorarea calității și siguranței alimentelor prin biotehnologie și inginerie alimentară

Director de proiect: m.c. AȘM, prof. univ. Rodica Sturza

Proiect de Stat

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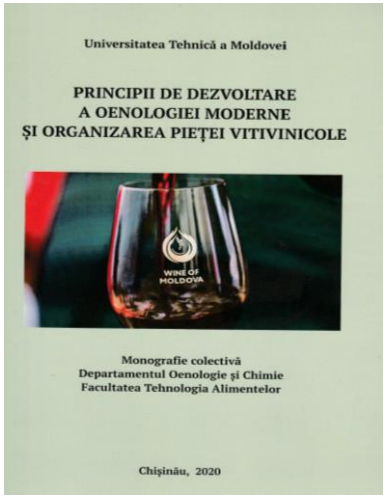
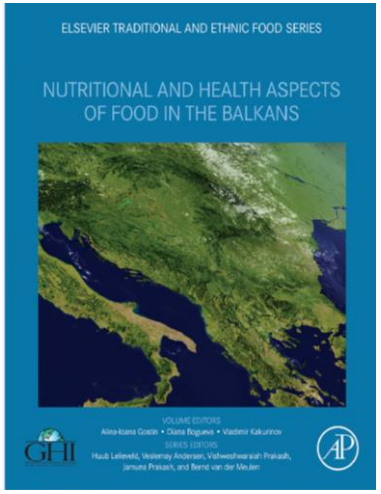
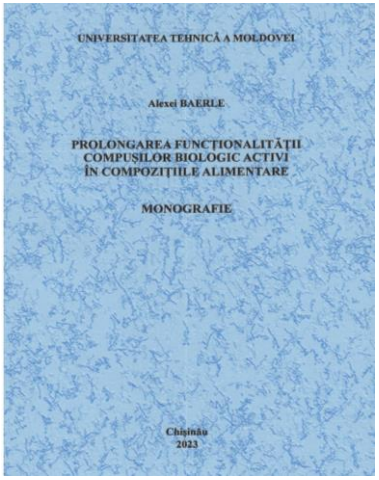
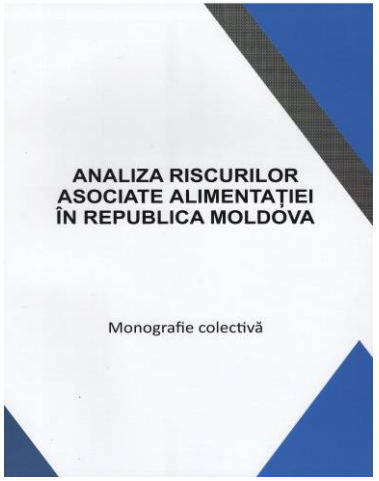
Monografii colective și capitole in monografii publicate în cadrul proiectului









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Director de proiect: m.c. AȘM, prof. univ. Rodica Sturza

antioxidants

MDPI

Article

The Effect of Aromatic Plant Extracts Encapsulated in Alginate on the Bioactivity, Textural Characteristics and Shelf Life of Yogurt

Liliana Popescu [1], Daniela Cojocari [2], Aliona Ghendov-Mosanu [1], Ildiko Lung [3,*], Maria-Loredana Soran [3], Ocsana Opriș [3], Irina Kacso [3], Alexandra Ciorîță [3,4], Greta Balan [2], Adela Pintea [5] and Rodica Sturza [1,*]

1. Faculty of Food Technology, Technical University of Moldova, 9/9 Studentilor St., MD-2045 Chisinau, Moldova
2. Department of Preventive Medicine, "Nicolae Testemitanu" State University of Medicine and Pharmacy, 165 Stefan cel Mare Bd., MD-2004 Chisinau, Moldova
3. Department of Physics of Nanostructured Systems, National Institute for Research and Development of Isotopic and Molecular Technologies, 400293 Cluj-Napoca, Romania
4. Faculty of Biology and Geology, Babes-Bolyai University, 5-7 Clinicilor, 400006 Cluj-Napoca, Romania
5. Faculty of Veterinary Medicine, University of Agricultural Sciences and Veterinary Medicine, 3-5 Calea Manastur St., 400374 Cluj-Napoca, Romania

* Correspondence: ildiko.lung@itim-cj.ro (I.L.); rodica.sturza@chim.utm.md (R.S.)

Abstract: The article investigated the antioxidant and antimicrobial activity of extracts from two aromatic plants—*Satureja hortensis* L. (SE) and *Rosmarinus officinalis* L. (RE), encapsulated in alginate, on—yogurt properties. The encapsulation efficiency was controlled by FTIR and SEM analysis. In both extracts, the individual polyphenol content was determined by HPLC–DAD–ESI-MS. The total polyphenol content and the antioxidant activity were spectrophotometrically quantified. The antimicrobial properties of SE and RE against gram-positive bacteria (*Bacillus cereus*, *Enterococcus faecalis*, *Staphylococcus aureus*, *Geobacillus stearothermophilus*), gram-negative bacteria (*Escherichia coli*, *Acinetobacter baumannii*, *Salmonella abony*) and yeasts (*Candida albicans*) were analyzed in vitro. The encapsulated extracts were used to prepare the functional concentrated yogurt. It was established that the addition of 0.30–0.45% microencapsulated plant extracts caused the inhibition of the post-fermentation process, the improvement of the textural parameters of the yogurt during storage, thus the shelf life of the yogurt increased by seven days, compared to the yogurt simple. Mutual information analysis was applied to establish the correlation between the concentration of the encapsulated extracts on the sensory, physical-chemical, and textural characteristics of the yogurt.

Keywords: summer savory; rosemary; extraction; encapsulation; functional foods; concentrated yogurt

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Citation: Popescu, L.; Cojocari, D.; Ghendov-Mosanu, A.; Lung, I.; Soran, M.-L.; Opriș, O.; Kacso, I.; Ciorîță, A.; Balan, G.; Pintea, A.; et al. The Effect of Aromatic Plant Extracts Encapsulated in Alginate on the Bioactivity, Textural Characteristics and Shelf Life of Yogurt. *Antioxidants* **2023**, *12*, 893. https://doi.org/10.3390/antiox12040893

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1. Introduction

Yogurt is considered one of the most popular fermented dairy products [1]. Consumers demand yogurt not only because of the bioavailability of essential nutrients resulting from yogurt's bacterial activity [2] but also for the wide product variations that are available in terms of texture and flavor. Concentrated yogurt is a fermented milk in which the protein content has been raised to a minimum of 5.6% [3]. This type of yogurt has gained increased consumer interest due to the improved taste and texture as well as the health benefits of milk proteins [4,5]. In addition, concentrated yogurt could be beneficial in calorie-restricted diets because energy intake from protein has a greater effect on satiety than fat or carbohydrate intake [6]. Consequently, concentrated yogurt could be enriched with various bioactive ingredients such as probiotics, phenolic compounds, carotenoids, polyunsaturated fatty acids, dietary fiber, vitamins, mineral salts, and others. [7,8]. Phenolic compounds have demonstrated antioxidant, antimicrobial, and anti-inflammatory activity and exhibit anti-cancer effects [9], including phenolic compounds from aromatic plants. Therefore, phenolic

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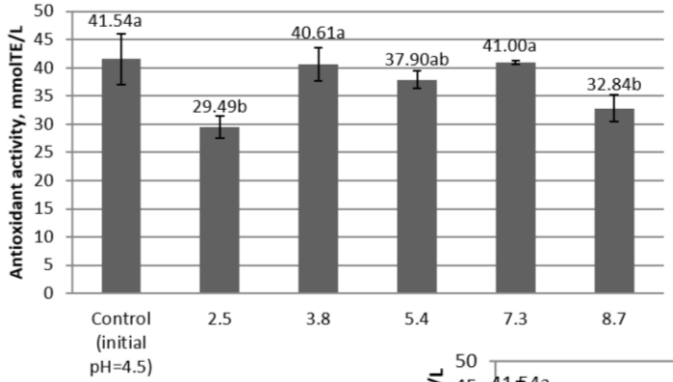

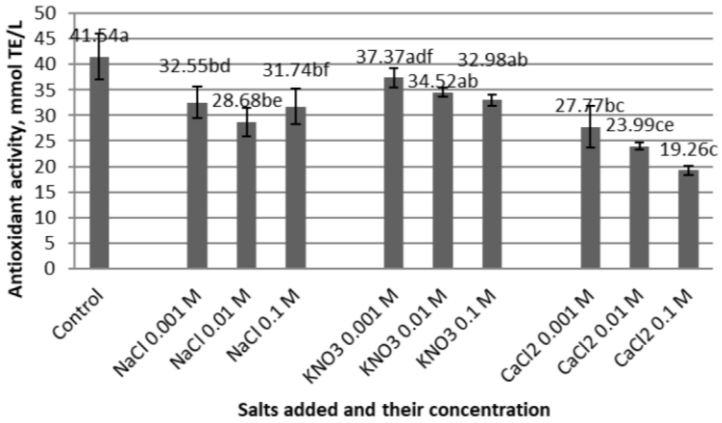

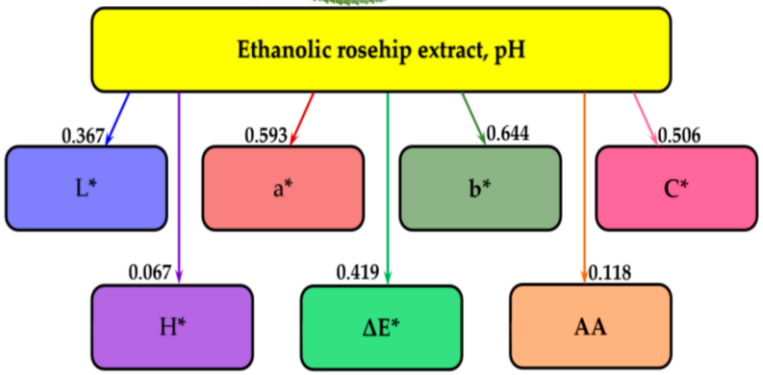

molecules

MDPI

Article

Rose Hips, A Valuable Source of Antioxidants to Improve Gingerbread Characteristics

Aliona Ghendov-Mosanu [1], Elena Cristea [1], Antoanela Patras [2,*], Rodica Sturza [1] and Marius Niculaua [3]

[1] Department of Oenology and Chemistry, Food Technology, Technical University of Moldova9/9 Studentilor St, MD-2045 Chisinau, Moldova; aliona.mosanu@tpa.utm.md (A.G.-M.); elena.cristea@sa.utm.md (E.C.); rodica.sturza@chim.utm.md (R.S.)

[2] Department of Sciences, Faculty of Horticulture, "Ion Ionescu de la Brad" University of Agricultural Sciences and Veterinary Medicine of Iasi, 3 Mihail Sadoveanu Alley, 700490 Iasi, Romania

[3] Research Center for Oenology, Romanian Academy, Iasi Branch, 9 Mihail Sadoveanu Alley, 700490 Iasi, Romania; niculaua@gmail.com

* Correspondence: antoanelapatras@gmail.com or apatras@uaiasi.ro

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Abstract: The present study analyzes the complex of bioactive compounds from rose hips pulp powder (RHP) obtained after separating the seeds from *Rosa canina* L. in order to obtain the oil. The extract prepared from RHP was characterized in terms of the total content of polyphenols, flavonoids, cinnamic acids, flavonols, carotenoids, but also the content of individual polyphenols and carotenoids, antioxidant activity, and CIELab color parameters. The effects of some salts, potentially present in foods, and pH variations were examined to predict possible interactions that could occur when adding rosehip pulp as a food component. The results turned out to be a high content of polyphenols, carotenoids and antioxidant activity. The main phenolic components are procyanidin B1, chlorogenic acid, epicatechin, procyanidin B2, gallic acid, salicylic acid, and catechin. The carotenoid complex includes all-*trans*-β-carotene, all-*trans*-lycopene, zeaxanthin, α-cryptoxanthin, β-cryptoxanthin, rubixanthin, *cis*-β-carotene, *cis*-γ-carotene and *cis*-lycopene. The addition of $CaCl_2$ and NaCl to the RHP extract reduced the antioxidant activity and the strong acidic environment (pH to 2.5) decreased the antioxidant activity by 29%. The addition of rose hip powder to gingerbread has improved its general characteristics, and increased its antioxidant activity and microbiological stability, the effects of 4% RHP being the most important.

Keywords: *Rosa canina* L.; antioxidant activity; phenolic compounds; carotenoids; bioactive compounds; natural compounds; food

1. Introduction

Publications specialized in the analysis of the food industry report that currently Europe is "the fastest growing market for food colorings, driven by natural and organic products" [1]. Even though synthetic colors still outsell natural ones around the globe, Europe is the largest regional market and thus dictates the trends. The increasing consumer appeal for natural ingredients is expected to raise the demand for natural food dyes in the next few years. Furthermore, extracts obtained from well-known foodstuffs are popular with manufacturers because they are considered ingredients and not additives, and do not require an E number, which scares many consumers [1].

Driven by the consumer demand, companies in the United States of America are also starting to look at natural colorants. Natural food dyes are required in the production of dairy products,

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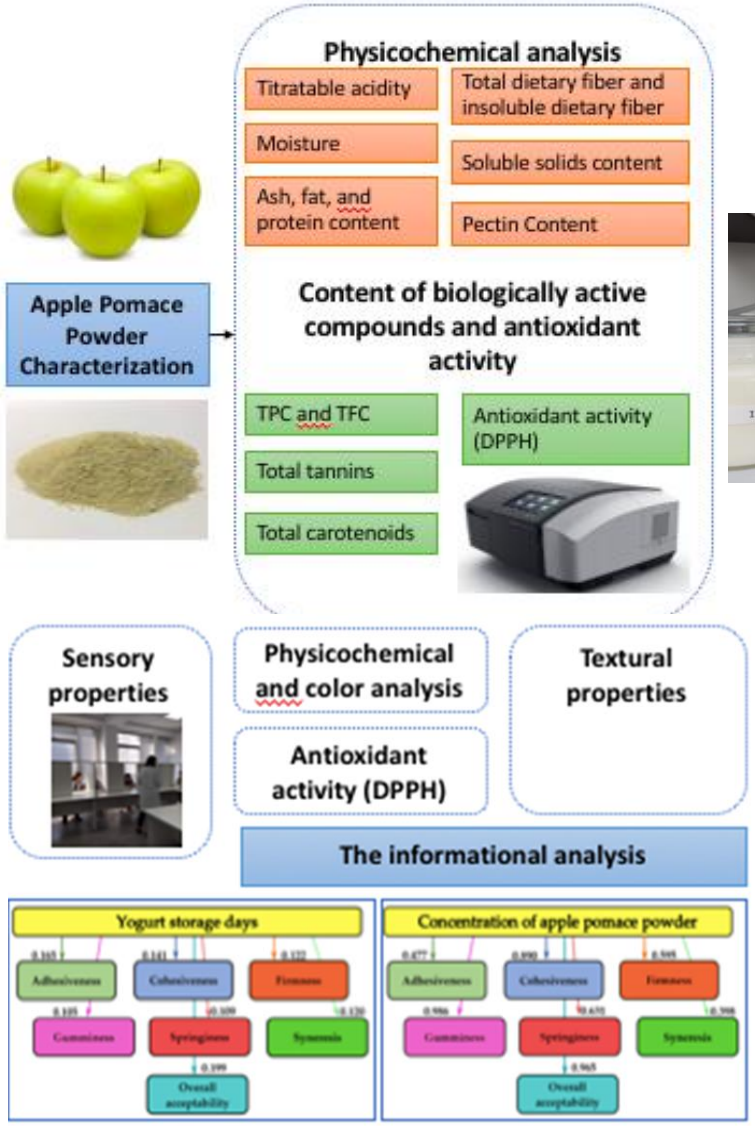

foods

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Article

Impact of Apple Pomace Powder on the Bioactivity, and the Sensory and Textural Characteristics of Yogurt

Liliana Popescu *, Tatiana Ceșco, Angela Gurev, Aliona Ghendov-Mosanu, Rodica Sturza and Ruslan Tarna

Faculty of Food Technology, Technical University of Moldova, 9/9 Studentilor St., MD-2045 Chisinau, Moldova
* Correspondence: liliana.popescu@tpa.utm.md; Tel.: +373-69595625

Abstract: This study focused on the development of a yogurt with an improved structure, texture and antioxidant activity level, by using apple pomace (AP) powder that was obtained in large quantities during the production of juices. The objective was to determine the sensory, physicochemical, textural and antioxidant characteristics of yogurt with the addition of AP powder (0.2–1.0%), during its shelf life. The physicochemical composition of AP was determined as follows: dietary fibers—62.73%, including pectin—23.12%; and the content of the antioxidant compounds in AP—total polyphenols (728.8 mg GAE/100 g DW), flavonoids (246.5 mg QE/100 g DW), tannins (63.54 mg TAE/100 g DW), carotenoids (4.93 mg/100 g DW) and the ability to inhibit the free radical (2433 µmol TE/100 g DW). AP addition reduces the yogurt fermentation time. The increase in the total dietary fiber content of up to 0.63% and in the insoluble fiber of up to 0.14% was attested in this study, as well as a significant increase in antioxidant activity, which correlated to the AP content. The addition of AP improved the textural properties of the yogurt during storage (20 days) and led to a significant reduction in syneresis. The influence of the AP content and the storage period on the textural characteristics and the overall acceptability of the yogurt samples were analyzed by the mutual information method. The AP content greatly influenced the yogurt's quality, with the information analysis value for the overall acceptability being 0.965 bits. The analysis of the sensory and textural parameters of the yogurt during storage (1–20 days) demonstrated that samples with AP in proportions of 0.6–0.8% were evaluated with the highest score.

Keywords: apple pomace powder; dietary fiber; yogurt; textural parameters; antioxidant activity; and quality

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Citation: Popescu, L.; Ceșco, T.; Gurev, A.; Ghendov-Mosanu, A.; Sturza, R.; Tarna, R. Impact of Apple Pomace Powder on the Bioactivity, and the Sensory and Textural Characteristics of Yogurt. *Foods* **2022**, *11*, 3565. https://doi.org/10.3390/foods11223565

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1. Introduction

Food industries produce millions of tons of waste during processing, which becomes a significant environmental, economic and nutritional problem. Agricultural waste could serve as an important source of bioactive compounds, including antioxidants, dietary fibers, polysaccharides, vitamins, carotenoids, pigments and oils [1]. These compounds are of increasing scientific interest due to the benefits they bring to human life [2].

Among fruit wastes, apple pomace (AP) is a potential source of phytochemicals and contains significant amounts of carbohydrates, as well as small amounts of proteins, vitamins and minerals [3]. It has been estimated that the production of apple juice results in a product that is low in polyphenolic compounds and that has only 3–10% of the antioxidant activity of the fruit from which it is produced. Most of the polyphenol compounds remain in apple pomace—a heterogeneous mixture of peel, core, seed, stem and soft tissue [4]. Currently, there are few uses of AP, with most of it being used on farms as animal feed or transported to landfills and incinerators. Sad to say, this has a negative effect on the environment, contributing to the greenhouse effect [5].

AP contains insoluble sugars, including cellulose (127.9 g/kg dried weight (DW)); hemicellulose (7.2–43.6 g/kg DW); lignin (15.3–23.5 g/kg DW); and simple sugars, such as glucose, fructose and galactose [5,6]. In addition, AP is an important source of substances

Sea Buckthorn Berry Flour Characteristics	Value
Moisture content, %	7.80 ± 0.20
Ascorbic acid, mg/100 g	352.5 ± 23.4
Total polyphenols (Folin-Ciocalteu), mg GAE/100 g	1467 ± 471
Total polyphenols (Abs280), mg GAE/100 g	1311 ± 105
Total flavonoids, mg GAE/100 g	555 ± 61
Cinnamic acids, mg CAE/100 g	425 ± 34
Flavonols, mg QE/100 g	668 ± 33
Total carotenoids, mg/100 g	34.93 ± 1.30
ABTS Antioxidant activity, mmol TE/100 g	7.64 ± 0.41
DPPH Antioxidant activity, %	67.99 ± 1.20
Catechin, mg/100 g	35.3 ± 5.1
Hyperoside, mg/100 g	23.6 ± 12.1
Chlorogenic acid, mg/100 g	11.1 ± 6.3
Cis-resveratrol, mg/100 g	10.8 ± 7.5
Trans-resveratrol, mg/100 g	10.4 ± 0.4
Ferulic acid, mg/100 g	10.3 ± 1.6
Protocatechuic acid, mg/100 g	7.0 ± 0.9
Procyanidin B2, mg/100 g	4.3 ± 1.7
Epicatechin, mg/100 g	2.5 ± 1.8
Gallic acid, mg/100 g	2.2 ± 0.5
Procyanidin B1, mg/100 g	1.6 ± 0.2
Quercetin, mg/100 g	0.9 ± 0.8
p-hydroxybenzoic acid, mg/100 g	0.8 ± 0.2
Syringic acid, mg/100 g	0.7 ± 0.3
m-hydroxybenzoic acid, mg/100 g	0.5 ± 0.1
Vanillic acid, mg/100 g	0.5 ± 0.2
p-coumaric acid, mg/100 g	0.3 ± 0.2
Caffeic acid, mg/100 g	0.2 ± 0.0
Sinapic acid, mg/100 g	nd
Polydatine, mg/100 g	nd
Salicylic acid, mg/100 g	nd
Ferulic acid methyl ester, mg/100 g	nd
Gentisic acid, mg/100 g	nd

nd = not detected.

molecules

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Article

Potential Application of *Hippophae Rhamnoides* in Wheat Bread Production

Aliona Ghendov-Mosanu [1], Elena Cristea [1], Antoanela Patras [2,*], Rodica Sturza [1], Silvica Padureanu [2], Olga Deseatnicova [1], Nadejda Turculet [1], Olga Boestean [1] and Marius Niculaua [3]

[1] Technical University of Moldova, 9/9 Studentilor St, MD-2045 Chisinau, Moldova; aliona.mosanu@tpa.utm.md (A.G.-M.); elena.cristea@sa.utm.md (E.C.); rodica.sturza@chim.utm.md (R.S.); olga.deseatnicova@toap.utm.md (O.D.); turculetnadejda@yahoo.com (N.T.); olga.boestean@tpa.utm.md (O.B.)

[2] "Ion Ionescu de la Brad" University of Agricultural Sciences and Veterinary Medicine of Iasi, Romania, 3 Mihail Sadoveanu Alley, 700490 Iasi, Romania; silvyp27@yahoo.com

[3] Research Center for Oenology, Romanian Academy, Iasi Branch, 9 Mihail Sadoveanu Alley, 700490 Iasi, Romania; niculaua@gmail.com

* Correspondence: antoanelapatras@gmail.com or apatras@uaiasi.ro

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Abstract: Sea buckthorn (*Hippophae rhamnoides*) berries are well known for their content in bioactive compounds, high acidity, bright yellow color, pleasant taste and odor, thus their addition in a basic food such as bread could be an opportunity for modern food producers. The aim of the present research was to investigate the characteristics and the effects of the berry' flour added in wheat bread (in concentration of 1%, 3% and 5%) on sensory, physicochemical and antioxidant properties, and also bread shelf life. Berry flour contained total polyphenols—1467 mg gallic acid equivalents (GAE)/100 g, of which flavonoids—555 mg GAE/100 g, cinnamic acids—425 mg caffeic acid equivalents (CAE)/100 g, flavonols—668 mg quercetin equivalents (QE)/100 g. The main identified phenolics were catechin, hyperoside, chlorogenic acid, cis- and trans-resveratrol, ferulic and protocatechuic acids, procyanidins B1 and B2, epicatechin, gallic acid, quercetin, *p*- and *m*-hydroxybenzoic acids. The antioxidant activity was 7.64 mmol TE/100 g, and carotenoids content 34.93 ± 1.3 mg/100 g. The addition of berry flour increased the antioxidant activity of bread and the shelf life up to 120 h by inhibiting the development of rope spoilage. The obtained results recommend the addition of 1% *Hippophae rhamnoides* berry flour in wheat bread, in order to obtain a product enriched in health-promoting biomolecules, with better sensorial and antioxidant properties and longer shelf life.

Keywords: sea buckthorn berries; bioactive compounds; polyphenols; natural additive; antioxidant; antimicrobial; shelf life; organoleptic properties

1. Introduction

For millennia, bread and other bakery products have been and currently still are staples in many countries. Although bread making may look simple at first glance, its production is becoming increasingly complex due to consumer requirements regarding functionality and nutritional properties, but also in terms of sensory characteristics. These products represent an important part of the foods produced in many countries, e.g., the average volume index of bakery and flour products consumed in the Republic of Moldova between 2012 and 2017 was 102.6 [1].

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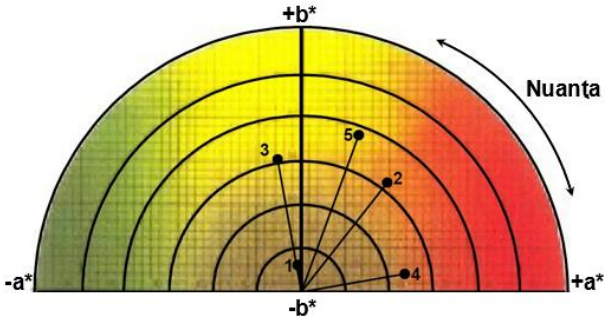

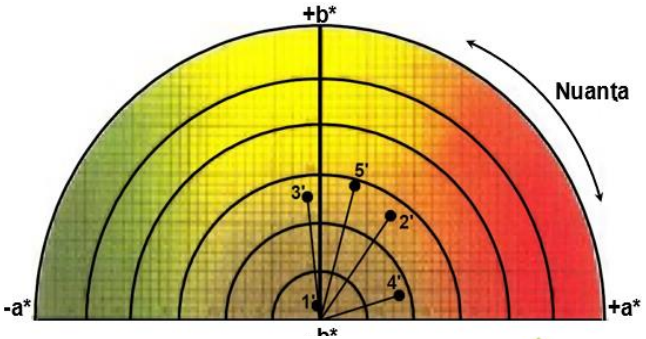

applied sciences

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Article

Aronia Extracts in the Production of Confectionery Masses

Aliona Ghendov-Mosanu [1,*], Mădălina Ungureanu-Iuga [2,3], Silvia Mironeasa [2] and Rodica Sturza [1]

[1] Faculty of Food Technology, Technical University of Moldova, 9/9 Studentilor St., MD-2045 Chisinau, Moldova; rodica.sturza@chim.utm.md
[2] Faculty of Food Engineering, Ștefan cel Mare University, 13, Universității Street, 720229 Suceava, Romania; madalina.iuga@usm.ro (M.U.-I.); silviam@fia.usv.ro (S.M.)
[3] 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, 13th University Street, 720229 Suceava, Romania
* Correspondence: aliona.mosanu@tpa.utm.md

Abstract: The article examines the opportunity to use extracts and Aronia melanocarpa (Michx.) Elliot fruit powders in the production of sugar confectionery for the substitution of synthetic dyes. In the technology of manufacturing confectionery masses, synthetic dyes are used that can cause various allergic reactions, as well as hyperactivity syndrome and lack of concentration in children. The composition of hydroalcoholic extracts was analyzed, and the metabolites of polyphenols, individual anthocyanins and organic acids were quantified. Antioxidant capacity and CIELab chromatic parameters were tested. The technology for manufacturing confectionary masses with extract and powder of aronia was developed. The sensory profile, physicochemical and microbiological quality parameters, antioxidant activity and color characteristics of the confectionary masses with the extract and powder of aronia addition were determined on the 1st and 50th day from the production date. The evolution of DPPH antioxidant activity of confectionery masses during storage was measured in vitro, in the conditions of gastric digestion. The results showed that Aronia melanocarpa (Michx.) Elliot extract is rich in polyphenols, flavonoids and tannins, the main organic acids being represented by malic, citric, acetic and ascorbic acid. During the 50th storage day, the antioxidant activity was higher in confectionery masses containing aronia compared to the control. The sensory and microbiological testing of confectionary masses demonstrated that the combination of extract and aronia powder ensures the optimal shelf life and organoleptic scores. It was demonstrated that during the storage of confectionery masses with aronia, the physicochemical indicators of quality were in accordance with the regulated admissible values. Positive effects of aronia were observed on confectionery masses' color saturation. These results underline the opportunity to use aronia extract and/or powder in confectionery industry to replace synthetic dyes and obtain products with enhanced functionality.

Keywords: Aronia melanocarpa (Michx.) Elliot; biologically active compounds; antioxidant activity; color parameters; sugar products; quality characteristics

Citation: Ghendov-Mosanu, A.; Ungureanu-Iuga, M.; Mironeasa, S.; Sturza, R; Aronia Extracts in the Production of Confectionery Masses. *Appl. Sci.* **2022**, *12*, 7664. https://doi.org/10.3390/app12157664

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1. Introduction

Aronia (Aronia melanocarpa (Michx.) Elliot) is widely distributed in eastern, southern, and central parts of Europe, being grown on an industrial scale [1]. Aronia fruits are used in the manufacture of juices, purees, jams, jellies and wine [2]. This is due to the high content of polyphenols, with considerable antioxidant activity and a remarkable coloring potential [3,4].

Among the polyphenols present in aronia, quercetin is the strongest antioxidant among the monomer phenolic compounds, followed by cyanidol-glucoside and chlorogenic acid [5]. Anthocyanins, flavonols and hydroxycinnamic acids contribute about

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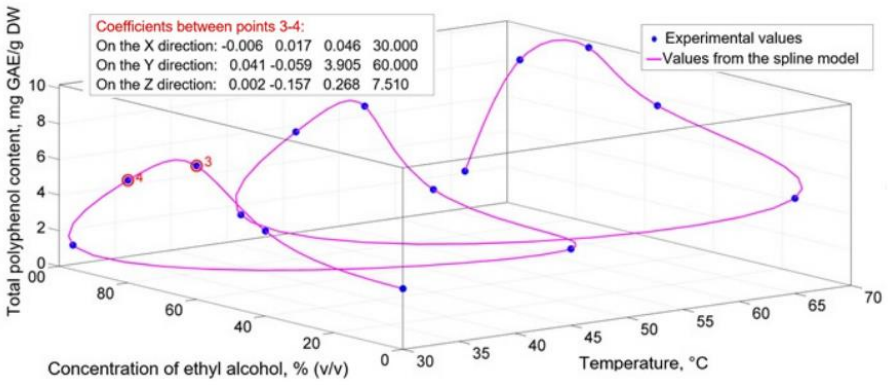

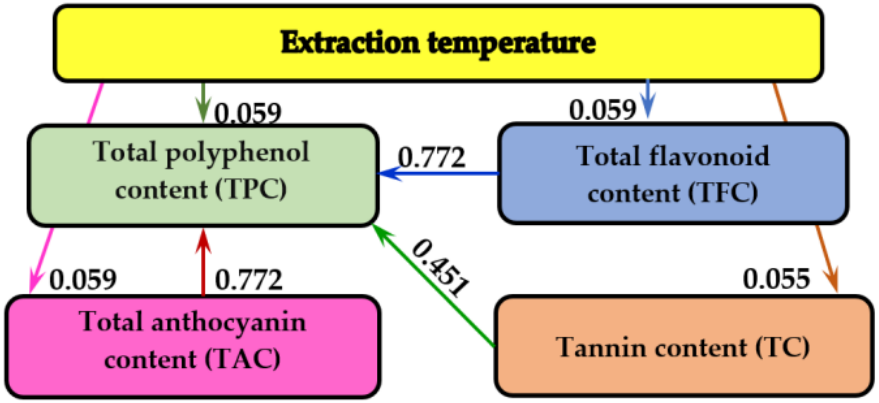

molecules

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Article

Chemometric Optimization of Biologically Active Compounds Extraction from Grape Marc: Composition and Antimicrobial Activity

Aliona Ghendov-Mosanu [1,*], Daniela Cojocari [2], Greta Balan [2], Antoanela Patras [3], Ildiko Lung [4], Maria-Loredana Soran [4], Ocsana Opriș [4], Elena Cristea [1] and Rodica Sturza [1]

[1] Department of Oenology and Chemistry, Food Technology, Faculty of Food Technology, Technical University of Moldova, 9/9 Studentilor St., MD-2045 Chisinau, Moldova; cristea.ele@gmail.com (E.C.); rodica.sturza@chim.utm.md (R.S.)
[2] Department of Microbiology and Immunology, Faculty of Medicine No I, "NicolaeTestemitanu State" University of Medicine and Pharmacy, 165 Stefan cel Mare Bd., MD-2004 Chisinau, Moldova; daniela.cojocari@usmf.md (D.C.); greta.balan@usmf.md (G.B.)
[3] Department of Sciences, Faculty of Horticulture, "Ion Ionescu de la Brad" Iasi University of Life Sciences, 3 Mihail Sadoveanu Alley, 700490 Iasi, Romania; apatras@uaiasi.ro
[4] Department of Physics of Nanostructured Systems, National Institute for Research and Development of Isotopic and Molecular Technologies, 400293 Cluj-Napoca, Romania; ildiko.lung@itim-cj.ro (I.L.); loredana.soran@itim-cj.ro (M.-L.S.); ocsana.opris@itim-cj.ro (O.O.)
* Correspondence: aliona.mosanu@tpa.utm.md

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Citation: Ghendov-Mosanu, A.; Cojocari, D.; Balan, G.; Patras, A.; Lung, I.; Soran, M.-L.; Opriș, O.; Cristea, E.; Sturza, R. Chemometric Optimization of Biologically Active Compounds Extraction from Grape Marc: Composition and Antimicrobial Activity. *Molecules* **2022**, *27*, 1610. https://doi.org/10.3390/molecules27051610

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Abstract: The article focuses on the optimization of the extraction process of biologically active compounds (BAC) from grape marc—a by-product of the wine industry. The influence of temperature, specifically 30 °C, 45 °C and 65 °C, and ethanol concentration in solutions, specifically 0–96% (*v*/*v*) on the extraction yield of polyphenols, flavonoids, tannins and anthocyanins, were investigated. The composition of individual polyphenols, anthocyanins and organic acids, antioxidant activity (DPPH and ABTS) and CIELab chromatic characteristics of the grape marc extracts (GME), were characterized. The microbiostatic and microbicidal effects in direct contact of GME with pathogenic microorganisms, *Bacillus subtilis*, *Staphylococcus aureus*, *Escherichia coli*, *Klebsiella pneumoniae*, were determined in vitro. The influence of extraction parameters on the total polyphenol content (TPC), total flavonoid content (TFC), tannin content (TC), total anthocyanin content (TAC) and their interdependencies were studied using information analysis. A mathematical model was developed on cubic spline functions. The analysis of individual compounds showed the presence of a wide range of flavonoids (procyanidin B2, procyanidin B1, hyperoside and quercetin), flavones (catechin), hydroxybenzoic acid derivatives (gallic, protocatechuic, *p*-hydroxybenzoic acids, *m*-hydroxybenzoic acid, syringic acid), hydroxycinic acid derivatives and ferulic acid methyl ester. The malvidol-3-glucoside was the main anthocyanin identified in the extract. A high amount of tartaric acid was also found. GME showed significant antimicrobial activity against Gram-positive bacteria and lower activity against Gram-negative bacteria.

Keywords: grape marc; extraction parameters; biologically active compounds; mathematical models; antimicrobial activity; pathogenic microorganisms

1. Introduction

Alcoholic and non-alcoholic beverage production generates waste and by-products that can be recovered. This would not only minimize their disposal costs and environmental hazards, but also add value to the development of new products. Traditional methods of using waste as fertilizer or animal feed use only a small part of the waste and are often not very effective [1]. Efforts must also be made to isolate and structurally elucidate new bioactive compounds. This will lead to achievements in the recovery of bioactive

Proiect de Stat

20.80009.5107.09 Ameliorarea calității și siguranței alimentelor prin biotehnologie și inginerie alimentară

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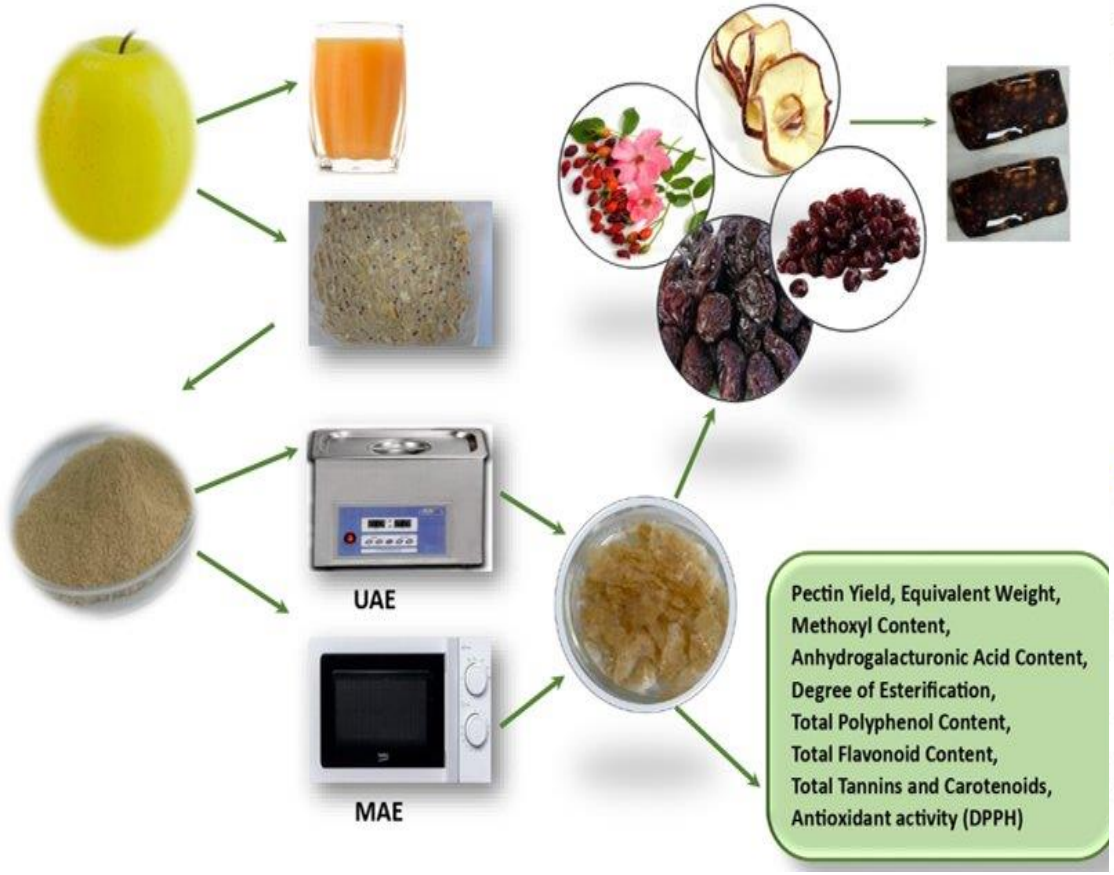

foods

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Article

Ultrasound- and Microwave-Assisted Extraction of Pectin from Apple Pomace and Its Effect on the Quality of Fruit Bars

Angela Gurev [1,*], Tatiana Cesko [1], Veronica Dragancea [1], Aliona Ghendov-Mosanu [1], Adela Pintea [2,*] and Rodica Sturza [1]

[1] Faculty of Food Technology, Technical University of Moldova, 9/9 Studentilor St., MD-2045 Chisinau, Moldova; tatiana.cesko@saiem.utm.md (T.C.); veronica.dragancea@chim.utm.md (V.D.); aliona.mosanu@tpa.utm.md (A.G.-M.); rodica.sturza@chim.utm.md (R.S.)
[2] Faculty of Veterinary Medicine, University of Agricultural Sciences and Veterinary Medicine, 3-5 Calea Manastur St., 400372 Cluj-Napoca, Romania
* Correspondence: angela.gurev@chim.utm.md (A.G.); apintea@usamvcluj.ro (A.P.)

Abstract: The article investigates the process of pectin extraction using ultrasonic and microwave techniques from apple pomace generated during juice production in the context of circular bioeconomy. The extraction yield, equivalent mass, content of methoxyl groups, content of anhydrogalacturonic acid, and degree of esterification of pectin were investigated. These indicators varied depending on the parameters and extraction method. The resulting pectin displayed a co-extracted total polyphenol content (TPC) ranging from 2.16 to 13.05 mg GAE/g DW and a DPPH radical inhibition capacity of 4.32–18.86 µmol TE/g. It was found that the antioxidant activity of raw pectin is correlated with TPC and with the content of terminal groups released during the polysaccharide degradation process. The extracted pectin was used as a binding and coating agent for dried fruit bars. Evaluation of water activity (a_w), TPC and total flavonoid content (TFC), together with sensory and microbiological analyses of the fruit bars over a period of 360 days, revealed a protective effect of pectin: reducing moisture loss, minimizing the degradation of bioactive compounds during storage, and maintaining the potential antioxidant activity of the product.

Keywords: apple pectin; ultrasound; microwave; extraction; phenolic content; antioxidant effect; biopolymer coating; dried fruits; quality

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Citation: Gurev, A.; Cesko, T.; Dragancea, V.; Ghendov-Mosanu, A.; Pintea, A.; Sturza, R. Ultrasound- and Microwave-Assisted Extraction of Pectin from Apple Pomace and Its Effect on the Quality of Fruit Bars. *Foods* **2023**, *12*, 2773. https://doi.org/10.3390/foods12142773

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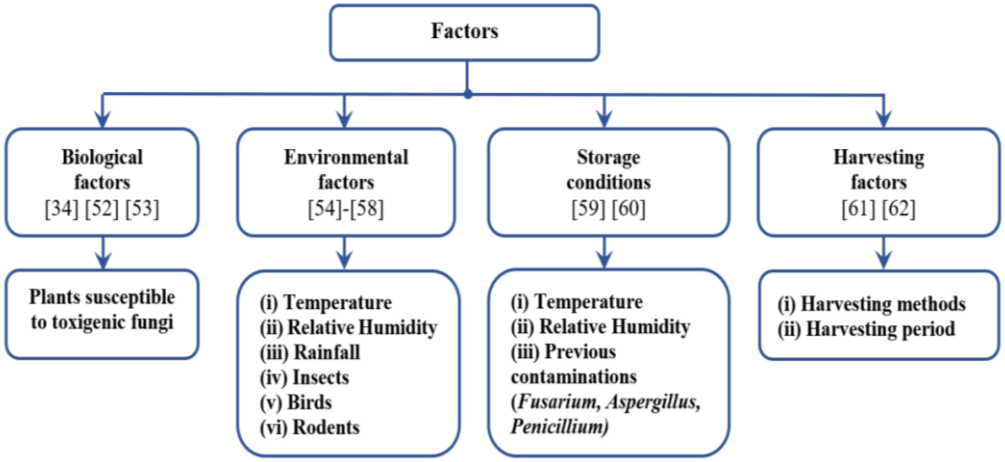
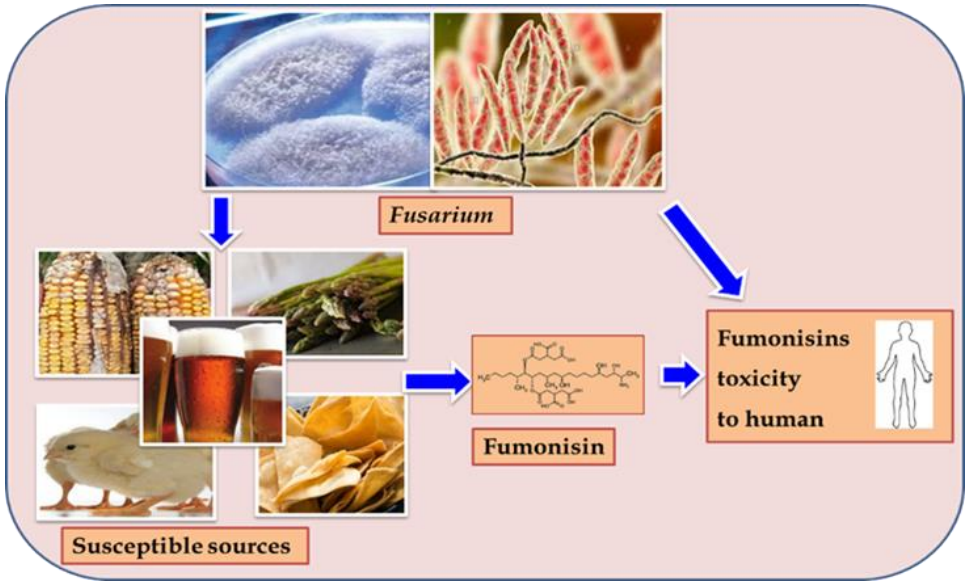
1. Introduction

Apples are some of the most widespread fruits, with multiple benefits for the consumer's health. In the Republic of Moldova, in 2017, apple production reached 430,000 tons from a total orchard area of 56,000 hectares. It was forecasted that the cultivated area for apple trees would increase by 52,400 hectares during the period of 2017–2027, resulting in a total apple production of 793,000 tons [1]. Significant amounts of apple pomace (globally, 4 million tons/year) are produced as a byproduct during the processing of apples for jams, juices, and fermented products. Despite the fact that apple pomace is primarily used as animal feed or fertilizer, it is a substantial source of functional components such as carbohydrates, dietary fibers (including pectin), phenolic compounds, and others [2]. The pectin derived from apple pomace is used in the pharmaceutical, food, cosmetic, and other industries, where it serves as a biopolymer, preservative, antioxidant, anticorrosive agent, protective agent for diverse surfaces, etc. [2,3]. Fibers obtained from fruits offer an advantage over cereal fibers due to their superior solubility, lower phytic acid content, and the presence of bioactive molecules associated with antioxidant activity [4]. Pectin is industrially obtained from apple pomace through conventional extraction (CE) methods, such as using hot acidified water with either mineral acids (sulfuric, hydrochloric, nitric) or organic acids (citric, malic, oxalic) from pH 1.5 to 3.0 and temperatures ranging





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The Risk of *Fusarium* and Their Mycotoxins in the Food Chain

Elisaveta Sandulachi[1], Aliona Ghendov-Mosanu[1*], Daniela Cojocari[2*], Rodica Sturza[3]

[1]Department of Food Technology, Technical University of Moldova, Chisinau, Republic of Moldova
[2]Department of Preventive Medicine, "Nicolae Testemitanu" State University of Medicine and Pharmacy, Chisinau, Republic of Moldova
[3]Department of Oenology and Chemistry, Technical University of Moldova, Chisinau, Republic of Moldova
Email: *aliona.mosanu@tpa.utm.md, *daniela.cojocari@usmf.md

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Abstract

Fusarium sp. and mycotoxins of these species pose a major risk to consumer health, agriculture and the food industry. This paper is a worldwide bibliographic study on impact of *Fusarium* and mycotoxins on the food chain. The factors influencing the development of fungi *Fusarium sp.*, the formation of mycotoxins and their microbiological risk on the food chain must be considered as a whole. For cereals and oilseeds before and after harvest, fungal infections and mycotoxin contamination present serious problems worldwide. This paper is an overview of the factors that include the microbiological risk and impact of *Fusarium* in the food chain mentioned in national and international studies. The methods and results obtained in this direction internationally are mentioned, such as: infrared spectroscopy, Raman spectrometry and hyperspectral imaging. Also, in review are presented solutions to reduce this impact on the food chain.

Keywords

Fusarium sp., Mycotoxins, Food Chain, Management Systems in Agriculture and Food Industry, Food Safety

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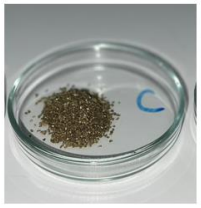

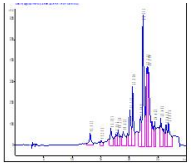

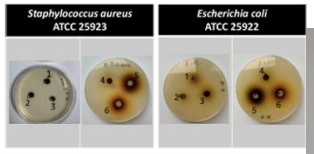

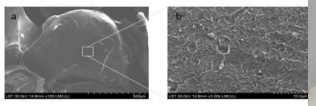

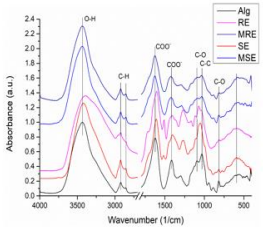

molecules MDPI

Article

Effect of Microencapsulated Basil Extract on Cream Cheese Quality and Stability

Liliana Popescu [1], Daniela Cojocari [2], Ildiko Lung [3], Irina Kacso [3], Alexandra Ciorîță [3,4], Aliona Ghendov-Mosanu [1], Greta Balan [2], Adela Pintea [5] and Rodica Sturza [1,*]

1 Faculty of Food Technology, Technical University of Moldova, 9/9 Studentilor Street, MD-2045 Chisinau, Moldova
2 Department of Preventive Medicine, "Nicolae Testemitanu" State University of Medicine and Pharmacy, 165 Stefan cel Mare Boulevard., MD-2004 Chisinau, Moldova
3 Department of Physics of Nanostructured Systems, National Institute for Research and Development of Isotopic and Molecular Technologies, 400293 Cluj-Napoca, Romania
4 Faculty of Biology and Geology, Babes-Bolyai University, 5-7 Clinicilor Street, 400006 Cluj-Napoca, Romania
5 Faculty of Veterinary Medicine, University of Agricultural Sciences and Veterinary Medicine, 3-5 Calea Manastus Street, 400374 Cluj-Napoca, Romania
* Correspondence: rodica.sturza@chim.utm.md

Abstract: The antimicrobial and antioxidant effects of plant extracts are well known, but their use is limited because they affect the physicochemical and sensory characteristics of products. Encapsulation presents an option to limit or prevent these changes. The paper presents the composition of individual polyphenols (HPLC–DAD-ESI-MS) from basil (*Ocimum basilicum* L.) extracts (BE), and their antioxidant activity and inhibitory effects against strains of *Staphylococcus aureus*, *Geobacillus stearothermophilus*, *Bacillus cereus*, *Candida albicans*, *Enterococcus faecalis*, *Escherichia coli*, and *Salmonella Abony*. The BE was encapsulated in sodium alginate (Alg) using the drop technique. The encapsulation efficiency of microencapsulated basil extract (MBE) was 78.59 ± 0.01%. SEM and FTIR analyses demonstrated the morphological aspect of the microcapsules and the existence of weak physical interactions between the components. Sensory, physicochemical and textural properties of MBE-fortified cream cheese were evaluated over a 28-day storage time at 4 °C. In the optimal concentration range of 0.6–0.9% (*w*/*w*) MBE, we determined the inhibition of the post-fermentation process and the improvement in the degree of water retention. This led to the improvement of the textural parameters of the cream cheese, contributing to the extension of the shelf life of the product by 7 days.

Keywords: microencapsulated basil extract; antimicrobial activity; cream cheese; quality; shelf life

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Citation: Popescu, L.; Cojocari, D.; Lung, I.; Kacso, I.; Ciorîță, A.; Ghendov-Mosanu, A.; Balan, G.; Pintea, A.; Sturza, R. Effect of Microencapsulated Basil Extract on Cream Cheese Quality and Stability. *Molecules* **2023**, *28*, 3305. https://doi.org/10.3390/molecules28083305

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1. Introduction

A growing demand for safe, natural, and synthetic preservative-free food products leads researchers to develop new alternatives and sustainable approaches for food preservation [1]. Cheeses are dairy products widely consumed throughout the world as part of a regular diet, and are valued for their high content of proteins, fats, mineral (especially calcium), and vitamins [2]. Cream cheese is a fresh soft cheese used as an ingredient in many food applications [3]. Due to the high moisture content and a favorable pH, cream cheese is considered an optimal environment for the growth of pathogenic and spoilage microorganisms [4]. The addition of preservatives is one of the most used methods of ensuring the antimicrobial stability of cheeses [5]. Effective replacement of preservatives (e.g., sorbates, nitrites, etc.) is the focus of various recently reviewed studies [6]. Phenolic extracts from aromatic plants have attracted the attention of the scientific community regarding their safety as natural ingredients as well as their wide application in the food industry [5,7,8]. Basil extract is characterized by high antioxidant and antimicrobial activity [9,10], contributing to reducing the population of pathogenic microorganisms and to

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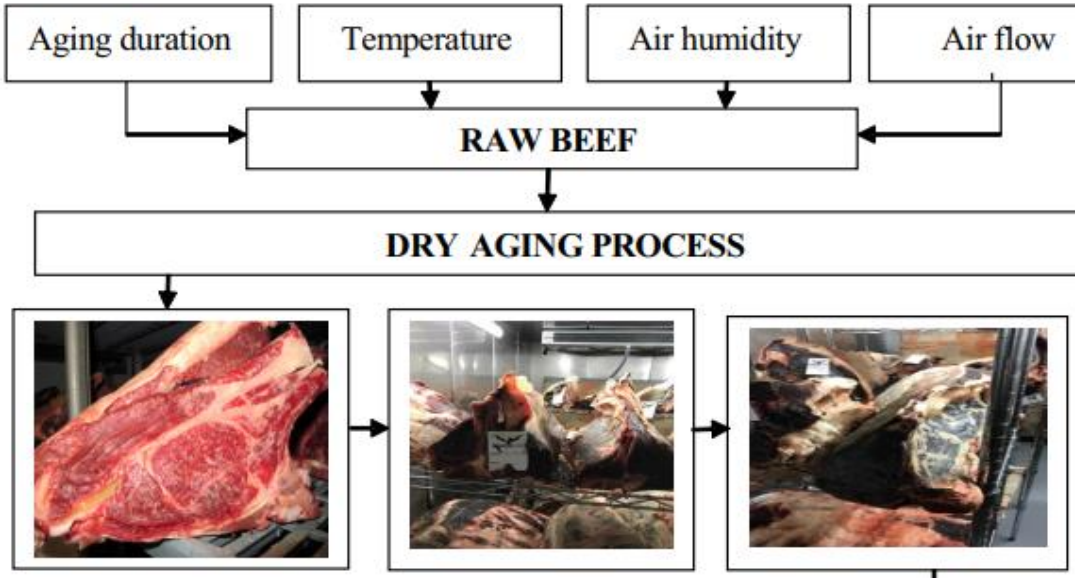

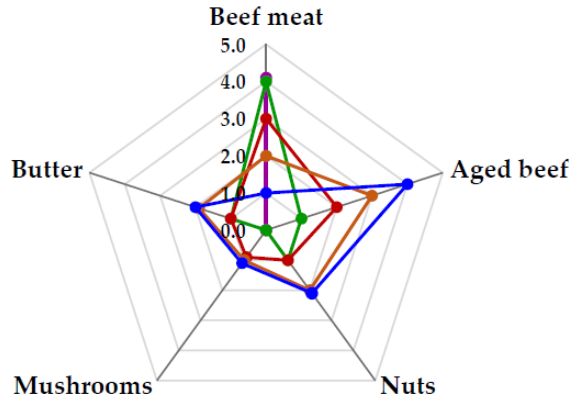

Fresh beef M14 M21 M28 M35

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Article

Assessment of Quality Indices and Their Influence on the Texture Profile in the Dry-Aging Process of Beef

Viorica Bulgaru *, Liliana Popescu, Natalia Netreba, Aliona Ghendov-Mosanu and Rodica Sturza

Faculty of Food Technology, Technical University of Moldova, 9/9 Studentilor St., MD-2045 Chisinau, Moldova; liliana.popescu@tpa.utm.md (L.P.); natalia.netreba@tpa.utm.md (N.N.); aliona.mosanu@tpa.utm.md (A.G.-M.); rodica.sturza@chim.utm.md (R.S.)
* Correspondence: viorica.bulgaru@tpa.utm.md; Tel.: +373-69264628

Abstract: The aim of this study was to investigate the effects of the dry-aging method on the sensory properties, chemical composition, and profile parameters of the texture of beef obtained from local farms. The qualitative characteristics of the beef were investigated for five samples, respectively, fresh meat, and dry-aged beef for 14, 21, 28, and 35 days, in aging rooms with controlled parameters: temperature (1 ± 1 °C), relative humidity (80 ± 5%), and air circulation speed (0.5–2 m/s). During the dry-aging period, there was a decrease in humidity by about 6.5% in the first 21 days, which allowed the concentration of fat, protein, and total collagen content. The dry-aging process considerably influenced the pH value of the meat, which, in the second part of the dry-aging process (14–35 days), increased from 5.49 to 5.66. These values favored the increase by 37.33% of the water retention capacity and the activation of the meat's own enzymes (calpain, cathepsin, collagenase). This influenced the solubilization process of proteins and collagen, thus contributing to the improvement of the texture profile. Because variations in organoleptic and physicochemical parameters occurred simultaneously during dry-aging and storage, the method of analyzing the information was applied. Mutual information on the influence of physicochemical indicators on the texture profile parameters was followed, a factor of major importance in the consumer's perception. The degree of influence of soluble proteins, sarcoplasmic and myofibrillar proteins, fats, and soluble collagen content on the texture profile parameters (hardness, cohesiveness, springiness, gumminess, and chewiness) of the dry-aged beef for 35 days was established. These investigations allowed the optimization of the beef dry-aging technological process in order to obtain a product with a sensory profile preferred by the consumer.

Keywords: beef; aged meat; sensory and physicochemical indicators; texture parameters; information analysis

Citation: Bulgaru, V.; Popescu, L.; Netreba, N.; Ghendov-Mosanu, A.; Sturza, R. Assessment of Quality Indices and Their Influence on the Texture Profile in the Dry-Aging Process of Beef. *Foods* **2022**, *11*, 1526. https://doi.org/10.3390/foods11101526

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1. Introduction

Meat has been and is an indispensable product of the human diet, both as a food in itself, and as an essential ingredient in many other foods, due to its chemical composition and valuable biological value [1–3]. According to the Organization for Economic Cooperation and Development (OECD), the world production of beef in 2021 increased by 4.8 million tons compared to the level of 2012, which amounted to 6.8%. The main counterparties in the beef market are the USA, Brazil, and China, which provide more than 40% of the world production [4]. The production of beef in the European Union countries over the past decade has slightly decreased by an average of 1.5%, and holds a more stable position, providing about 10% of the world beef production [5].

Meat is mostly the muscle tissue of an animal, with a complex chemical composition [6–8].

Beef has a protein content of between 26% and 31% [9,10], which is the main constituent of the structure of the meat product [9]. Actin and myosin (myofibrillar proteins)

Parameter	Value
Total polyphenols (Folin-Ciocalteu) (mg GAE/L extract)	4441 ± 243
Total flavonoids (mg GAE/L extract)	4293 ± 209
Total polyphenols by Abs280 (mg GAE/L extract)	3470 ± 21
Cinnamic acids (mg CAE/L extract)	580 ± 21
Flavonols (mg QE/L extract)	501 ± 15
Total anthocyanins (mg/L extract)	102 ± 2
Monomeric anthocyanins (mg/L extract)	61 ± 2
$ABTS^{\bullet}$ scavenging antioxidant activity (mmol TE/L extract)	31.61 ± 1.02
$DPPH^{\cdot}$ scavenging antioxidant activity (% inhibition)	72.95 ± 0.24
Catechin (mg/100 mL)	7.8 ± 0.0
Epicatechin (mg/100 mL)	3.95 ± 0.32
Ferulic acid (mg/100 mL)	3.71 ± 2.57
Protocatechuic acid (mg/100 mL)	1.50 ± 0.07
Ferulic acid methyl ester (mg/100 mL)	1.32 ± 0.54
Gallic acid (mg/100 mL)	0.36 ± 0.05
p-hydroxybenzoic acid (mg/100 mL)	0.23 ± 0.04
Quercetin (mg/100 mL)	0.21 ± 0.11
Procyanidin B2 (mg/100 mL)	0.17 ± 0.06
m-hydroxybenzoic acid (mg/100 mL)	0.11 ± 0.01
Sinapic acid (mg/100 mL)	0.10 ± 0.01
Hyperoside (mg/100 mL)	0.10 ± 0.01
Procyanidin B1 (mg/100 mL)	0.09 ± 0.05
Vanillic acid (mg/100 mL)	0.08 ± 0.01
Chlorogenic acid (mg/100 mL)	0.08 ± 0.06
Syringic acid (mg/100 mL)	0.04 ± 0.01
p-coumaric acid (mg/100 mL)	0.04 ± 0.01
Gentisic acid (mg/100 mL)	0.01 ± 0.00
Cis-resveratrol (mg/100 mL)	0.01 ± 0.00
Trans-resveratrol (mg/100 mL)	0.008 ± 0.003
Salicylic acid	Traces
Caffeic acid (mg/100 mL)	–
Polydatine (mg/100 mL)	–

Synthetic dye's substitution with chokeberry extract in jelly candies

Aliona Ghendov-Mosanu[1] · Elena Cristea[1] · Rodica Sturza[1] · Marius Niculaua[2] · Antoanela Patras[3]

Revised: 31 March 2020 / Accepted: 23 April 2020

Abstract Matching the general trend of replacing synthetic additives with healthier natural products, the present research studies the effects of different concentrations of chokeberry extract which substitute carmoisine dye in jelly candies. Also, the colour and antioxidant properties of the aforementioned extract and their changes at various pH and in presence of different mineral salts from foods are analysed. The phenolic content of the extract was determined using HPLC and spectrophotometric methods. A high concentration of polyphenols was found in the chokeberry extract, of which around 97% were flavonoids. Catechin, epicatechin, ferulic acid and its methyl esther, protocatechuic, gallic and *para*-hydroxybenzoic acids were the major phenolics identified in the extract. The total antioxidant activity decreased in acidic media, while close-to-neutral and alkaline pH values did not exhibit any effect on this parameter. Furthermore, the green/red colour parameter, the chroma and the hue angle were enhanced in the most acidic media (pH 2.3 and 3.5). From the studied salts, $CaCl_2$ and KNO_3 had the most significant effects on colour. The chokeberry extract proved to be suitable as replacement of carmoisine dye in jelly candies, as the physico-chemical and microbiological properties comply with the regulated requirements. More than that, the extract improved the antioxidant and sensory properties of jellies in all studied concentrations and the best total sensory score was obtained for 1.5% extract. After 5 and 50 days of storage, the microbiological properties were improved in candies prepared with aronia extracts compared to carmoisine, as the total viable count registered important diminutions.

Keywords Aronia · Carmoisine · Antioxidant · CIELab colour parameters · Total viable count · Storage

Introduction

Many studies proved that certain synthetic food additives may cause immediate or long-term health problems, when consumed for long periods of time (Borzelleca and Hallagan 1988). The ingestion of artificial dyes such as tartrazine and erythrosine combined with a diet rich in trans-fats, nitrites, nitrates and reduced intake of fibres is related to malignancies, specifically in the oesophagus, breast, rectum, stomach, and ovaries (Polonio and Peres 2009). Carmoisine (also named azorubine, or E 122) may induce allergic reactions, intensifying of asthma symptoms, intolerance in people sensitive to salicylates, children hyperactivity and is suspected for carcinogenic properties connected to urinary bladder cancer (Ghendov-Mosanu et al. 2016). On the other hand, jelly candies are multi-coloured sweets with gelatinous structure, especially popular among children, the production of which involves the use of various colouring additives to obtain an attractive appearance (Tamer et al. 2013). The replacement of the synthetic food dyes with colourings of natural origin is therefore a current concern.

The use of natural ingredients as food additives is becoming more and more popular across the food industry

✉ Antoanela Patras
apatras@uaiasi.ro

[1] Technical University of Moldova, 9/9 Studentilor St, 2045 Chișinău, Republic of Moldova

[2] Research Center for Oenology, Iasi Branch, Romanian Academy, 9 Mihail Sadoveanu Alley, 700490 Iasi, Romania

[3] "Ion Ionescu de la Brad" University of Agricultural Sciences and Veterinary Medicine of Iasi, 3 Mihail Sadoveanu Alley, 700490 Iasi, Romania

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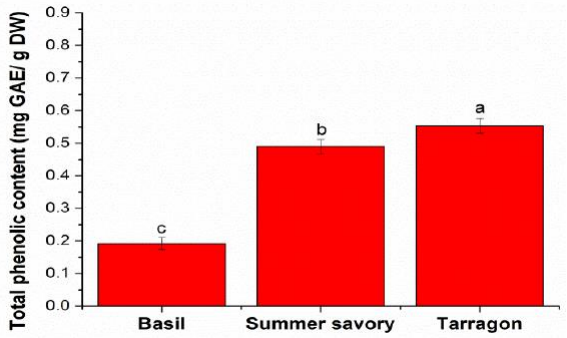

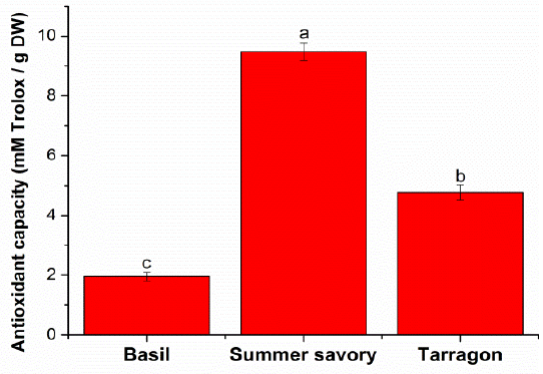

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Article

Antimicrobial Effects of Basil, Summer Savory and Tarragon Lyophilized Extracts in Cold Storage Sausages

Artur Macari [1], Rodica Sturza [1,*], Ildiko Lung [2,*], Maria-Loredana Soran [2], Ocsana Opriș [2], Greta Balan [3], Aliona Ghendov-Mosanu [1], Dan Cristian Vodnar [4] and Daniela Cojocari [3]

1 Faculty of Food Technology, Technical University of Moldova, 9/9 Studentilor Street, MD-2045 Chisinau, Moldova; artur.macari@tpa.utm.md (A.M.); aliona.mosanu@tpa.utm.md (A.G.-M.)
2 National Institute for Research and Development of Isotopic and Molecular Technologies, 400293 Cluj-Napoca, Romania; loredana.soran@itim-cj.ro (M.-L.S.); ocsana.opris@itim-cj.ro (O.O.)
3 Department of Preventive Medicine, "Nicolae Testemitanu State" University of Medicine and Pharmacy, 165 Stefan cel Mare Bd., MD-2004 Chisinau, Moldova; greta.balan@usmf.md (G.B.); daniela.cojocari@usmf.md (D.C.)
4 Faculty of Food Science and Technology, University of Agricultural Sciences and Veterinary Medicine, 3-5 Mănăștur Street, 400372 Cluj-Napoca, Romania; dan.vodnar@usamvcluj.ro
* Correspondence: rodica.sturza@chim.utm.md (R.S.); ildiko.lung@itim-cj.ro (I.L.)

Abstract: The problem of functional foods with bioactive components of natural origin is current for the food industry. Plant extracts rich in polyphenols with antioxidant and antimicrobial activity are a promising source for use in improving the quality and characteristics of fresh meat and meat products. In this context, the purpose of the present study was to evaluate the physico-chemical, microbiological, sensory properties of sausages prepared with the addition of lyophilized extract of basil, thyme or tarragon. For the beginning, the total amount of polyphenols, the antioxidant and antimicrobial activity of the extracts obtained from three spices were evaluated. In the sausages previously infected with *Staphylococcus aureus* and *Escherichia coli* it was observed that there is a much larger number of colonies of microorganisms in the control sample compared to the other samples within 24 and 48 h. Moreover, following the addition of sausage extracts, no changes were found regarding their sensory acceptability.

Keywords: aromatic plants; extracts; antimicrobial activity; sausages; quality

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1. Introduction

The functional foods are considered to be those foods that are intended to be consumed as part of the normal diet and that contain additional biologically active components that offer the potential for increased health or reduced risk of disease [1].

The interest for this category of food products has increased and the aim is to develop standards and guidelines for the development and promotion of such foods. Consumer interest in the relationship between food and health has grown substantially in Europe. There is a much broader recognition that today people can reduce the risk of disease and maintain their health and well-being through a healthy lifestyle, including diet.

The important role of foods such as fruits, vegetables, and whole grains in disease prevention, as well as the latest research on dietary antioxidants and combinations of plant protection substances, has provided an impulse for the development of the functional food market [2].

The use of plant extracts as a source of bioactive compounds is becoming an attractive strategy for improving the quality and characteristics of fresh meat and meat products [3]. Indeed, given their natural origins, bioactive compounds obtained from plants are ideal candidates to replace synthetic antioxidants (generally considered less safe) and to increase the shelf life of meat products. At the same time, these plant extracts can improve, either directly or indirectly, the functional value of meat products [4].

Nr.	Berries	*L. monocytogenes* ATCC 19118 Diameter of the complete growth inhibition zone (mm) 250 mg/ml	Berries	*L. monocytogenes* EGDe Diameter of the complete growth inhibition zone (mm) 250 mg/ml
1.	Sea buckthorn (*extract*)	22.25 … 22.75	Sea buckthorn C_1, C_2 (concentrated hydroalcoholic extract)	30 … 32
2.	Sea buckthorn (*powder*)	16.07 … 16.59	Sea buckthorn H_1, H_2 (hydroalcoholic extract)	29 … 30
5.	Rose-hip (*extract*)	16.07 … 16.59	Rose-hip C_1, C_2 (concentrated hydroalcoholic extract)	20 … 21.5
6.	Rose-hip (*powder*)	17.33 … 18. 17	Rose-hip H_1, H_2 (hydroalcoholic extract)	22 … 22

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Antimicrobial Effects of Berries on *Listeria monocytogenes*

Elisaveta Sandulachi[1], Daniela Cojocari[2], Greta Balan[2], Liliana Popescu[1], Aliona Ghendov-Moșanu[1], Rodica Sturza[1*]

[1]Technical University of Moldova, Chisinau, Republic of Moldova (RM)
[2]"*Nicolae Testemitanu*" State University of Medicine and Pharmacies, Chisinau, Republic of Moldova (RM)
Email: *rodica.sturza@chim.utm.md

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Abstract

The purpose of this study was to first evaluate the antimicrobial effects of powder and extracts of berries (rose-hip, aronia, sea buckthorn and hawthorn) on the development of antibiotic-resistant *L. monocitogenes*. *Listeria monocytogenes* is considered one of the most important pathogens responsible for food-borne infection. Antimicrobial properties were evaluated using the standard Kirby-Bauer disk diffusion method. Bacterial inactivation networks were determined and compared, as well as the possibility of using powders and extracts of berries to control the risk of *Listeria monocytogees* infestation in the milk and dairy industry as well as in the meat industry. The effect of pH (4.78 - 4.43) and water activity (0.90 - 0.80) on the relationship between optical density (OD) at 600 nm and the plate count (CFU ml^{-1}) was investigated for *Listeria monocytogenes*. It was determined Minimum Inhibitory Concentration (MIC), Minimum Bactericidal Concentration (MBC) of berries for *L. monocytogenes*. The most relevant bacteriostatic and bactericidal effect on *L. monocytogenes* in the tested berries demonstrated sea buckthorn and rosehip.

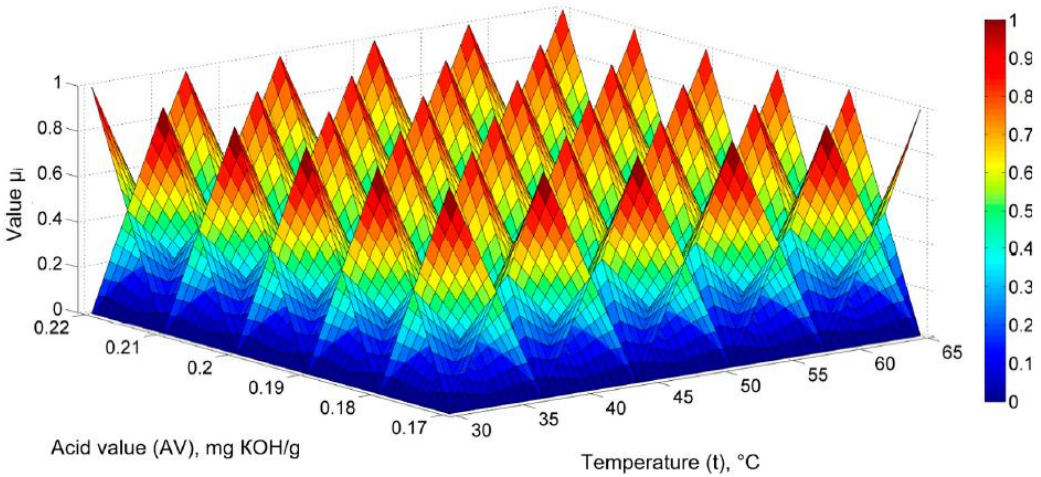
Keywords

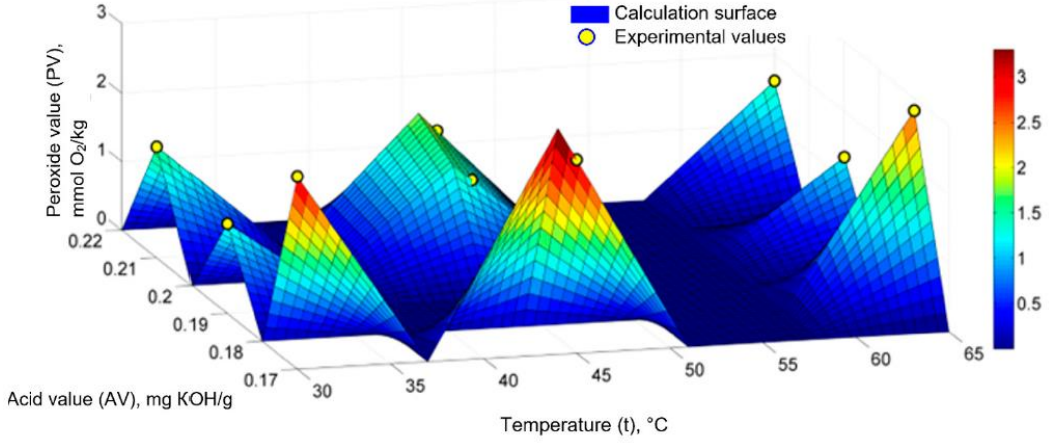
L. monocitogenes, Berries, Kirby-Bauer Test, Minimum Inhibitory Concentration (MIC), Minimum Bactericidal Concentration (MBC)

Proiect de Stat

20.80009.5107.09 Ameliorarea calității și siguranței alimentelor prin biotehnologie și inginerie alimentară

Director de proiect: m.c. AȘM, prof. univ. Rodica Sturza





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Article

Stabilization of Sunflower Oil with Biologically Active Compounds from Berries

Aliona Ghendov-Mosanu [1], Violina Popovici [1], Cristina Gabriela Constantinescu (Pop) [2], Olga Deseatnicova [1], Rodica Siminiuc [1], Iurie Subotin [1], Raisa Druta [1], Adela Pintea [3], Carmen Socaciu [3] and Rodica Sturza [1,*]

1 Faculty of Food Technology, Technical University of Moldova, MD-2045 Chisinau, Moldova; aliona.mosanu@tpa.utm.md (A.G.-M.); violina.popovici@toap.utm.md (V.P.); olga.deseatnicova@toap.utm.md (O.D.); rodica.siminiuc@adm.utm.md (R.S.); iurie.subotin@fta.utm.md (I.S.); raisa.druta@fta.utm.md (R.D.)
2 Faculty of Food Engineering, Ștefan cel Mare University of Suceava, 720229 Suceava, Romania; gabriela.constantinescu@fia.usv.ro
3 Faculty of Veterinary Medicine, University of Agricultural Sciences and Veterinary Medicine, 400374 Cluj-Napoca, Romania; apintea@usamvcluj.ro (A.P.); carmen.socaciu@usamvcluj.ro (C.S.)
* Correspondence: rodica.sturza@chim.utm.md

Abstract: Sunflower oil (*Helianthus annuus*) contains a rich concentration of polyunsaturated fatty acids, which are susceptible to rapid oxidative processes. The aim of this study was to evaluate the stabilizing effect of lipophilic extracts from two types of berries, sea buckthorn and rose hips, on sunflower oil. This research included the analysis of sunflower oil oxidation products and mechanisms, including the determination of chemical changes occurring in the lipid oxidation process via LC-MS/MS using electrospray ionization in negative and positive mode. Pentanal, hexanal, heptanal, octanal, and nonanal were identified as key compounds formed during oxidation. The individual profiles of the carotenoids from sea buckthorn berries were determined using RP-HPLC. The influence of the carotenoid extraction parameters ascertained from the berries on the oxidative stability of sunflower oil was analyzed. The dynamics of the accumulation of the primary and secondary products of lipid oxidation and the variation of the carotenoid pigment content in the lipophilic extracts of sea buckthorn and rose hips during storage demonstrated good stability at 4 °C in the absence of light for 12 months. The experimental results were applied to mathematical modeling using fuzzy sets and mutual information analysis, which allowed for the prediction of the oxidation of sunflower oil.

Keywords: sunflower oil; carotenoids; sea buckthorn; rose hips; lipid oxidation; oxidative stability

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Citation: Ghendov-Mosanu, A.; Popovici, V.; Constantinescu (Pop), C.G.; Deseatnicova, O.; Siminiuc, R.; Subotin, I.; Druta, R.; Pintea, A.; Socaciu, C.; Sturza, R. Stabilization of Sunflower Oil with Biologically Active Compounds from Berries. *Molecules* **2023**, *28*, 3596. https://doi.org/10.3390/molecules28083596

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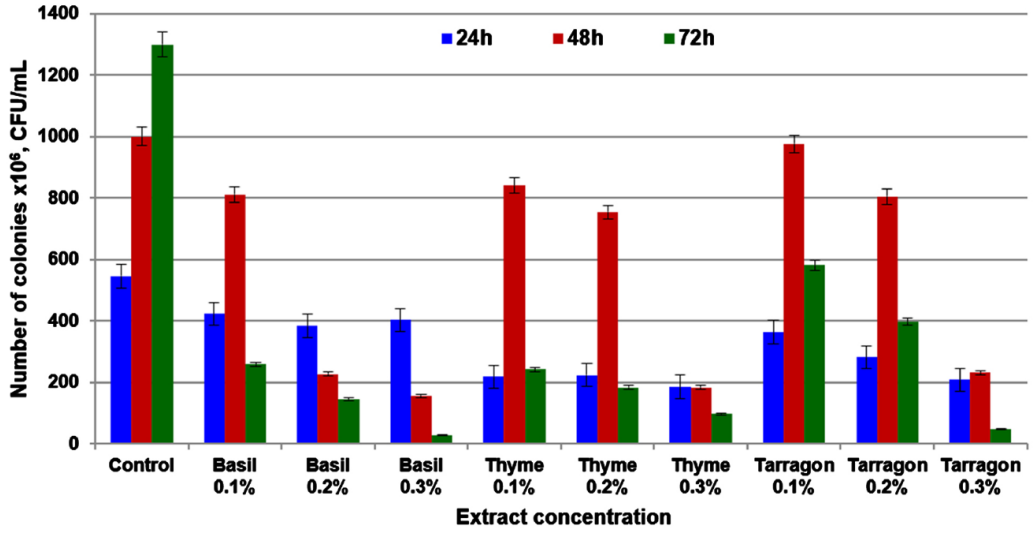
1. Introduction

A permanent concern in the modern food industry is to ensure an optimal shelf life of food products. The main factor that leads to food spoilage is oxidation [1,2]. Oxidation is a chemical process involving the modification of fatty acids, amino acids, and vitamins, which, in turn, affects the organoleptic and nutritional characteristics of food [3,4].

The oxidation of lipids in food is a complex process that is influenced by various factors, such as the chemical structure of the food; the food's physical condition; the quantity and quality of substances that act as antioxidants in food; and the processing, packaging, and storage conditions of the food. Lipids are an easily alterable fraction of food, so their storage conditions largely depend on their nature and concentration. The consequences of this process, which are precipitated by the degradation of some easily oxidizable constituents of the lipid fraction in food, can include the appearance of a rancid odor, color changes, and, in some cases, changes in food texture, which negatively influence the sensory parameters of food [5]. The nutritional value of foods subjected to oxidative degradation of their lipid fraction can also be affected to a considerable extent. However,

Name of the sample	Concentration, %	Incubation time, h						
		0	24		48		72	
		ln$X$	ln$X$	GM*, μ	ln$X$	GM, μ	ln$X$	GM, μ
Control		12.21	20.11	0.33 ± 0.01	20.72	0.18 ± 0.02	20.99	0.12 ± 0.01
Basil	0.1	12.21	19.87	0.32 ± 0.02	20.52	0.17 ± 0.01	19.30	0.10 ± 0.01
	0.2	12.21	19.76	0.31 ± 0.01	19.24	0.15 ± 0.02	19.03	0.09 ± 0.01
	0.3	12.21	10.82	0.32 ± 0.01	18.87	0.14 ± 0.01	18.40	0.09 ± 0.01
Thyme	0.1	12.21	19.20	0.29 ± 0.01	20.55	0.17 ± 0.01	19.37	0.10 ± 0.01
	0.2	12.21	19.23	0.29 ± 0.01	20.44	0.17 ± 0.01	18.79	0.09 ± 0.01
	0.3	12.21	19.04	0.28 ± 0.02	19.03	0.14± 0.02	17.18	0.07 ± 0.01
Tarragon	0.1	12.21	19.71	0.31 ± 0.01	20.70	0.18 ± 0.01	20.18	0.11 ± 0.01
	0.2	12.21	19.46	0.30 ± 0.02	20.51	0.17 ± 0.01	19.80	0.11 ± 0.01
	0.3	12.21	19.15	0.29 ± 0.01	19.26	0.15 ± 0.01	17.69	0.08 ± 0.01

*Note: GM—Growth Monitoring.



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Antioxidant and Antimicrobial Activity of Basil, Thyme and Tarragon Used in Meat Products

Elisaveta Sandulachi[1], Artur Macari[1], Aliona Ghendov-Mosanu[1*], Daniela Cojocari[2*], Rodica Sturza[3]

[1]Department of Food Technology, Technical University of Moldova, Chisinau, Republic of Moldova
[2]Department of Preventive Medicine, "Nicolae Testemitanu" State University of Medicine and Pharmacy, Chisinau, Republic of Moldova
[3]Department of Oenology and Chemistry, Technical University of Moldova, Chisinau, Republic of Moldova
Email: *aliona.mosanu@tpa.utm.md, *daniela.cojocari@usmf.md

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Abstract

Currently, the food industry, including the meat industry, is paying close attention to the use of natural additives as preservatives. From ancient times, the plants are used to treat various diseases, to produce perfumes and as ingredients to improve the taste in food. This paper presents a bibliographic and experimental study of the antioxidant and microbial properties of basil, thyme and tarragon. International scientific papers on the use of these plants in the food industry, including the meat industry, are targeted. The role of basil, thyme and tarragon in the manufacture of functional and stable products in storage is mentioned. Percentage decrease in *Salmonella Abony* growth under the influence of basil constituted 84.4%, thyme 61.6% and tarragon 76.8% after 48 hours of action and respectively 97.2%, 90.2% and 95.3% after 72 hours of action. The interdependence between the percentage reduction of S. Abony infestation and the concentration of basil, mushrooms and tarragon was respectively: basil (R^2 = 0.7725 … 0.7916), thyme (R^2 = 0.7733 … 0.7768), tarragon (R^2 = 0.7689 … 0.8137).

Keywords

Basil, Tarragon, Thyme, Antimicrobial Activity, Antioxidant Activity, Meat Products

Compounds/Properties	Quantity
Polyphenols	
Total polyphenols (Folin-Ciocalteu), mg GAE/100 g	1468 ± 42
Total polyphenols (Abs280), mg GAE/100 g	1343 ± 176
Total flavonoids, mg GAE/100 g	525 ± 20
Cinnamic acids, mg CAE/100 g	383 ± 18
Flavonols, mg QE/100 g	242 ± 23
Catechin, mg/100 g	130.00 ± 10.00
Ferulic acid methyl ester, mg/100 g	13.80 ± 0.80
p-hydrozybenzoic acid, mg/100 g	10.70 ± 1.00
Procyanidin B1, mg/100 g	8.50 ± 0.80
Epicatechin, mg/100 g	7.40 ± 1.80
Gallic acid, mg/100 g	3.90 ± 0.10
Syringic acid, mg/100 g	3.70 ± 1.80
Polydatine, mg/100 g	3.70 ± 0.10
Chlorogenic acid, mg/100 g	2.80 ± 1.70
Ferulic acid, mg/100 g	2.50 ± 1.70
Caffeic acid, mg/100 g	2.10 ± 1.40
Protocatechuic acid, mg/100 g	1.80 ± 0.20
Quercetin, mg/100 g	1.20 ± 0.20
Sinapic acid, mg/100 g	0.70 ± 0.10
Vanillic acid, mg/100 g	0.40 ± 0.30
p-coumaric acid, mg/100 g	0.40 ± 0.10
cis-resveratrol, mg/100 g	0.20 ± 0.10
trans-resveratrol, mg/100 g	0.10 ± 0.10
Procyanidin B2, mg/100 g	Traces
Gentisic acid, mg/100 g	Traces
Organic acids	
Malic acid, mg/100 g	333.70 ± 11.2
Citric acid, mg/100 g	19.32 ± 1.41
Ascorbic acid, mg/100 g	2.08 ± 0.10
Succinic acid, mg/100 g	12.84 ± 0.52
Acetic acid, mg/100 g	7.58 ± 0.25
Carotenoids	
Total carotenoids, mg/100 g	21.65 ± 0.27
Carotenoid bioaccessibility, %	15.3 ± 1.89
Zeaxanthin, mg/100 g	1.11 ± 0.10
β-cryptoxanthin, mg/100 g	1.37 ± 0.08
cis-*β*-carotene, mg/100 g	0.15 ± 0.01
all-*trans*-*β*-carotene, mg/100 g	1.78 ± 0.15
γ-carotene, mg/100 g	0.10 ± 0.01
Antioxidant activity	
Antioxidant activity (ABTS), mmol TE/100 g	5.84 ± 0.34
Antioxidant activity (DPPH), µmol TE/100 g	1084 ± 16

ABTS = 2,20-azino-bis-3-ethylbenzthiazoline-6-sulphonic acid, DPPH = 2,2-diphenyl-1-picrylhydrazyl-hydrate.

Temperature, Storage Conditions, pH, and Ionic Strength on the Antioxidant Activity and Color Parameters of Rowan Berry Extracts. *Molecules* **2021**, *26*, 3786. https://doi.org/10.3390/molecules26133786

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Article

The Influence of Temperature, Storage Conditions, pH, and Ionic Strength on the Antioxidant Activity and Color Parameters of Rowan Berry Extracts

Elena Cristea [1], Aliona Ghendov-Mosanu [1,*], Antoanela Patras [2], Carmen Socaciu [3], Adela Pintea [3], Cristina Tudor [3] and Rodica Sturza [1]

[1] Department of Oenology and Chemistry, Food Technology, Faculty Food Technology, Technical University of Moldova, 9/9 Studentilor Street, MD-2045 Chisinau, Moldova; cristea.ele@gmail.com (E.C.); rodica.sturza@chim.utm.md (R.S.)
[2] Department of Sciences, Faculty of Horticulture, "Ion Ionescu de la Brad" Iasi University of Life Sciences, 3 Mihail Sadoveanu Alley, 700490 Iasi, Romania; apatras@uaiasi.ro
[3] Department of Chemistry and Biochemistry, Faculty of Veterinary Medicine, University of Agricultural Sciences and Veterinary Medicine Cluj-Napoca, Manastur Street, 3–5, 400372 Cluj-Napoca, Romania; csocaciudac@gmail.com (C.S.); apintea@usamvcluj.ro (A.P.); cristina.tudor@usamvcluj.ro (C.T.)
* Correspondence: aliona.mosanu@tpa.utm.md

Abstract: Recent trends in the food industry combined with novel methods in agriculture could transform rowan into a valuable raw material with potential technological applications. Thus, the aim of this research was to investigate the content of bioactive compounds in its fruits and to assess the color and antioxidant stability of the extracts prepared from such fruits during various thermal treatments and at different pH and ionic strength values. Various spectrophotometric methods, HPLC, and capillary electrophoresis were used to quantify the concentrations of bioactive compounds—polyphenols, carotenoids, organic acids, and to assess antioxidant activity and color. The results show that rowan berries contain circa 1.34–1.47 g/100 g of polyphenols among which include catechin, epicatechin, ferulic acid methyl ester, procyanidin B1, etc.; ca 21.65 mg/100 g of carotenoids including zeaxanthin, *β*-cryptoxanthin, all-*trans*-*β*-carotene, and various organic acids such as malic, citric, and succinic, which result in a high antioxidant activity of 5.8 mmol TE/100 g. Results also showed that antioxidant activity exhibited high stability when the extract was subjected to various thermal treatments, pHs, and ionic strengths, while color was mainly impacted negatively when a temperature of 100 °C was employed. This data confirms the technological potential of this traditional, yet often overlooked species.

Keywords: rowan berries; antioxidant activity; CIELab color parameters; polyphenols; carotenoids; bioaccessibility; organic acids; stability

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1. Introduction

Sorbus aucuparia L. is a *Rosaceae* family species interesting for its bright-colored yellow compounds which also possess functional properties. Some of its common names are mountain ash, rowan, keirn, cuirn, and witch wiggin tree. Native to the cooler regions of the northern hemisphere, it used to grow most often at high altitudes. Nowadays, this tree also serves for decorative purposes and can be seen in gardens and parks [1].

Its bright scarlet fruits are also known for their high content in potassium, calcium, and phosphorus, vitamin C, unsaturated fatty acids, and polyphenols, although discrepancies in concentrations due to growing region and climatic conditions have been reported. For the aforementioned reasons, many authors expressed support for future

Proiect de Stat

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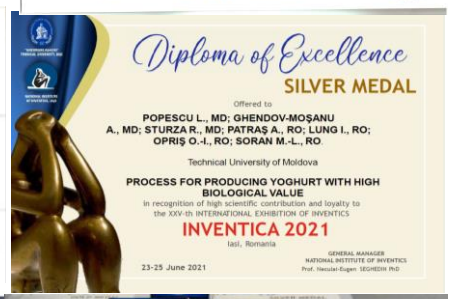

Proiect de Stat

20.80009.5107.09 Ameliorarea calității și siguranței alimentelor prin biotehnologie și inginerie alimentară

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Teze de doctor/doctor habilitat susținute în cadrul proiectului

1. **RADU Oxana.** Compoziţii alimentare pe baza uleiului de nucă (Juglans regia L.) rezistente la degradări oxidative. Conducători științifici: TATAROV Pavel; BAERLE Alexei.

2. **POPOVICI Violina.** Stabilizarea uleiurilor vegetale cu compuși biologic activi din surse regenerabile. Conducător științific: STURZA Rodica.

3. **BALAN Mihail.** Procesul de uscare a semințelor de struguri în strat suspendat. Conducători științifici: BERNIC Mircea, ȚISLINSCAIA Natalia.

4. **BOIȘTEAN Alina.** Optimizarea tehnologiei și caracterizarea calității oțetului de vin autohton. Conducător științific: CHIRSANOVA Aurica, consultant științific: GĂINĂ Boris.

5. **MELENCIUC Mihail.** Uscarea perelor în atmosferă modificată de CO2. Conducător științific: ȚISLINSCAIA Natalia.

6. **VIȘANU Vitali.** Elaborări teoretice și practice privind metoda combinată de deshidratare a fructelor de piersic. Conducători științifici: BERNIC Mircea, ȚISLINSCAIA Natalia.

7. **GHENDOV-MOȘANU Aliona.** Obținerea și stabilizarea unor coloranți, antioxidanți și conservanți de origine vegetală pentru alimente funcționale. Consultant științific: STURZA Rodica.