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BARRY CALLEBAUT

Banvit

Stable Micro Systems
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NUH'UN ankara MAKARNASI

GURME Sayak

1st International / 11th National FOOD ENGINEERING CONGRESS

1st International / 11th National

FOOD ENGINEERING CONGRESS

1. Uluslararası / 11. Ulusal

GIDA MÜHENDİSLİĞİ KONGRESİ

7-9 November / Kasım 2019
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Dear Colleagues,

Chamber of Food Engineers has been organizing The Food Engineering Congress regularly since 1992. With the great experience and knowledge gained over the years we have decided transform it into an international congress. Hence we are organizing the 1st International / 11th National Food Engineering Congress on November 7-9, 2019 in Antalya.

We hope to come together stakeholders of the sector from around the World in our Congress. This book contains abstract/ full text of oral and poster presentations to be submitted for three days.

I would like to thank; the members of the Organizing Committee and the Scientific Committee, who work during the organization of our congress; our invited speakers, the participants who give an oral and poster presentations, the participants who listen and discuss these valuable studies and the supporting institutions.

With best regards,

Kemal Zeki Taydaş
Congress Chair

1st International / 11th National Food Engineering Congress
Poster Presentation Program
(7-8-9 November 2019)

1. Effect of Different Drying Methods on The Essential Oil Content and Composition of Kumquat (Fortunella margarita Swingle)
   Demet Yildiz Turgut, Kadriye Yüksel, Orçun Çınar
   Batı Akdeniz Agricultural Research Institute, Antalya

2. Determination of Drying Characteristics of Crimson Seedless Grape Variety
   Ahmet Candemir, Ali Güler, Kadir Emre Özaltın, Fatma Belgin Aşıklar
   Viticulture Research Institute, Manisa, Turkey

3. Effect of Different Drying Techniques On Some Functional Properties of Semidried Fig
   Nilgün Tan, Ramazan Konak, Erdem Çiçek
   Fig Research Institute, Aydın, Turkey

4. Fatty Acid Composition of Fig Seed Oil Obtained by Different Methods
   Ramazan Konak[1], Demet Yildiz Turgut[2], Erdem Çiçek[1], Nilgün Tan[1]
   [1]*Fig Research Institue, Aydın, Turkey*
   [2]*Batı Akdeniz Agricultural Research Institue, Antalya, Turkey*

5. Investigation of the changes on some quality parameters of semi-dried figs during storage period
   Erdem Çiçek, Ramazan Konak, Nilgün Tan, Gül Kuruoğlu Aşçı
   Fig Research Institute, Aydın, Turkey

6. Use of Fining Agents in Fig Juice Production
   Hafizenur Şengül Binat, Ramazan Konak, Nilgün Tan, Erdem Çiçek, Ziya Binat
   Fig Research Institute, Aydın, Turkey

7. The Role of Dairy Products on weight management and obesity
   Zeynep Dayıoğlugil
   TAT Gıda Sanayi A.Ş., R&D, Bursa, Turkey

8. Determination of Crystallization Parameters and Textural Stability in Soft Caramel Dragee Confectionery
   Özge Eyyüpoğlu, M.Ali Marangoz
   Durukan Confectionery R&D Centre, Ankara, Turkey
9. Investigation of the Effects of Ultrasonic Treatment on Collagen Stability
   Özge Ata[1], Şebnem Tavman[2], Burcu Kaplan Türköz[2]
   [1]*Graduate School of Natural and Applied Science, Ege University, İzmir, Turkey*
   [2]*Department of Food Engineering, Ege University, İzmir, Turkey*

10. Organic Acid Compositions of Sultani Çekirdeksiz and Cabernet Sauvignon Sour Grape Juices
    Ali Güler, Kadir Emre Özaltin, Ahmet Candemir
    Viticulture Research Institute, Manisa, Turkey

11. Determination of the Correlations between Total Phenolic Content and Antioxidant Activity in the Grape Juice
    Ali Güler, Ahmet Candemir, Kadir Emre Özaltın
    Viticulture Research Institute, Manisa, Turkey

12. The Effects of Antimicrobials in Food on Probiotic Bacteria
Aysun Sağlam[1], Kamil Bostan [2], Nagihan Kalintaş[3]
[1]*Food Quality Control Analysis, İstanbul Aydın University, İstanbul, Turkey*
[2] *Gastronomy and Culunary arts, İstanbul Aydın University, İstanbul, Turkey*
[3]*Food Teghnology, İstanbul Aydın University, İstanbul, Turkey*

13. Fed Batch Production of Polygalacturonase and Pectin Lyase Enzymes Using Apple Pomace as Feedstock
Deniz Çekmecelioğlu, Ayşe Güneruz
Department of Food Engineering, Middle East Technical University, Ankara, Turkey

14. Comparative Study of Microbial Oil Production Using *Lipomyces starkeyi* and *Rhodosporidium toruloides* Yeasts
Nermin Gürel, Deniz Çekmecelioğlu
Department of Food Engineering, Middle East Technical University, Ankara, Turkey

15. Effects of Microwave Heating On Electrospinning of Carob Bean Flour Based Nanofibers
Eylül Uygun, Gülüm Şumnu, Serpil Şahin, Eda Yıldız
Department of Food Engineering, Middle East Technical University, Ankara, Turkey

16. Textural Properties of Pastırma Types with Transglutaminase
Fatma Yağmur Hazar[1], Güzin Kaban[2], Mükerrem Kaya[2]
[1] *Department of Food Engineering, Kastamonu University, Kastamonu, Turkey*
[2] *Department of Food Engineering, Atatürk University, Erzurum, Turkey*

17. Investigation of the Liquid Form of Energy Drinks Composition in Terms of Inositol, Taurine, Glucoronolactone
Pınar Manarga Birlik, Ayşe Binnur Karataş, İbrahim Emre Tokat
Food Additives and Residues Department, Central Research of Institute of Food and Feed Control, Bursa, Turkey

18. The Importance of Innovative Entrepreneurship in Food and Beverage Businesses and a Successful Case Study
Kamuran Öztop
Department of Hotel, Restaurant and Catering, Toros University, İçel, Turkey

19. Effect of Fat Content on Aroma Release and Rheological Properties of Dairy Desserts
Müge Baysal, Yeşim Elmacı
Department of Food Engineering, Ege University, Izmir, Turkey

20. Utilization of fruit and vegetable wastes for production of lignocellulosic materials and its potential use in food industry
Fahriye Ayrıç, Taner Baysal
Department of Food Engineering, Ege University, Izmir, Turkey

21. The Molecular Imprinting Method: A Rapid and Easy Method for the Detection of Microorganisms in Food
Funda Demir, Zerrin Erginkaya, Gözde Konuray
Department of Food Engineering, Çukurova University, Adana, Turkey

22. Ultrasound Applications for Surface Cleaning In Dairy Industry
Turkuaz Ecem Oğul[1], Elif Belbez[1], Şule Keyik[2], Elif Ercioğlu[1], Zeynep Dayioğlugil[1]
Tat Gıda Sanayi A.Ş., R&D, Bursa, Turkey

23. Hydroxymethyl Furfural Formation In Grape And Pomegranate Juices Over Heating Treatments
Idil Tekin, Ayça Akyüz, Seda Ersus Bilek
Department of Food Engineering, Ege University, İzmir, Turkey

24. Training Materials for Bakery Sector
Arzu Yavuz[1], Yildiray Istanbullu[1], Nurcan AYSAR Guzelsoy[1], Filiz Çavuş[1], Nazan Çöplü[1], Ozlem Isik[1], Sirli Rosenvald[2], Sorin Iorga[3], Sibel Tokat[4], Emre Demir[5], Ahmet Budaklier[6]
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[2]Center of Food and Fermentation Techniques, Estonia
[3]National Institute of Research and Development for Food Bioresources, Romania
[4]Bursa Directorate of Provincial Agriculture and Forestry, Turkey
[5]Bursa Metropolitan Municipality, Bursa Bread and Nutrition Industry and Trade Inc, Turkey
[6]General Directorate of Agricultural Research and Policies, Turkey

25. Date Seed Coffee
Nuray Can, Aysun Sağlam
Food Quality Control and Analysis Programme, Anadolu Bil Vocational School, Istanbul Aydın University, İstanbul, Turkey

26. Gilaburu Fruit
Nuray Can, Aysun Sağlam
Food Quality Control and Analysis Programme, Anadolu Bil Vocational School, Istanbul Aydın University, İstanbul, Turkey

27. Innovative Packaging Application in Meat Technology
İklime Özcan Öztürk[1], Furkan Türker Sarıcaoğlu[2]
[1]Köfteci Yusuf, Plant Quality Management, Bursa, Turkey
[2]Department of Food Engineering, Bursa Technical University, Bursa, Turkey

28. Effect of Formulation on the Glass Transition Temperature of Sugar Confectionery during Storage
Suzan Tireki[1,2], Gülüm Şumnu[1], Serpil Şahin[1]
[1]Department of Food Engineering, Middle East Technical University, Ankara, Turkey
[2]Department of Food Engineering, Istanbul Sabahattin Zaim University, Istanbul, Turkey

29. Physicichemical Properties of Starch Gels Prepared in Milk Samples with Different Fat Content
Ayşegül Bilgiç, Sedat Sayar
Department of Food Engineering, Mersin University, Mersin, Turkey

30. Physicochemical Properties of Crouton Produced From Full and Par-Baked Bread
Demet Manap, Sedat Sayar
Department of Food Engineering, Mersin University, Mersin, Turkey

31. Development of Soft Textured Ready-To-Eat Intermediate Moisture Mango Products by Pasteurization: A Comparative Study with Different Caltuvars
Gözde Bostanoğlu, Damla Öykü Şahin, Dilara Okut, Ali Nalbant
K.F.C. GIDA A.Ş., R&D Center, Izmir, Turkey

32. Phenolic compounds of *Eremurus spectabilis* Bieb. From Liliaceae family
Nurcan Ayşar Güzelsoy, Filiz Çavuş
Central Research Institute of Food and Feed Control, Bursa, Turkey

33. Food Allergens and Bioinformatics Methods
Asuman Adali[1], Aysun Genç[2], Burcu Kaplan Türköz[2], Bahar Bakar[1]
[1]*Graduate School of Natural & Applied Sciences, Department of Food Engineering, Ege University, Izmir, Turkey*
[2] *Department of Food Engineering, Ege University, Izmir, Turkey*

34. Characterization of the filamentous fungal flora of Konya mold-ripened tulum cheese
Meryem Seri, Banu Metin
Department of Food Engineering, Istanbul Sabahattin Zaim University, Istanbul, Turkey

35. The Presence Of Allergens In Meat Products And A General Look On Current And New Detection Techniques
Pelin Özkaya, Semra Kayaardı
Department of Food Engineering, Manisa Celal Bayar University, Manisa, Turkey

36. The Effects of Chocolate with Different Rheological Properties on Quality Characteristics of Chocolate Coated Wafer
Gökşen Işık[1,2], Elif Yakışık[1], Ömer Said Toker[1]
[1] *Department of Food Engineering, Yildiz Technical University, İstanbul, Turkey*
[2] *Detay Food & Trade Co., İstanbul, Turkey*

37. The Effect of Cocoa Masses with Different Geographical Origin on Bitter Chocolate Quality
Öznur Kargı[1,2], Fatma Ebru Fıratlıgil[2]
[1]*Detay Food & Trade Co., İstanbul, Turkey*
[2] *Department of Food Engineering, Istanbul Technical University, Istanbul, Turkey*

38. Functional Gummy with Containing Vitamin D and Calcium
Dilara Aktay, Kübra Toprak
Kervan Gıda, R&D, İstanbul, Turkey

39. Considerations and Applied Methods of Preserving the Viability of Probiotics during Food Processing and Storage
Kamuran Öztop[1], Zerrin Erginkaya[2], Gözde Konuray[2]
[1]*Department of Hotel, Restaurant and Catering, Vocational School, Toros University, İçel, Turkey*
[2]*Department of Food Engineering, Çukurova University, Adana, Turkey*

40. Edible Film Production from Low Level Esterification Beet Pulp Pectin and Its Applications in Food Material
Mehmet Akbulut, Hacer Çoklar, Hülya Çabuk, Beyza Özcoşkun, Gizem Şahin
Department of Food Engineering, Selcuk University, Konya, Turkey

41. Using Egg as a Fat Substituent in the Production of Diet Block Type Melting Cheese
Hasan Cankurt[1], Hasan Yetim[2], Ramiz Yüksel[3]
[1]*Department of Food Technology, Safiye Cikrikcioglu Vocational School, Kayseri University, Kayseri, Turkey*
[2]*Department of Food Engineering, İstanbul Sabahattin Zaim University, İstanbul, Turkey*
[3]*Ministry of Agriculture and Forestry, Food Inspection, Kayseri, Turkey*

42. The Importance Given To Food Safety in Tourism
Hüseyin Doğan Bozkurt[1], Ecem Aydin[2]
[1]*Department of Food Engineering, İzmir Institute of Technology, Izmir, Turkey*
[2]*Department of Food Engineering, Ege University, Izmir, Turkey*

43. Determination of the bacterial profile during the production process of pastırma
Alya Toy, Banu Metin
Department of Food Engineering, Istanbul Sabahattin Zaim University, Istanbul, Turkey

44. Development of Pan Release Oil for High Sugar Cake Dough, and Quality & Performance Measurement of These Oils
F.Nevin Başaran[1], Ferda Altuner[1], Fahri Yemişçioğlu[2], Candaş Aytekin[1], Muzaffer Kamil Çelebi[1], Temel Demirci[1], Nurten Gökçen[1], Yusuf Özgür Anuk[1]
[1]Besler Gıda ve Kimya San. ve Tic. A.Ş. R&D Center, Istanbul, Turkey
[2] Department of Food Engineering, Ege University, İzmir, Turkey, İzmir, Turkey

45. Synthesis of Neohesperidine Analogies, Investigation of Their Texture and Biochemical Properties
Simge Kaya[1,2], Salih Tuncay[1]
[1]Food Technology Program, Uskudar University, Istanbul, Turkey
[2]Food Safety Program, Istanbul Aydın University, Istanbul, Turkey

46. Use of Carob Powder as Cocoa Alternative in Compound Chocolate Formulation
Esra Akdeniz[1], Büşra Turan[1], Sedef Akkin[1], Ece Tipigil[1], Elif Yakişik[1], Ömer Said Toker[1], Özge Özcan[2]
[1]Department of Food Engineering, Yıldız Technical University, Istanbul, Turkey
[2]Elvan Gıda San. Tic. A.Ş., Istanbul, Turkey

47. Geranium (*Pelargonium graveolens*) Flavored Boza
Burak Aydoğan, Büşra Sarataş, Ekin Toprak Demir, Müge Yılmaz, Fırat Çınar, Salih Aksay
Department of Food Engineering, Mersin University, Mersin, Turkey

48. Quality Changes in Sous-Vide Cooked Meat
Esra Derin, Fatma Meltem Serdaroğlu
Graduate School of Natural and Applied Sciences, Department of Food Engineering, Ege University, Izmir, Turkey

49. Fishbone as a Source of Food Ingredient and Supplement
Birsen Öktem, Gizem Erk, Özlem Çağindi, Nazlı Savlak, Ergun Köse
[1]Department of Food Engineering, Manisa Celal Bayar University, Manisa, Turkey

50. The Usage of Exopolysaccharides in Food Industry
Zeynep Kurt, Özlem Turgay
Department of Food Engineering, Kahramanmaraş Sütçü Imam University, Kahramanmaraş, Turkey

51. Application of Probiotic in Dairy Products: Potential Health Benefits
Nusiba Alsiddig Badawi, Nihat Akın,
Department of Food Engineering, Selcuk University, Konya, Turkey

52. Factors Affecting Fermentable Sugar Extraction of Household Tea Wastes
Gizem Murat, Ahsel Özgü Gürel, Sümeyya Selçuk, Sena Nur Ertürk, Sibel Uzuner
Department of Food Engineering, Bolu Abant Izzet Baysal University, Bolu, Turkey

53. Investigation of the Effect of Microwave-Vacuum Drying on the Quality Characteristics of Rosehips
Mahir Cin, Tunç Koray Palazoğlu
Department of Food Engineering, Mersin University, Mersin, Turkey

54. Impact of Surface Type on the Resistance of *Candida albicans, Staphylococcus aureus* and *Listeria monocytogenes* Biofilms to UV-C
Elif Çetin[1], Mert Üreğen[2], Ayşe Handan Baysal[1]
[1]Department of Food Engineering, İzmir Institute of Technology İzmir, Turkey
[2]Department of Biotechnology, İzmir Institute of Technology, İzmir, Turkey

55. UV-C Irradiation for Inactivation of Escherichia coli O157:H7, Listeria monocytogenes and Staphylococcus aureus on Strawberries and Redberries
Irmak Piril Yildirim, Damla Bulut, Ayşe Handan Baysal
Department of Food Engineering, İzmir Institute of Technology İzmir, Turkey

56. Buffalo Milk and Products Manufactured From Buffalo Milk
Esma Ayata, Hatice Aydemir, Selin Demir, Özge Duygu Okur
Department of Food Engineering, Zonguldak Bulent Ecevit University, Zonguldak, Turkey

57. Donkey Milk as an Alternative Functional Product
Büşra Azgi, Fatma Dinç, Gülşah Albayrak, Özge Duygu Okur
Department of Food Engineering, Zonguldak Bulent Ecevit University, Zonguldak, Turkey

58. Probiotics and Their Areas of Utilization in Milk Industry
Büşra Yerli, Büşra Ateş, Özge Duygu Okur
Department of Food Engineering, Zonguldak Bulent Ecevit University, Zonguldak, Turkey

59. Functional Food Products Produced Using Kefir and Kefir Cultures
Eda Artan, Yücel Tulumoğlu, Özge Duygu Okur
Department of Food Engineering, Zonguldak Bulent Ecevit University, Zonguldak, Turkey

60. Rheological Behavior of a New Analogue Cheese Obtained From Peanut
Hubert Eudier[1], Salma Ben-Harb[1], Jean-paul Lorand[1], Fabien Duthil[1], Jean-marc Saiter[2], Monique Chan-Huot[3]
[1]ONYX DEVELOPPEMENT SAS, R&D, Malaunay, France
[2]Université de Rouen, Faculté des Sciences, Laboratoire SMS, Rouen, France
[3]ONYX DEVELOPPEMENT, R&D, Malaunay, France

61. Ohmic Heating Assisted Extraction of Natural Coloring Matters From Foodstuffs
Buse Melek Çabas, Filiz Içier
Department of Food Engineering, Ege University, İzmir, Turkey

62. The Potential of Using Olive Oil Biophenols against to Cancer Stem Cell
Didar Üçüncüoğlu
Department of Food Engineering, Cankiri Karatekin University, Cankiri, Turkey

63. Drying of Quince Puree with Maltodextrin by Different Drying Methods: Some Physical Properties
Özle Ünlüeroğlugil, Safiye Nur Dirim
Department of Food Engineering, Ege University, Izmir, Turkey

64. Determination of Chemical, Biochemical, Microbiological, Color and Sensorial Characteristics of Tulum Cheeses Sold in Bolu Markets
Hayri Coşkun, Ercan Sarıca, Sümeyra Eser, Merve Demirtaş
Department of Food Engineering, Bolu Abant İzzet Baysal University, Bolu, Turkey

65. Dilactone Limonene Level of Orange Concentrate Produced In Turkey and Brazil
Öyküm B. Esen, Duygu Çabuk
Dimes Food LTD., Izmir, Turkey

66. Research on the Effects of Vegetable Fibers on Veal Burger and Meatball Products
Rana Burukoğlu[1], Emine Hararcı[2]
[1]Department of Food Engineering, Selçuk University, Konya, Turkey
[2]Milk and Dairy Products Technology Program, Karacabey Vocational High School, Uludağ University, Bursa, Turkey

67. Preparation and Characterisation of Chickpea Flour-based Biodegradable Films Reinforced with Rice Starch Nanoparticles
Buse Aşık, Kübra Ertan, Serpil Şahin
Department of Food Engineering, Middle East Technical University, Ankara, Turkey

68. The Effect of Microfluidization Process on Morphology of Legume Flours based Nanofibers Produced by Electrospinning Method
Seren Oğuz, Nilay Tam, Ayça Aydoğdu, Gülüm Şumnu, Serpil Şahin
Department of Food Engineering, Middle East Technical University, Ankara, Turkey

69. Kinetics of Drying, Transport Properties and Hardness of Pear Coated with Chitosan
Nasim Kian-Pour, Sukru Karatas
Department of Food Engineering, Istanbul Aydin University, Istanbul, Turkey

70. Effect of Different Sugar Replacers on No Sugar Added High Protein Ice Cream Physical Properties
Cansu Sağlam, Ece Çelebi
Unilever Algida R&D Center, İstanbul, Turkey

71. Effect of Edible Coating Formulated with Gelatin, Chitosan and Rosemary Extract on the Quality of Pearl Mullet Fillets during Cold Storage at +4°C
Doğukan Özay, Gökhan Boran
Department of Food Engineering, Van Yüzüncü Yıl University, Van, Turkey

72. Effect of Frying On Viscosity of Hazelnut Oil
Ayhan Baştürk[1], M. Murat Ceylan[2]
[1]*Department of Food Engineering, Van Yüzüncü Yıl University, Van, Turkey*
[2]*Department of Food Engineering, Iğdır University, Iğdır, Turkey*

73. Effect of Different Extraction Methods on Fatty Acid Composition of Black Cumin and Linseed Oils
Kübra Sadiksoy, Tahir Yücel, İsa Cavidoğlu
Department of Food Engineering, Van Yüzüncü Yıl University, Van, Turkey

74. Use of Solid State Fermentation Technique in Natural Color Pigment Production
Seda Sarıyıldız[1], Mehmet Yekta Göksungur[1], Sayit Sargın[2]
[1]*Department of Food Engineering, Ege University, İzmir, Turkey*
[2]*Department of Bioengineering Department, Ege University, İzmir, Turkey*

75. Some Instrumental Characteristics of Chicken Skin Gelatin in Comparison with Commercial Gelatins from Different Sources
Ümran Cansu[1], Gökhan Boran[2]
[1]*Technical Sciences Vocational School, Harran University, Şanlıurfa, Turkey*
[2]*Department of Food Engineering, Van Yüzüncü Yıl University, Van, Turkey*

76. Examination of the Texture Properties of Bakery Product
Lütfü Aysu, Necdet Aydın
Kerevitaş Gıda Sanayi Ticaret A.Ş / R&D Centre, Bursa, Turkey

77. The Usage of Bacteriophages in Food Preservation
Yusuf Tunçtürk, Neşe Badak
Department of Food Engineering, Van Yuzuncu Yil University, Turkey

78. Comparison the Quality Characteristics of Herby Cheeses Produced In Traditional and Industrial Conditions
Yusuf Tunçtürk[1], Mubin Koyuncu[2], Neşe Badak[1]
[1]*Department of Food Engineering, Van Yuzuncu Yil University, Turkey*
[2]*Department of Food Engineering, Igdır University, Turkey*

79. Microbial profile of the traditional beverage shalgam during the fermentation period
Banu Metin, Emine Sena Kafkaskiray
Department of Food Engineering, Istanbul Sabahattin Zaim University, Istanbul, Turkey

80. Parameters Affecting Stability of Cold Coffee
Nilay Şekerin, Buket Orhan
Döhler Gıda San A.Ş., İstanbul, Turkey

81. The Effects of Liquid Smoke Flavouring on the Sensory and Chemical Characteristic of Dried Red Pepper
Ecem Vural, Handan Başünal Gülmez, Ayhan Topuz
Department of Food Engineering, Akdeniz University, Antalya, Turkey

82. Effects of Fruit Juice Clarification on Anthocyanin Stability
Buket Orhan, Nilay Şekerin
Döhler Gıda San A.Ş., İstanbul, Turkey

83. Migration of acetaldehyde from polyethylene teraphthalate (PET) food packaging
Esma Korkmaz[1], Prof. Dr. Hasan Basri Koçer[2], Semra Çavuş[1], Adnan Fatih Dağdelen[3]
[1]*Central Research Institute of Food and Feed Control, Bursa, Turkey*
[2]*Department of Fiber and Polymer Engineering, Bursa Technical University, Bursa, Turkey*
[3]*Department of Food Engineering, Bursa Technical University, Bursa, Turkey*

84. Thermal and Rheological Characteristics of Kuwaiti Honeys
Hasan Al-Attar, Jasim Ahmed, Sarah Al-Jassar
Food & Nutrition Program; Environment & Life Sciences Research Center
Kuwait Institute for Scientific Research, Kuwait

85. Nutritional Content of Whole Wheat Flour and the Importance of the Use of Foods Containing Whole Wheat Flour
Nagihan Uğur, H.Özgül Uçurum, Raim Şenocak
Central Research Instıtute of Food and Feed Control, Bursa, Turkey

86. Zein-Based Electrospun Fibres/Capsules for Food Applications
Sílvia Castro Coelho[1], Philomène Benaut[2], Sebastien Laget [2], Berta N. Estevinho [1], Fernando Rocha[1]
[1]*LEPABE - Laboratory for Process Engineering, Environment, Biotechnology and Energy, Faculty of Engineering, University of Porto, Chemical Engineering, Porto, Portugal*
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87. Evaluation of Food Wastes in Color Pigment Production
Cansu Akgül, Aysun Sağlam
Food Quality Control and Analysis Programme, Anadolu Bil Vocational School, İstanbul Aydın University, İstanbul, Turkey

88. Aspects of Thermography Use on Evaluations of Novel Food Processing Technologies
Filiz İçier[1], Deniz Döner[2], Damla Bayana[2], Ömer Faruk Çokgezme[2], Orhan Kaya[2], Buse Melek Çabas[2]
[1]*Department Of Food Engineering, Ege University, İzmir, Turkey*
[2]*Graduate Faculty of Natural and Applied Science, Ege University, İzmir, Turkey*

89. Vacuum-Atmospheric Drying Of Camel Milk
Abdizhapparova B.T., Khanzharov N.S., Orymbetova G.E.
M.Auezov South Kazakhstan State University, Shymkent City, Republic of Kazakhstan

90. Study of the Influence of Flour from Non-Traditional Raw Materials on Cooked Sausages
Gulbagi Orymbetova[1], Bakhytkul Abdijapparova[1], Altynay Abdugamitova[2], Ayaulym Mustafayeva[2], Ainara Iskineyeva[2], Emit Orymbetov[3]
[1]Auezov South Kazakhstan State University, Shymkent c., Kazakhstan, [2]S.Seifullin Kazakh Agrotechnical University, Nur-Sultan c., Kazakhstan,[3]South Kazakhstan Medical Academy, Shymkent c., Kazakhstan

91. A Novel Approach for Effective Alkaline Neutralization of Crude Oils: Ultrasound Assisted Neutralization
Özgür Devrim Ablay, Onur Özdikicierler, Aytaç Saygın Gümüşkesen
Department of Food Engineering, Ege University, İzmir, Turkey

92. Neutralization and Bleaching Process for Minimizing Diglyceride Content Of Olive oil to Reduce 3-MCPD and Glycidyl Content
Merve Yazılıkaya, Onur Özdikicierler, Fahri Yemişçioğlu
Department of Food Engineering, Ege University, İzmir, Turkey

93. Use of High Oleic Refined Vegetable Oils in Chemical and Enzymatic Interesterification Method for Industrial and Pastry Oil Production
Merve Yazilikaya[1], Berna Yildirim[2], Onur Özdikicierler[1], Fahri Yemişçioğlu[1]
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1st International / 11th National Food Engineering Congress

Scientific Program

Thursday, 7 November 2019

08:00-09:30
Registration

09:30-11:20
Opening Ceremony / Opening Speeches

11:20-12:00
Opening Conference
Prof. Dr. Mikdat Kadıoğlu

12:00-13:30
Lunch

13:30-15:30
Panel "Perception of Media in Food (Disinformation and Misleading Claims About Food)"

Chair: Prof. Dr. Ertan Anlı
Department of Food Engineering, Ankara University

- Gila Benmayor / Journalist, Hürriyet
- Asst. Prof. Mehtap Türkay/ Turkish Medical Association
- Aziz Koçal / Federation of Consumer Associations, Chairman
- Dr. Bülent Şık / Food Engineer

15:30-16:00
Coffee Break and Poster Review

16:00-17:30
Session 1

Chair: Serpil Şahin
Department of Food Engineering,
Middle East Technical University

"Supercooling technology for extended shelf life of perishable foods"
Soojin Jun
Department of Human Nutrition, University of Hawaii at Manoa

"Heat treatment applications in the food ındustry and microwave pasteurization as an example"
Taner Baysal , Ahsen Rayman Ergun
Department of Food Engineering, Ege University

"Microwave drying kinetics of green sweet and bell peppers"
Meriç Şimşek Aslanoğlu, Özge Süfer, Merve Yıldırım
Department of Food Engineering, Osmaniye Korkut Ata University

"Experimental comparison of microwave and radio frequency heating of peanut butter"
Ezgi Parın, Welat Miran,Tunç Koray Palazoğlu
Department of Food Engineering, Mersin University

Friday, 8 November 2019

08:30-09.00
Registration

09:00-10:15
Session 2

Chair: Deniz Çekmecelioğlu
Department of Food Engineering, Middle East Technical University

"Determination of the antimicrobial and antioxidant effects of sodom apple (Calotropis Procera) used in the production of west african cheese (Wagashi)"
Adamou Mamoudou Anza, Zerrin Erginkaya, Gözde Konuray,
Department of Food Engineering, Çukurova University

"Bacterial cellulase production using grape pomace hydrolysate as a carbon source"
Ayşe Sultan Kurt, Deniz Çekmecelioğlu
Department of Food Engineering, Middle East Technical University

"Determination of the microbial profile during the fermentation process of grape leaves brine"
Banu Metin[1], Esra Nur Yaşa[2], Zeki Durak[2]
[1] Department of Food Engineering, İstanbul Sabahattin Zaim University
[2] Department of Food Engineering, Yıldız Technical University

"Utilization of apple and pomegranate peels for production of pectinase by Aspergillus spp."
Zehra Gülsünoğlu, Meral Kılıç Akyılmaz, Funda Karbancıoğlu Güler,
Department of Food Engineering, İstanbul Teknik University

10:15-10:45
Coffee Break

10:45-12:15
Session 3

Chair: Gülüm Şumnu
Department of Food Engineering, Middle East Technical University
Keynote Speaker
"Antimicrobial nanopackaging for food products: Prospects and limitations"
Jasim Ahmed
Kuwait Institute for Scientific Research

"Dielectric properties of sour cherry (Prunus Cerasus L.) POMACE: ınfluence of frequency, concentration, PH, temperature and particle size"
Duygu Başkaya Sezer[1], Jasim Ahmed[2], S.Gülüm Şumnu[1], Serpil Şahin[1],
[1] Department of Food Engineering, Middle East Technical University
[2]Kuwait Institute for Scientific Research

"Investigation of ultrasound assisted enzymatic collagen extraction and its effects on collagen characterization"
Burcu Kuban, Şebnem Tavman
Department of Food Engineering, Ege University

"Development of nanofiber based colorimetric sensors for detection of fish freshness"
Ekin Toprak Demir, Burak Aydoğan, Meryem Yılmaz, Aylin Altan
Department of Food Engineering, Mersin University

12:15-13:15
Lunch

13:15-13:30
Invited Speaker
Sumiter S. Broca
FAO, Senior Policy Officer

13:30-15:30
Panel "Food Engineering Education and Its Conformity with the Food Sector"

Chair: Kemal Zeki Taydaş
UCTEA Chamber of Food Engineers, Chairman

- Metin Duruk / Aroma A.Ş. , Chairman
- Dr. Gerhard Schleining / Institute of Food Science, Universität F. Bodenkultur Wien / ISEKI-Food Association
- Prof.Dr.Ferruh Erdoğdu, Department of Food Engineering, Ankara University
- Gamze Kozanlı / Department of Food Engineering, Ankara University, Undergraduate Student
- Onur Aydın / Food Engineer / UCTEA Chamber of Food Engineers, Gaziantep Provincial Representative

15:30-16:00
Coffee Break and Poster Review

16:00-17:30
Session 4

Chair: Taner Baysal
Department of Food Engineering, Ege University

"Effect of using whey protein, inulin and cream on the viability of yogurt and probiotic bacteria in probiotic yogurts during passage through a dynamic in vitro gastrointestinal model"
Emine Mine Çomak Göçer[1], Firuze Ergin[2], Ahmet Küçükçetin[2]
[1] Department of Nutrition and Dietetics, Akdeniz University
[2]Department of Food Engineering, Akdeniz University

"Effects of gelled emulsions containing peanut and flaxseed oil mixture on the oxidative stability of heat processed fermented sausages"
Hülya Serpil Kavuşan, Burcu Öztürk Kerimoğlu, Meltem Serdaroğlu
Department of Food Engineering, Ege University

"Evaluation of bioactive compounds in arugula (Eruca sativa) after lyophilization and tray-drying"
Noor Alruwaıh[1], Varoujan Yaylayan[2]
[1]Kuwait Institute for Scientific Research
[2]Department of Food Science and Agricultural Chemistry, McGill University

"Heat induced gelation time profile for salep and konjact glucomannan"
Senem Yetgin[1], Oswaldo Campanella[2]
[1] *Department of Food Engineering, Kastamonu University, Kastamonu, Turkey*
[2] *Department of Food Science and Technology Ohio State University, USA*

"Vocational education and training materials to minimize postharvest losses within food chain"
Nurcan Ayşar Güzelsoy[1], Yıldıray İstanbullu[1], Arzu Yavuz[1], Banu Akgün[1], Angel Martınez-Sanmartin[2], Fahrettin Göğüş[3], Ahmet Budaklıer[4], Fetullah Bingül[5], Fehmi Yıldız[6], Gerhard Schleining[7], Foteini Chrysanthopoulou[7], Gabriela Iordachescu[8]
[1]Central Research Institute of Food and Feed Control
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[5]Bursa Metropolitan Municipality TARIMAS
[6]Bursa Commodity Exchange
[7]ISEKI-Food Association
[8]Department of Food Engineering, Dunarea de Jos University of Galati

Saturday, 9 November 2019

08:30-09.00
Registration

09:00-10:45
Session 5

Chair: Halil Vural
Department of Food Engineering, Hacettepe University

"Moisture adsorption isotherms and adsorption isosteric heat of dry ground meat"
Nesimi Aktaş
Department of Food Engineering, Nevşehir Hacı Bektaş Veli University

"Possibility of using textiles as casing materials in fermented sausages"
Hasan Yetim[1], Gökçegün Ciritci[2], Fatih Bozkurt[3], Abdulatef Ahhmed[3]
[1] Department of Food Engineering, İstanbul Sabahattin Zaim University
[2] Department of Food Engineering, Erciyes University
[3] Department of Food Engineering, Yıldız Technical University

"Rehydration of Whey Protein Isolate: Effect of Temperature, Water Activity, and Storage Time"
Sarah Al-Jassar[1], Yrjö Roos[2]
[1]Kuwait Institute for Scientific Research
[2]Department of Food Technology, University College Cork

"Comparison of different extraction methods of phenolic compounds from bay leaf (Laurus nobilis L.)"
Ayça Akyüz, Idil Tekin, Seda Ersus Bilek
Department of Food Engineering, Ege University

"Determination of Physicochemical Properties of Different Citrus Fruit Wastes"
Bihter İşyaran, Sedat Sayar
Department of Food Engineering, Mersin University

"Effect of Turkish coffee brewing technique in extraction of the volatile compounds of coffee"
Yaşar Mert Biçici, Ceyda Dadalı, Yeşim Elmacı,
Department of Food Engineering, Ege University

10:45-11:00
Coffee Break

11:00-12:30
Session 6

Chair: Pınar Şanlıbaba
Department of Food Engineering, Ankara University

Keynote Speaker
"Development of an innovative oxygen scavenging label: A journey from the idea to the product"
Selcuk Yildirim
Zurich University of Applied Sciences

"Production of phenolic-rich pregelatinized starch"
Mehmet Yüksel, Sedat Sayar
Department of Food Engineering, Mersin University

"Determination of protein fraction profiles of concentrated kefir produced by different methods"
Merve Al, Muammer Demir
Department of Food Engineering, Akdeniz University

"Effects of different starch types on retardation of staling of cakes"
Saniye Akyıl[1,2], Dilara Kılınç2, Bülent Şentürk[2]
[1]Yıldız Technical University, Faculty of Chemical and Metallurgical Engineering, Department of Food Engineering, İstanbul, Turkey
[2]Şölen Çikolata Gıda Sanayi A.Ş, İstanbul, Turkey

12:30-13:30
Lunch

13:30-14:00
Invited Speaker
"Experience of the food industry in Greece during the integration period to EU"
Maria Papageorgiou
International Hellenic University

14:00-16:00
Panel "Food Politics and Food Economy"

Chair: Atakan Günay
UCTEA Chamber of Food Engineers, Former Chairman

- Prof. Dr. Zümrüt Begüm Ögel - Member of Presidency Health and Food Policies Council / Konya Food and Agriculture University
- Dr. Necdet Oral / Agricultural Engineer, Author
- Mustafa Sönmez- Economist, Author
- Umut Özdil - TV Program Producer and Presenter

16:00-16:15
Announcement of Poster Competition Results and Closing Ceremony

16:15-18:30
Social Program

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Oral Presantations

Education, Training, Skills and Competences Required for Food Engineers

Gerhard Schleining

BOKU - University of Natural Resources and Life Sciences, Vienna,
Department of Food Science and Technology, Austria
ISEKI-Food Association, Vienna, Austria

Many reports on the effectiveness of current education systems in the food sector for meeting skills needs highlight that (i) the development of skills during the university degree programmes are not sufficiently focused on the improvement of those that are actually required in the workplace, (ii) that a lack of practical experience exits in many courses aimed to both understanding the problems of a modern manufacturing and processing workplace as well as to develop basic intrapreneurial skills and that (iii) education methods are too often outdated, less effective and sometimes using obsolete tools and equipment.

Rapid changes in the economy are a big challenge for the competition of the Food Industry worldwide. Innovative education & training for students targeted towards needs of the industry thus increasing their employability is a key for the success of the industry. Rapid development in technology also requires to facilitate innovative continual professional development for academic and company staff.

Several studies and projects have analysed the needs of possible employers, identifying technical competences also e.g. in food legislation and control, food safety management, etc., and soft skills including communicating, critical thinking and problem solving, product development, etc.

Because of the rapid developments in technology and teaching tools, there is a need for a flexible demand based education and training and a permanent monitoring of the needs. Some project initiatives have been undertaken and/or under development to facilitate the alliances between food business and acedemia, focused on training, education and knowledge transfer and to establish a "PERMANENT OBSERVATORY".

Keywords: higher education, continuous professional development, European Qualification Framework, food engineering

Antimicrobial nanopackaging for food products: Prospects and limitations

Jasim Ahmed

Food & Nutrition Program; Environment & Life Sciences Research Center
Kuwait Institute for Scientific Research, Kuwait

In recent times, the development in food packaging has gradually shifted from the conventional polymeric materials to environment-friendly green biodegradable materials. Additionally, researchers across the globe are focusing on the development of active or smart packaging by protruding nanoparticles or plant-based essential oils into the virgin polymer. These concepts could generate new opportunities and challenges for the development of nanomaterials in the food packaging industry. Contrary to the conventional packaging, biodegradable packaging materials are brittle, and their mechanical, thermal and barrier properties are not comparable with the conventional packaging materials. To improve the properties of the biodegradable polymers, a trace amount of nanoparticles (1-100 nm) have been impregnated, and the resultant properties depend upon the miscibility of the nanoparticles in the blend composites. Different types of plant-based essential oils (EO) such as thyme, cinnamon, clove basil, oregano, garlic, and basil essential oils are incorporated into a wide range of biodegradable and fossil-fuel derived polymer films for the development of food packaging films. It has been observed that the addition of plant-based essential oil into the polymer composite improve the elongation at break and impart the antimicrobial properties in the resulting film either individually or in a combination with the nanoparticles. This lecture will deliver by summarizing the results obtained in the last five years works on the synthesis of biopolymer (e.g., polylactide, chitosan, gelatin, hydrocolloids) nanocomposite films by employing nanoparticles (e.g., surface treated and untreated zinc oxide, silver/copper bimetallic, graphene oxide, nanoclay) and essential oils (e.g., clove, garlic and cinnamon essential oil), and their resultant mechanical, structural, thermal, barrier and microbial properties. This lecture will also highlight the limitations on the development of the biodegradable packaging and its industrial applicability. A comparison of the antimicrobial activity will be made between the nanoparticles and the essential oil while forming a nanocomposite films for the food applications, in particular, food safety.

Development of an Innovative Oxygen Scavenging Label: A journey from the Idea to the Product

Selcuk Yildirim

Zürich University of Applied Sciences, Waedenswil, Switzerland

Over recent years, consumer demand for natural high-quality foods, which are non-processed or minimally processed and which do not contain any preservatives but have an acceptable shelf life, has increased significantly. To respond to this need, the protective function of packaging has been further expanded through the development of innovative packaging solutions such as active packaging technologies [1]. The application of oxygen scavengers is one of the most important active packaging technologies, which aims to remove any residual oxygen present in the food packaging. One of the most important hurdle for the application of oxygen scavengers for food packaging is the low oxygen scavenging rates of the available technologies. We have developed an oxygen scavenging film based on vacuum deposited palladium layers to remove fast the residual oxygen remaining in food packages after modified atmosphere packaging. Oxygen scavenging rate of the active films were optimized by the optimization of the coating substrate as well as the Pd deposition thickness [2]. Polyethylene terephthalate coated SiOx was found to be the most suitable substrate and the optimal Pd layer thickness for the investigated oxygen scavenging films was between 0.7 and 3.4nm. When resulting oxygen scavenging films were tested with foods, although the scavenger worked with various types of food, with some foods, an inhibition of the palladium catalyst was observed. It was shown that the catalytic activity of the palladium was inhibited by the volatile sulphur compounds such as dimethyl sulfide, dimethyl disulphide, dimethyl trisulfide, methional, and furfuryl thiol present in food [3]. Benefits of application of the oxygen scavenging films for various food systems have been studied. It was shown that oxygen scavenging films can prevent the discoloration of cooked ham [4], prolong the mold-free shelf life of bakery products, and prevent the oxidation in linseed oil. Finally, a self adhesive oxygen scavenging labels containing an additional food contact layer was developed and produced on industrial scale.

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2. Yildirim, S., et al., *Development of Palladium-based Oxygen Scavenger: Optimization of Substrate and Palladium Layer Thickness.* Packaging Technology and Science, 2015. **28**(8): p. 710-718.
3. Röcker, B., et al., *Inactivation of Palladium-based Oxygen Scavenger System by Volatile Sulfur Compounds Present in the Headspace of Packaged Food.* Packaging Technology and Science, 2017. **30**(8): p. 427-42.
4. Hutter, S., N. Rüegg, and S. Yildirim, *Use of palladium based oxygen scavenger to prevent discoloration of ham.* Food Packaging and Shelf Life, 2016. **8**: p. 56–62.

Supercooling Technology for Extended Shelf Life of Perishable Foods

Soojin Jun

Department of Human Nutrition, Food and Animal Sciences, University of Hawaii at Manoa, USA

An innovative supercooling device was developed to preserve fresh quality of foods at subzero temperature by treating them with a combination of pulsed electric field and an oscillating magnetic field. The magnetic and electric fields keep water molecules vibrating to prevent the formation of ice crystals even as products drop below freezing temperatures. Therefore, under the subjected environment, supercooled foods do not need to undergo a thawing process, thus allowing them to maintain their quality, texture, and nutrients while extending their shelf life. The fabricated device successfully maintained perishable meat products and fruits in a supercooled state at around -4 ~ -7°C, and their original freshness could be kept intact for transportation and storage purposes. A microcontroller-based supercooling control unit was designed and fabricated to achieve a stable supercooled state using a combination of pulsating electric fields and oscillating magnetic fields. General performance of the supercooling unit was examined via supercooling beef steak at an ambient freezer temperature range of -8 to -10°C. An internal beef temperature of -4°C, approximately two degrees below its freezing point, was maintained for up to three weeks. Quality assessment factors such as color, lipid oxidation, drip loss and texture of supercooled beef samples were evaluated and compared with those of refrigerated (at 4°C), frozen (at -18°C) and fresh samples. Similar procedures were repeated and validated for highly perishable fish and tropical fruit samples.

Heat Treatment Applications in the Food Industry and Microwave Pasteurization as an Example

Taner Baysal, Ahsen Rayman Ergun

Department of Food Engineering, Ege University, İzmir, Turkey

In the food industry, one of the most widely used food preservation methods for the inactivation of microorganisms and enzymes and also prolonging the shelf life of the product is the canning. While there is no problem in the heating of the products which were canned containing brine or syrup in the conventional heat treatment applications, slow heat transfer and difficulties in the determination of the cold point are the important problems, especially when heating without brine or high viscosity foods such as humus or tomato paste, and intermadiate moisture fruits. In order to eliminate these negative effects of traditional food processing methods and also with the increasing demand of consumer preference for consumption of natural and minimally processed foods, the new processing methods which are alternative to conventional processing methods are increasing. Microwave heating technique is used in the food technology with the advantages of rapid volumetric heating and short processing time, less vitamins and mineral losses, needs less space for the equipment, easy cleaning and saving energy during the process as the heat is produced within the material.

In this study, determination of heat treatment conditions in heating process of foods, microwave heating technique as an alternative to traditional heating methods and determination of traditional and microwave pasteurization conditions of organic intermaiate moisture raisins were investigated. Heat teatment conditions was determined by calculating the D and z values of target microorganism in raisins. The result of the study shows that microwave pasteurization of raisin is a promising technology to enhance microbial safety.

Key words: Pasteurization, heat treatment, medium moist grape, microwave, traditional heating

Effects of gelled emulsions containing peanut and flaxseed oil mixture on the oxidative stability of heat processed fermented sausages

Hülya Serpil Kavuşan, Burcu Öztürk Kerimoğlu, Meltem Serdaroğlu

Department of Food Engineering, Ege University, İzmir, Turkey

In this study, it was aimed to examine the effect of using gelled emulsions (GE) as fat replacer on the oxidative stability of heat processed fermented sausages. For this purpose 4 batch heat processed fermented sausages were prepared with different fat/oil levels and sources as follows: C20 containing 20% beef fat, C10 containing 10% beef fat, GE10 containing 10% GE prepared with linseed and peanut oil mixture + 10% beef fat. GE20 containing 20% GE. Peroxide value, p- anisidine, free fatty acids (FFA) and TBARS analysis were evaluated throughout 3 month storage at 4°C. Reduction of beef fat did not significantly affect the peroxide values ($P>0.05$), meantime the addition of GE increased the peroxide values ($P<0.05$). Higher GE addition resulted higher peroxide values except for the first month of storage ($P<0.05$). Addition of GE increased the p- anisidine values of heat processed fermented sausages ($P<0.05$). At the end the storage, GE20 samples had the highest p- anisidine values ($P<0.05$). The lesser beef fat content led the lower FFA while incorporation of GE resulted higher FFA ($P<0.05$). FFA of all treatments tend to increase at the end of the storage except C10 ($P<0.05$). FFA of C10 remained unchanged until the third month of storage ($P>0.05$). TBARS values of K20, GE10, and GE20 were found similar and these treatments had higher TBARS than C10 ($P<0.05$). C10 had the lowest TBARS values on all storage months ($P<0.05$). Increase on the addition level of GE accelerated the oxidation of fermented sausages during storage($P<0.05$). Treatments added with GE showed different trends in terms of TBARS changes. TBARS values of GE10 treatment increased ($P<0.05$), while no statistical changes were observed in TBARS values of GE20 samples throughout the storage ($P>0.05$).

It was concluded further researches should be done related to the addition of GE in order to understand detailed effect of GE on fermented sausage formulations.

The authors would like to thank to Scientific and Technological Research Council of Turkey (TUBITAK) under the project number 116-O-506.

Keywords: gelled emulsion, fat replacer, heat processed fermented sausage, oxidation

Effect of Using Whey Protein, Inulin and Cream on the Viability of Yogurt and Probiotic Bacteria in Probiotic Yogurts During Passage Through a Dynamic In Vitro Gastrointestinal Model

Emine Mine Çomak Göçer[1], Firuze Ergin[2], Ahmet Küçükçetin[2]

[1]*Department of Nutrition and Dietetics, Akdeniz University, Antalya, Turkey*
[2]*Department of Food Engineering, Akdeniz University, Antalya, Turkey*

Objectives
The purpose of this research was to investigate the effect of addition of whey protein, inulin or cream to yogurt milk on the microbiological properties of probiotic yogurt in a dynamic in vitro gastrointestinal model designed in laboratory conditions.

Material and methods
The pasteurized milk used in the production of probiotic yogurt was divided into 3 groups and whey protein, inulin or cream were added to yogurt milk to obtain %15 total solids. The probiotic yogurt samples were passed through a dynamic in vitro gastrointestinal model. The model consists of 3 consecutive sections to represent the mouth, stomach and small intestine. The parameters simulated in the dynamic in vitro gastrointestinal model were body temperature, pH, salivation control in the mouth region, control of HCl and pepsin secretion in the stomach, NaHCO3, pancreatin and bile secretion control in the small intestine, residence and transition times in the gastrointestinal tract, anaerobic media (N2 gas washing) and mixing. The time of passage through the gastrointestinal tract was kept under control for 2 minutes in the mouth region, for 2 hours in the stomach region and for 2 hours in the small intestine region.

Results
Based on the results of microbiological analyses, during the passage through the dynamic in vitro gastrointestinal model, the mean counts of *Lactobacillus acidophilus* La5, *Streptococcus thermophilus* and *Lactobacillus delbrueckii* subsp. *bulgaricus* in the probiotic yogurt samples decreased. The highest reduction in viability of *L.acidophilus* La5 was observed in the whey protein added samples and also there was no difference between inulin and cream added samples. The reduction in viability of *L. delbrueckii* subsp. *bulgaricus* and *S. thermophilus* in probiotic yogurts was not significantly affected by the addition of whey protein, inulin or cream.

Conclusions
The results showed that the addition of inulin and cream to yogurt milk can improve the survival of L. acidophilus La5 in probiotic yogurt.

Evaluation of Bioactive Compounds in Arugula (Eruca Sativa) After Lyophilization And Tray-Drying

Noor Alruwaih[1], Varoujan Yaylayan[2]

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[2]*Food Science and Agricultural Chemistry, McGill University, Montreal, Canada*

There is an increased interest in using crucifers as functional foods to deliver high concentrations of health promoting bioactive compounds (Bennett et al., 2006). The evaluation of the stability and degradation patterns of these bioactive compounds is required before they can be used in the development of functional foods (Zainol, Abdul-Hamid, Bakar, & Dek, 2009). Cruciferous species such as Eruca sativa (rocket) are known to contain a variety of bioactive compounds. The total flavonoid assay showed significantly different concentrations between the lyophilized rocket (LR) (3.29±0.15 g/100 g) and tray-dried rocket (TDR) samples (2.42±0.22 g/100 g) measured as quercetin equivalents (QE) although the total phenolic content between the samples showed no statistical difference: 8.6760.6 g/100g QE and 8.560.8 g/100g QE, for LR and TDR, respectively. The antioxidant activity, measured using the DPPH· assay indicated a similar scavenging activity for LR and TDR. Moreover, total isothiocyanate contents showed a two-fold higher concentration in the TDR sample (6.05±0.83 µg/g) versus LR (3.26±0.59 µg/g). ESI/qTOF/LC/MS analysis indicated the presence of glycosides in the LR sample and aglycones in the TDR sample. Moreover, images from Scanning Electron Microscopy revealed variations in the average particle diameter in TDR and LR particles. The comparison of two different pre-processing methods (lyophilization and tray-drying) to determine the fate of bioactive compounds such as flavonoids and isothiocyanates in arugula will facilitate the production of large batches of functional powder efficiently. The dehydrated powder may be utilized as a functional ingredient in a wide array of food products to provide enhanced nutritional benefits and prolonged shelf life as well as reducing vegetable waste and energy consumption.

References:

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Zainol, M. K. M., Abdul-Hamid, A., Bakar, F. A., & Dek, S. P. (2009). Effect of different drying methods on the degradation of selected flavonoids in Centella asiatica. International Food Research Journal, 16, 531–537.

Rehydration of Whey Protein Isolate: Effect of Temperature, Water Activity, and Storage Time

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The hydration properties of Whey Protein Isolate (WPI) powder has many applications in both food industry and pharmaceutical processing. However, the understanding of hydration properties of food powders is limited. Also, the knowledge about the conformational modification of protein structure associated with water activity requires more research. The present study focused on WPI at high concentrations and high solids systems. Amorphous WPI were humidified over a wide water activity, aw, range (0.11, 0.23, 0.44, 0.54, 0.65, 0.76, 0.85aw). WPI aqueous solution were prepared at 5, 10, 20, 30, and 40% (mass). The rehydration/hydration transition of WPI was temperature- and time-dependent, as reported by Farahnaky et al. (2005) and Roos and Potes (2015). Variation in protein hydration resulted in aw hysteresis during the dynamic heating and cooling steps. The physical flow behavior of WPI dispersions was significantly higher at less than or equal to 35°C, corresponding to increased protein hydration at low temperatures in agreement with Differential Scanning Calorimetry (DSC) data. The loss of viscosity of protein dispersions around 35°C was a result of changes in protein conformation structure (Roos and Potes 2015). As a result, it could be suggested that the dehydration of WPI took place at temperature >40°C. Further study is needed to understand the effect of water activity on the hydration temperature of whey proteins.

Key words: Whey Protein Isolate, Hydration/Thermal Transition, Water Sorption Isotherm, Protein Conformational Structure

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Microwave Drying Kinetics of Green Sweet and Bell Peppers

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Drying is a traditional food preservation method performed generally as sun drying particulary for tomatoes, peppers and eggplants in Turkey. However, sun drying can result in some detrimental effects on the products such as color and vitamin loss, and high microbial load due to harsh enviromental conditions. Therefore, considerable attention has been paid to the alternative drying methods. The aim of this study was to determine the microwave drying kinetics of green sweet and bell peppers using different thin layer drying models. In this study, green sweet and bell peppers were dehydrated whole and without any pretreatment at microwave power levels of 90 W, 180 W and a combination of 90 W+180 W, after their interior parts were removed. These power levels were selected to avoid hot spots by preliminary experiments. The drying times of green sweet and bell peppers were recorded as 60, 30 and 39 min and 60, 27.5 and 35.5 min for 90, 180 and 90+180 W, respectively until moisture ratios reached below the average value of 0.065. Lewis, Page, Modified Page, Logarithmic, Sigmoid, Thompson, Midilli, Rational, Parabolic and Wang & Singh models were thin layer models fitted to drying data. Results showed that Midilli and Sigmoid models were the best to describe the dehydration phenomena. The coefficient of determination (R2) values of aforementioned superior equations were between 0.998-0.999. The diffusion coefficients were in range of 1.081-1.868 × 10-7 m2/s for sweet peppers (R2 ≥ 0.949) and 0.823-1.543 × 10-7 m2/s for bell peppers (R2 ≥ 0.973). As a consequence, microwaves enabled well-qualified products and shortened the drying time approximately 70 h as compared to conventional drying performed at 60 °C.

Key words: Drying, microwave, green sweet pepper, green bell pepper.

Dielectric Properties of Sour Cherry (Prunus cerasus L.) Pomace: Influence of Frequency, Concentration, pH, Temperature and Particle Size

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The sour cherry pomace (SCP) is one of the important by-products after the juice extracted. Incorporation of pomace into bakery products could act as a functional ingredient by improving the intake of antioxidants as well as dietary fibers. The dielectric heating is employed to achieve the pasteurization, thawing, and baking of food products. It is important to understand the dielectric behavior of SCP before adding to the complex formulation of bakery products, which will undergo dielectric heating.

The SCP samples were hot-air dried in a tray-drier. The dried samples were ground in a coffee grinder followed by sieving through a series of standard sieves.

The particle size (595, 297, 149, 105, and 74-μm), temperature (0, 20, 40, 60, and 80°C), concentration (2.5, 5, 7.5, 10, and 12.5%), pH (2.0, 4.0, 6.0, 8.0, and 10.0), salt and sugar concentrations (0.25, 0.5, 0.75, and 1%) were selected as independent variables. The response surface model was employed to a flexible design structure using the Design Expert software. The dielectric properties (ε′ and ε″) were measured in the frequency range of 500 to 3500 MHz using a network analyzer attached with an open-ended coaxial probe.

Overall, the second order polynomial models fitted well to the experimental data with the coefficient of determinations (R2) were higher than 0.90. The salt and the process temperature were found to be the predominant variables, which influence the values of ε″ and ε′. By increasing the concentration of SCP, the ε′ and Dp dropped, whereas the ε″ was improved. The particle size and concentration interaction term affected the ε′ values negatively and the influence was relatively higher at 2450 MHz than 915 MHz. The SCP concentration and process temperature showed both individual and interactive interactions on the ε″ and Dp values. Conversely, the particle size affected the ε′ either individually or in a combination significantly by the temperature or concentration, whereas the interaction with pH showed a significant effect on the ε″ values.

Keywords: Dielectric constant, loss factor, penetration depth, concentration, sourcherry pomace.

Bacterial Cellulase Production using Grape Pomace Hydrolysate as A Carbon Source

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Grape pomace is the major waste in the wine industry, which contains skins, seeds, and stems of grapes. High moisture content and residual sugars such as sucrose, glucose, and fructose available in grape pomace make it susceptible to rapid microbial spoilage. Thus, it needs to be disposed of with care to eliminate environmental problems. The carbohydrate fraction of grape pomace consists of cellulose, hemicellulose, starch, and pectin, which render grape pomace a fibrous material, an additional source of fermentable sugar to produce biofuel and hydrolytic enzymes. However, the polysaccharides in the grape pomace require a pretreatment step to release sugar monomers that can be readily used by bacteria and yeasts.

In this study, grape pomace hydrolysate was obtained by dilute-acid hydrolysis and used for cellulase production with Bacillus subtilis at 37oC and 130 rpm using batch fermentation method. Cellulase production was optimized for solid loading of grape pomace, pH, and fermentation period by Box-Behnken response surface method. A range of 5-15% was used for solid loadig, 5-9 for pH, and 3-7 days for fermentation period. Cellulase activity was assayed by the DNS method using filter paper as the substrate at pH 5.0 and 50oC of incubation for one hour.

The highest cellulase activity was achieved at 0.196 IU/mL with 12.5% of solid loading (or 12.56 g/L reducing sugar) at pH 7.0 on 5th day. Also, the minimum cellulase production was measured as 0.045 IU/mL with 5% solid loading (or 5.33 g/L reducing sugar) and pH 9.0 on 5th day. The quadratic response surface model predicted an optimal cellulase activity of 0.178 IU/mL with 15.3% solid loading and pH 6.0 on 7th day. These results indicate that grape pomace is a potential carbon source for bacterial cellulase production. In order to improve cellulase activity, further studies will be carried out with different Bacillus species under fed-batch fermentation method.

Effect of Turkish Coffee Brewing Technique in Extraction of The Volatile Compounds of Coffee

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Abstract

Coffee is one of the most consumed beverages in the world and brewed with various techniques changing according to culture. Turkish coffee which has an important part in Turkish culture is brewed with a special brewing procedure. Approximately a thousand volatile compounds were determined in the coffee. These volatile compounds vary according to the type of brewing procedure. The aim of this study is to compare volatile compounds of roasted fine ground coffee with volatile compounds of Turkish coffee brew and to determine effectiveness of Turkish coffee technique to extract volatile compounds from ground coffee. The volatile compounds of ground coffee and Turkish coffee brews were evaluated by headspace solid-phase micro extraction/gas chromatography-mass spectrometry using divinylbenzene/carboxen/polydimethylsiloxane fiber. A total of fifty (including furans, pyrazines, pyrroles, furanones, phenols, aldehydes, pyridine, thiophene, ketone and benzene) and forty-two (furans, pyrazines, pyrroles, furanones, phenols, aldehydes, pyridine and thiophene) volatile compounds were identified in ground coffee and Turkish coffee brew, respectively. The volatiles from pyridine and benzene class were not determined in the Turkish coffee brew. It was observed that significant decrease was determined in furan, pyrazine, furanone class in Turkish coffee brew compared to ground coffee.
Key words: coffee, coffee brew, volatile compound, Turkish coffee

Effect of Turkish Coffee Brewing Technique in Extraction of The Volatile Compounds of Coffee

Introduction

Coffee is one of the most consumed beverages in the world. *Coffea arabica* L., which is one of the two types of coffee bean, has production of 5.1 million tons and *Coffea robusta* L. has annual production of 3.6 million tons for 2016 (Colzi et al. 2017). In order for coffee to be ready for consumption, it must go through three main processing steps. These are green bean roasting, grinding of roasted coffee bean and brewing (Angeloni et al. 2019). Roasting the green coffee bean produces both volatile and non-volatile compounds and gives the desired sensory properties of the coffee. There are differences between volatile compounds of green coffee bean and roasted coffee bean. The reason for these differences is the Maillard reaction, strecker degradation, breakdown of amino acids, degradation of lipids and fats. (Buffo and Cardelli-Freire, 2004). Volatile compound classes of roasted coffee were determined as; furans, pyrazines, ketones, alcohols, aldehydes, esters, pyrroles, thiophenes, sulphur compounds, benzenic compounds, phenolic compounds, phenols, pyridines, thiazoles, oxazoles, lactones, alkanes, alkenes and acids (Cecilia et al. 2012). Grinding of roasted coffee bean is important both for the higher proportion of flavour compounds in the beverage and for the preparation of the beverage. In the brewing process it is very important to extract the aromatic compounds from the ground coffee to the coffee beverage (Buffo and Cardelli-Freire 2004). The number of volatile compounds of brewed coffee is around one thousand (Moon and Shibamoto 2009). These volatile compounds can vary according to the type of green coffee bean, roasting parameters, grinding process and brewing methods (López-Galilea et al. 2006).

Coffee brewing methods vary according to consumers' flavour preferences, lifestyles, and the cultural area in which they live (Angeloni et al. 2019), e.g. filter coffee, espresso, Turkish coffee and instant coffee (Kıvançlı and Elmacı 2014). Turkish coffee is the method that is identified with our country among these brewing methods. Turkish coffee is prepared from roasted coffee beans (*Coffea arabica* L.) which are ground to a very fine powder by taking one teaspoon of ground coffee and boiling with a glass of cold water in a special pot named “cezve” (Kıvançlı and Elmacı, 2016).

The aim of this study is to compare volatile compounds of roasted fine ground coffee with volatile compounds of Turkish coffee brew and to determine effectiveness of Turkish coffee technique to extract volatile compounds from ground coffee. The volatile compounds of ground coffee and Turkish coffee brews were evaluated by headspace solid-phase micro extraction/gas chromatography-mass spectrometry (HS-SPME/GC-MS) using divinylbenzene/carboxen/polydimethylsiloxane (DVB/CAR/PDMS) fiber.

Material and Method

Material

Medium level roasted and finely ground coffee (*Coffea arabica* L.) (Kurukahveci Mehmet Efendi) was obtained from a local market.

Method

Turkish Coffee Brew Preparation
Turkish coffee brews are prepared with roasted, ground coffee and bottled water (Erikli). Turkish coffee brewing machine was used for obtaining Turkish coffee brew (Arçelik). Brew preparation was implemented according to Turkish coffee brewing machine producer's instructions using 5 g roasted, ground coffee and 65 ml water.

HS-SPME
Volatiles of coffee were extracted with 50/30 µm thick, Divinylbenzene/Carboxen/Polydimethylsiloxane (DVB/CAR/PDMS) fiber. For volatile compound extraction 1.5 g roasted, ground coffee and 20 ml of Turkish coffee brew was used. Coffee and Turkish coffee brew was inserted in a 40 ml vial and closed with PTFE coated silicone septum. Vial was heated on a block heater at 60°C and fiber was exposed to headspace for 30 min (Kıvançlı and Elmacı, 2016). Extracted volatile compounds were thermally desorbed in GC injection port.

GC-MS Analysis
GC-MS analysis of coffee and Turkish coffee brew volatiles were implemented according to modified method of Akiyama et al. (2008). Hewlett-Packard 6890 GC/HP 5973 MS (Agilent Technologies) with a fused silica capillary column DB-WAX (60 m × 0.25 mm, 0.50 µm film thickness, Agilent Technologies) and carrier gas Helium with 1.6 mL/min flow rate were used in separation of volatiles. The oven temperature was started with an initial temperature of 50°C for 2 min, followed by an increase of 5°C/min to 90° C and an increase of 2°C/min from 90 to 220°C, and held at 220°C for 1o min. Volatile compounds of coffee and Turkish coffee brew were identified by comparing their mass spectra with the WILEY and NIST libraries.

Statistical Analysis
The statistical evaluation of the results was performed with SPSS 16.0 Windows package program (SPSS 16.0 for Windows). The significant difference among the samples was assessed using Analyzes of Variance (ANOVA) and Duncan multiple range test at 95% confidence level.

Results and Discussion

As shown in Table 1 a total of 50 volatile compounds including 15 furans, 18 pyrazines, 6 pyrroles, 3 furanones, 2 phenols, 2 aldehydes,1 pyridine, 1 thiophene,1 ketone and 1 benzene class were determined in ground coffee. On the other hand 42 volatile compounds including 14 furans, 15 pyrazines, 6 pyrroles, 1 furanones, 2 phenols, 2 aldehydes, 1 pyridine and 1 thiophene class were identified in Turkish coffee brew.

Table 1. Volatile class and peak area percentage of volatiles identified in ground coffee and Turkish coffee brew

Volatile compound	Volatile class	Ground coffee	Turkish coffee brew
2-Methylfuran	Furan	0.17±0.02[a]	0.35±0.02[b]
2-Methylbutanal	Aldehyde	0.32±0.03[a]	0.40±0.05[a]
Unknown		0.55±0.01[b]	0.27±0.04[a]
1-Methyl-1H-pyrrole	Pyrrole	0.26±0.01[a]	0.47±0.06[b]
2-Vinyl-5-methylfuran	Furan	0.40±0.04[b]	0.20±0.04[a]
Unknown		0.39±0.05[a]	0.56±0.03[ba]
2-(2-Propenyl)-furan	Furan	0.20±0.01[a]	0.49±0.13[a]
Pyridine	Pyridine	1.98±0.01[a]	3.32±0.99[a]
1H-Pyrrole-2- methanol	Pyrrole	2.39±0.25[b]	0.69±0.26[a]
Dihydro-2-methyl- 3(2H)-furanone	Furanone	0.67±0.23[a]	0.50±0.04[a]
Methylpyrazine	Pyrazine	7.47±0.14[a]	7.08±0.85[a]
2,5-Dimethylpyrazine	Pyrazine	3.65±0.25[a]	3.03±0.68[a]
2,6-Dimethylpyrazine	Pyrazine	3.64±0.31[a]	3.29±0.11[a]
Ethylpyrazine	Pyrazine	2.54±0.03[a]	2.73±0.08[a]
2,3-Dimethylpyrazine	Pyrazine	0.89±0.03[a]	0.73±0.12[a]
2-Ethyl-6-methylpyrazine	Pyrazine	3.07±0.29[a]	3.55±0.46[a]
2-Ethyl-5-methylpyrazine	Pyrazine	1.99±0.16[a]	2.17±0.31[a]
2-Ethyl-3-methylpyrazine	Pyrazine	1.40±0.05[a]	1.27±0.01[a]
4-Ethylphenol	Phenol	1.31±0.11[a]	1.16±0.56[a]
2,6-Diethylpyrazine	Pyrazine	0.34±0.03[a]	0.36±0.07[a]
Ethenylpyrazine	Pyrazine	1.03±0.06[b]	0.18±0.01[a]
3-Ethyl-2,5-dimethylpyrazine	Pyrazine	3.43±0.02[a]	2.90±0.23[a]
2-Furancarboxaldehyde (furfural)	Furan	7.31±0.17[a]	11.79±0.37[b]
2-Ethyl-3,5-dimethylpyrazine	Pyrazine	0.63±0.02[a]	0.72±0.01[a]
Furfuryl methyl sulphide	Furan	0.28±0.01[a]	0.82±0.08 [b]
Furfuryl formate	Furan	0.92±0.01	-
2-Methyl-6-vinyl pyrazine	Pyrazine	0.75±0.07[a]	0.71±0.18[a]
2,3-Diethyl-5-methylpyrazine	Pyrazine	0.98±0.09 [a]	1.10±0.15 [a]
3,5-Diethyl-2-methyl- pyrazine	Pyrazine	0.39±0.07[a]	0.56±0.04[a]
1-(2-Furanyl)- ethanone	Furan	1.98±0.04[a]	2.44±0.57[a]
3,5-Dimethyl-2(5H)-furanone	Furanone	0.57±0.07	-
Benzaldehyde	Aldehyde	0.18±0.06[a]	0.73±0.11[b]
2-Furanmethanol acetate	Furan	5.79±0.28[a]	13.12±1.45 [b]
1-(Acetyloxy)-2-butanone	Ketone	0.49±0.04	-
5-methyl- 2-furancarboxaldehyde	Furan	12.85±0.55[a]	13.23±2.13[a]
2.2'-Bifuran	Furan	0.20±0.01[a]	0.54±0.07[b]
2-Furanmethanol propanoate	Furan	0.71±0.29[a]	0.94±0.17[a]
2.2'-Methylenebisfuran	Furan	0.30±0.01[a]	0.18±0.05[a]
1-Methyl-1H-pyrrole-2-carboxaldehyde	Pyrrole	1.40±0.06[a]	1.77±0.53[a]
Acetylpyrazine	Pyrazine	0.70±0.05	-
Dihydro- 2(3H)-furanone	Furanone	0.62±0.14	-
1-(1-Methyl-1H-pyrrol-2- yl)-ethanone	Pyrrol	0.62±0.02[a]	0.81±0.12[a]
2-(2-furanylmethyl)-5-methylfuran	Furan	1.11±0.29 [b]	0.61±0.11[a]
2-Furanmethanol	Furan	15.08±1.36[b]	6.13±0.18[a]
1-(5-Methyl-2-pyrazinyl)-1-ethanone	Pyrazine	0.84±0.14	-

2.4-Dimethyl-thiophene.	Thiophene	0.61±0.05	0.31±0.05
1-(3-Methylpyrazinyl)- ethanone	Pyrazine	1.09±0.26	-
2-Methoxy-benzenamine	Benzene	0.76±0.04	-
2.3-Dihydro-6-methylthieno[2,3c]furan	Furan	1.05±0.06[a]	1.98±0.34[a]
Unknown		0.65±0.01[a]	0.94±0.09[b]
1H-Pyrrole. 1-(2-furanylmethyl	Pyrrole	0.67±0.03	0.90±0.45
Unknown		0.66±0.03[a]	0.82±0.10[a]
p-Guaiacol	Phenol	0.42±0.09[a]	0.89±0.02[b]
Unknown		0.46±0.08[a]	0.64±0.05[a]
1-(1H-pyrrol-2-yl)- ethanone	Pyrrole	0.86±0.03[a]	1.83±0.18[b]

Furans and pyrazines are common volatile class found in ground coffee and Turkish coffee brew. In accordance with our study Rocha et al. (2004) reported that the major volatiles present were furans, followed by pyrazines, aldehydes and pyridines in espresso coffee. Also Gonzalez-Rios et al. (2007) showed that furans were the main volatile class found in ground Arabica coffee, followed by ketones, pyrazines, pyridines and pyrroles. Kıvançlı and Elmacı (2016) stated that furans were the main volatile class found in Turkish coffee brew followed by pyrazines and pyrrols. Amonpour and Selli (2016) also determined that furans were main volatile compounds of Turkish coffee brew. The furans are particularly important in quantity and quality of coffee flavour. Numerous furan compounds in coffee are often responsible for the burnt sugar, burnt, and caramel aromas (Sanz et al., 2001). Area percentage of volatiles from furan class significantly increased with Turkish coffee brewing ($p<0.05$). On the other hand one volatile compound namely furfuryl formate from furan class was not determined in Turkish coffee brew. Significant increases in area percentage of some furan volatiles namely 2-furancarboxaldehyde and 2-furanmethanol acetate were observed (Table 2) ($p<0.05$). Moreover area percentage of 2-furanmethanol content was statistically decreased ($p<0.05$).

Table 2. Total area percentages of volatile classes of ground coffee and Turkish coffee brew

Volatile class	**Ground coffee**	**Turkish coffee brew**
Furan	34.26±0.06[a]	46.69±0.70[b]
Pyrazine	35.14±0.80[a]	30.24±1.92[a]
Pyrrole	6.20±0.21[a]	7.55±2.08[a]
Furanone	1.86±0.02[b]	0.50±0.04[a]
Phenol	1.73±0.20[a]	2.04±0.54[a]
Aldehyde	0.50±0.03[a]	1.13±0.16[b]
Ketone	0.49±0.04	-
Thiophene	0.61±0.05[b]	0.31±0.05[a]
Benzene	0.76±0.04	-
Pyridine	1.98±0.01[a]	3.32±0.99[b]

Pyrazines are abundant in coffee and are related with the generation of roasted and burnt flavour notes. Many pyrazines are recognized as the volatiles contributing to nutty, coffee-like, roasted, earthy, green, and musty odour (Shimoda et al., 1990; Leino et al., 1991; Gloess et al., 2013).Total area percentage of volatiles from pyrazine class significantly did not changed with brewing ($p>0.05$). Although 18 pyrazine compounds were observed in ground coffee, 15 pyrazine compounds were determined in Turkish coffee brew. Acetylpyrazine, 1-(5-methyl-2-pyrazinyl)-1-ethanone and 1-(3-methylpyrazinyl)-ethanone were not found in Turkish cofffee brew.

Pyrroles form from the Maillard reaction between an amino acid and a sugar (Moon and Shibamoto, 2009). Both ground coffee and Turkish coffee had 6 pyrrole volatile compounds. No statistical difference was identified in total area percentage of pyrroles ($p>0.05$).

Furanones are generated in coffee mainly through the Maillard reaction and subsequent aldol condensation (Grosch, 2001). Furanones are responsible for the sweet caramel aroma of roasted coffee (Akiyama et al., 2007). While ground coffee had 3 furanone compounds, Turkish coffee brew had only

one furanone compound (Dihydro-2-methyl- 3(2H)-furanone). Peak area percentage of furanone class was significantly decreased with brewing ($p<0.05$).

Phenolic compounds are formed and released with roasting (Sunarharum et al., 2014). Turkish coffee brewing method was not significantly affect peak area percentage of phenolic compounds ($p>0.05$). Ground coffee and Turkish coffee brew has 2 phenolic compounds namely 4-ethylphenol and *p*-guaiacol.

2-Methylbutanal and benzaldehyde from aldehyde class were identified in ground coffee and Turkish coffee brew. As result of Turkish coffee brewing area percentage of aldehyde was increased ($p<0.05$). From ketone class 1-(acetyloxy)-2-butanone was determined in ground coffee, but in Turkish coffee brew it was not assigned. 2-Methoxy-benzenamine, a volatile from benzene class was identified only in ground coffee. However 2-methoxy-benzenamine could not be extracted with Turkish coffee brewing method so it was not observed in Turkish coffee brew.

Conclusion

Turkish coffee which has an important part in Turkish culture is brewed with a special brewing procedure. All the volatile compounds found in ground coffee were not detected in Turkish coffee brew. A total of 50 volatile compounds including 15 furans, 18 pyrazines, 6 pyrroles, 3 furanones, 2 phenols, 2 aldehydes,1 pyridine, 1 thiophene,1 ketone and 1 benzene class were determined in ground coffee. On the other hand 42 volatile compounds including 14 furans, 15 pyrazines, 6 pyrroles, 1 furanones, 2 phenols, 2 aldehydes, 1 pyridine and 1 thiophene class were identified in Turkish coffee brew. On the other hand pyridine and benzene class were not determined in the Turkish coffee brew. It was revealed that significant decrease was determined for the number of furan, pyrazine, furanone class in Turkish coffee brew compared to ground coffee.

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Moisture Adsorption Isotherms and Adsorption Isosteric Heat of Dry Ground Meat

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Dry ground meat is a cooked meat product. It is popular a meat product in Central Anatolian Region of Turkey. Calf plate or lamb flank meats and intermuscular fats are used in the production of dry ground meat. In this study, sorption isotherms were determined using nine different salt solutions having different relative humidity values (LiCl 11.3%, CH3COOK 23.11%, MgCl2 33.07%, K2CO3 43.16%, Mg(NO3)2 54.38%, NaNO2 65.5%, NaCl 75.47%, KCl 85.11% and BaCl2 90.69%) at 5, 15 and 25°C. The obtained experimental data were applied to Iglesias-Chirife, Oswin, BET, Harkins-Jura, Smith, Freundlich, Halsey, GAB, Peleg, modified Chung-Pfost, modified Oswin and Iglesias-Chirife and Peleg equations revealed the best fitting. From the experimental data obtained, it is found that the sorption isotherms have Type-II characteristics. Isosteric heats of adsorption were evaluated by applying the Clausius-Clapeyron equation to experimental isotherms and decreased with increasing moisture content.

Keywords: Dry ground meat, sorption isotherm, isosteric heat

Vocational Education and Training Materials to Minimize Postharvest Losses within Food Chain

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Nearly one third of the food produced in the world for human consumption every year -approximately 1.3 billion tonnes - gets lost or wasted. Postharvest food loss is a challenge for all countries in the last years. Postharvest loss includes the food loss across the food supply chain from harvesting of fruit or vegetable through harvesting, transportation and finally consumption level. The percentage of postharvest losses in fresh fruits and vegetables is estimated 5 to 25 percent in developed countries and 20 to 50 percent in developing countries. Major constraints in postharvest systems are improper handling of the produce at harvesting, transportation, storage, packaging and handling at marketing stage.

"Best Innovative Approach to Minimize Postharvest Losses within Food Chain for VET" Project is funded by the Erasmus+ Programme of the EU in the field of Strategic Partnership for vocational education and training. The Project is coordinated by Central Research Institute of Food and Feed Control in partnership with seven organisations from Turkey, Austria, Romania and Spain. The aim of the Project is to develop an educational package that meets the requirements of employees working in postharvest sectors to reduce losses and improve the quality, safety and marketability of selected horticultural products.

Several training materials have been developed including detailed information about proper harvesting, storage, transportation, packaging and marketing conditions of fresh fruits and vegetables, especially for grape, cherry, fig and tomatoes. All training materials are available on the e-learning platform (e-learning.postharvestproject.com/) in Turkish, English, German, Romanian and Spanish languages. Additionally a curriculum named "Minimizing Postharvest Losses" was prepared to serve all documents in a well planned programme to all possible stakeholders of the sector. In that respect this course will help to increase the knowledge of attendants by using well prepared, flexible, easy teaching instruments such as videos, animations, powerpoint presentations.

Comparison of different extraction methods of phenolic compounds from bay leaf (*Laurus nobilis L.*)

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Bay leaves (*Laurus nobilis* L.) are one of the oldest known widely used spices as alternative medicine which have antioxidant, antimicrobial and anti-inflammatory effects due to bioactive compounds. Bioactive compounds are secondary metabolites that have a positive effect on health by affecting physiological and cellular activities. Phenolic compounds are one of these secondary metabolites and the plants are known as rich in phenolic compounds. Phenolic compounds are used in food industry because of their nutritional quality, natural colorant, antioxidant activity and organoleptic properties. However, due to the presence of small amounts of these compounds it is necessary to determine the most suitable extraction method with high efficiency.

Extraction is an important stage for the identification and usage of phenolic compounds. The method used for the extraction of phenolic compounds is usually solvent extraction. Since the conventional method has many disadvantages such as the use of excess solvent and high temperature usage for a long time hence alternatives methods are being investigated. A number of alternative methods have been developed in recent years such as microwave, ultrasound, enzyme, supercritical fluid and pressurized fluid-assisted extraction methods.

In this study, three different extraction methods such as microwave assisted, enzyme-assisted and solvent extraction were used. Extraction efficiencies were compared in bay leaf extract in terms of phenolic content, antioxidant capacity and chlorophyll content. In addition, total dry matter, total ash, ascorbic acid, pH value, and total acidity of bay leaf were analyzed. In microwave treatment, pilot type custom made microwave equipment by MET Advanced Technology System (İzmir, Turkey) was used. The power (16000 W), frequency (2450 MHz) were used and the time for treatment was regulated according to the measured extract temperature during application. In enzymatic extraction, commercial enzyme, Pectinex Ultra SP-L (Novozymes), was used and the temperature, time and enzyme dose were also determined.

Determination of the Microbial Profile during the Fermentation Process of Grape Leaves Brine

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Brining is the most commonly used preservation method for grape leaves that are widely consumed in many regions in our country. The aim of this study is to analyze the effect of different salt concentrations (SC) (5%, 12% and 19%) on the microbial profile during brining of vine leaves. In addition to microbiological analyses, titratable acidity, salt and pH were analyzed on the samples taken from vine leaf brine on days 1, 7, 15, 30, 60 and 90. The SC and pH in all samples showed a significant decrease in the first week. For 5% and 12% SC, % acidity value in terms of lactic acid increased during the fermentation period; while for 19% SC, it increased during the first 30 days and then decreased later. For 5% and 12% SC, lactic acid bacteria (LAB) enumerated on MRS agar increased up to 5,4 and 5,5 log kob/ml on day 30, the numbers decreased later. The similar increasing trend was also observed for 19% SC, but starting later than the lower SCs, on day 15, until day 60, where it reached 6,1 log kob/ml. For yeasts detected on PDA agar, a very similar figure was obtained with maximum counts of 5,5 log kob/ml for 5% and 12% SC on day 30, and 6,0 log kob/ml for 19% SC on day 60. A total of 211 LAB and 117 yeasts were purified and subjected to DNA isolation. After grouping by Rep-PCR, 16S-rDNA sequencing for LAB and 26S-rDNA sequencing for yeasts, were performed for identification. For LAB, *Lactobacillus brevis* was the dominant microorganism with 63% for 5% SC and 12% SC, but it remained at 13% on the 3rd month for 19% SC. Among yeasts, *Hanseniaspora uvarum* was the dominant microorganism at 5% SC and *Debaryomyces hansenii* was the predominant one at 19% SC. At 12% salt concentration, H. uvarum, *H. opuntiae* and *D. hansenii* showed a mixed profile after 3 months.

Determination of the Antimicrobial and Antioxidant Effects of Sodom Apple (*Calotropis procera*) Used in the Production of West African Cheese (WAGASHI)

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Abstract: In this study, the leaves of *Calotropis procera* used to coagulate milk in the production of West African cheese (Wagashi) were investigated. The leaves freshly supplied from Niger, were freeze dried. The dried leaves were ground, and leaf contents were extracted using two different solvents (methanol and ethanol). Firstly, phytochemical composition and antioxidant activity of *Calotropis procera* leaves were determined. Then antimicrobial effect of this plant extracts on various bacteria (*Listeria innocua, Staphylococcus aureus, Bacillus subtilis, Escherichia coli, Salmonella* Typhi), yeasts (*Debaryomyces hansenii, Candida rugosa)* and molds (*Aspergillus niger* ve *Penicillium chrysogenum)* were determined. Analyses were done using SPSS (ver. 25). As a result of the analysis, the presence of tannins, saponins, flavonoids and terpenoids were detected in the leaves except cardiac glycosides. Total phenolic content was 7.683 ± 0.362 mg gallic acid/g, total flavonoid substance was 3.966 ± 0.573 mg quercetin/g and 43.62% antioxidant activity was obtained from a 10% diluted extract. It was found that more effective results were obtained with methanolic extract of the leaves. Inhibition zone diameters against *Salmonella* Typhi, *Listeria innocua*, *Debaryomyces hansenii* and *Candida rugosa* were 16.5, 17, 17.25 and 18 mm, respectively. The highest inhibitions were found against *Staphylococcus aureus*, *Aspergillus niger*, *Bacillus subtilis* and *Escherichia coli* with 20, 26.25, 26.5 and 29.5 mm inhibition zone respectively, for the antimicrobial effect. In addition, it was concluded that neither ethanolic nor methanolic leaf extract of *Calotropis procera* had inhibitory effect against *Penicillium chrysogenum*. The minimum inhibitor concentration was 160 mg/mL for all bacteria and *Debaryomyces hansenii*. This concentration was found to be a lethal concentration for *Bacillus subtilis* and *Escherichia coli*.

Keywords: *Calotropis procera*, cheese, West Africa, antimicrobial, antioxidant, phytochemical constituents.

1. Introduction

Calotropis procera belong to the Apocynaceae plant family and are cultivated in northern and tropical Africa, western and southern Asia. Its common names are *milk weed,* ***Sodom's milkweed,*** **or** ***Dead Sea apple***. Particularly in West Africa, it is known as "bambamby" by the Fulanis tribe. In Arabic it is called "kisher" and in French known as "pomme de sodome". It is a plant species growing up to 5.4 m height in tropical and subtropical regions, with milky latex production[1, 2]. It produces a large amount of latex that can be easily collected from the green leaves and bark of the plant[1]. Latex of this genre is used for various purposes in traditional medicine in African and Asian countries[3, 4] because they are a rich substance of secondary metabolism-induced chemicals found in roots, stems, leaves and flowers[5].

Figure 1: *Calotropis procera*

Wagashi is a soft, unripened cheese obtained after coagulation of goat or cow's milk[6]. Traditionally, after milking cows or goat's milk, it is mixed with the leaves or stems of the sodom apple plant. The mixture is allowed to stand at ambient temperature then the fermented mixture is gently heated for 40-75 minutes to make a clot formation. Subsequently, heating (70°C, about 10 minutes) is carried out to enhance the aroma and enzyme inactivation of the product. The resulting 'wara' is placed in the molds and the 'whey' is allowed to flow for a few minutes.

Figure 2: Wagashi

Due to basic processing and storage conditions in rural areas of Africa, the risk of pathogenic and spoilage microorganisms present in food for consumption is very high given that traditionally fermented milk products are widely produced and consumed in Africa**[7].** Therefore, consumption of milk and dairy products plays an important role in every stage of human life, especially in many African rural areas. Milk is an important nutrients source, but can be a means of zoonotic foodborne diseases, especially when raw milk is consumed[8].

In this study, phytochemical and antimicrobial activity of *Calotropis procera* leaf extracts in two solvents was examined. The microorganisms evaluated are known potential hazard for food safety and quality in some food sources and especially in cheese.

2. Method

In this study, antimicrobial analyzes were performed with 2 replications and 5 replications for the determination of phytochemical components in leaves.

The drying process was carried out in a freeze dryer at -66°C under 5 mtorr pressure for approximately 62 hours. The dried leaves were stored in moisture-free conditions[9].

To a 10 g portion of the powdered sample, 200 mL of ethanol and methanol were added separately in sterile 500 mL of aluminum foil coated glass vials and allowed to stand at room temperature for 24 hours. After filtration, a rotary evaporator was used to ensure complete extraction and stored at 4°C[10-12].

2.1. Determination of phytochemical components

The methods described by Krishnaiah, Devi [13] and Mikail [14] were used to determine the phytochemical components found in the leaves. Qualitative analysis consisted to detect the presence or absence of certain compounds. These compounds include tannin, saponin, flavonoid, terpenoid and cardiac glycosides.
Total phenol and flavonoid content were performed for quantitative analysis. The content of total phenolic compounds of the extracts was spectrophotometrically done according to the Folin-Ciocalteu colorimetric method[15]. Total phenol content was calculated from the calibration curve plotted with gallic acid and equivalent to mg gallic acid.
The flavonoid content of plant extracts was measured by modifying the method of Zhishen, Mengcheng [16]. Here, the absorbance of the solutions was calculated from the calibration curve drawn with quercetin, equivalent to mg quercetin.
Antioxidant activity was also determined by DPPH method and the absorbance of the samples was measured against 80% methanol and expressed as % inhibition of DPPH[17].

2.2. Determination of Minimum Inhibitor Concentration (MIC)

Ten-fold dilutions of the active ingredient were made on Mueller-Hinton Broth medium to obtain dilutions containing an increasing concentration of sodom apple extract. 0.1 mL of microorganism culture with 24-48 hours active susceptibility was determined and bacteria were incubated at 37°C for 24-48 hours and mold and yeasts were incubated at 25°C for 48-72 hours. The growth of microorganism in the tubes was done visually by assessing turbidity, so that the final dilution without growth was considered as MIC value. 0.1 mL of inoculum from the last dilution without growth was inoculated into 10 mL of medium and the absence of growth in the tube at the end of incubation gave the Minimum Lethal Concentration (MLC) value.

2.3. Determination of antibacterial and antifungal activity

For this well-known procedure of agar diffusion, agar plates were inoculated with 1 mL of a standardized inoculum of the test microorganisms. The colonies were standardized at $1.5x10^8$ CFU/mL for bacteria according to the McFarland Standard. Similarly, the yeasts and molds were prepared at 10^6 CFU/mL and 10^5 spores/mL, respectively. Then 3 wells with a diameter of 3 mm were opened on the solidified medium. 100 µL of sodom apple extract was transferred to two of the wells. The last well was used as a control.

The process was carried out separately for the extracts obtained using ethanol and methanol. The petri dishes were then incubated at 37°C for 24 hours for bacteria and at 25°C for 7 days molds and yeasts. At the end of the incubation, inhibition zones were evaluated in mm[18-20].

2.4. Statistical analyses

One-way analysis of variance was performed using IBM SPSS 25 package program. Differences between groups were evaluated according to Duncan's multiple range test (DMRT) at a level of significance (α) of 0.05. In order to determine whether there is a significant difference between the solvents used (ethanol and methanol), comparison of inhibition zones for each microorganism was done using a chi-square test.

3. Results and Conclusion

Phytochemical analyzes have shown that bioactive compounds, which may be responsible for the antimicrobial and antioxidant effect of in vitro on the microorganisms are due to the presence of alkaloids, tannins, saponins, flavonoids, terpenoids in the leaves. **The antioxidant activity, antibacterial and antifungal activity of the leaves was examined. In terms of antioxidant activity, the leaves of *Calotropis procera* have been shown to have very high activity.** It should be noted that the antioxidant activity, which is 43.62%, is obtained from a 10% diluted extract. **In order to determine the presence of phenolic compound with known antioxidant effect, the total phenolic and total flavonoid substances of the methanolic extract of the leaves were determined and the amounts were found to be 7.683±0.362 mg gallic acid/g and 3.966±0.573 mg quercetin/g, respectively.**

The antimicrobial activity of the ethanolic and methanolic extracts of the leaves showed various degrees of antibacterial and antifungal activity against all microorganisms tested. The inhibition sites of the ethanolic extract of *Calotropis procera* ranged from 0 to 16.25 mm (Figure 3), whereas the inhibition sites of the methanolic extract varied from 0 to 29.50 mm (Figure 4).

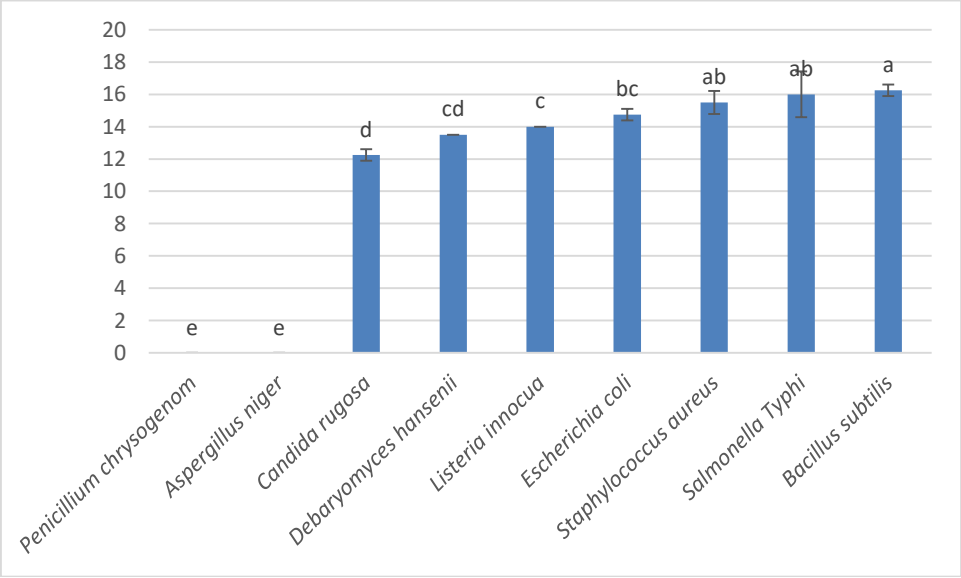

Figure 3: Effect of ethanolic extract of *Calotropis procera*

Mean bars with the same letter(s) are not significantly different (α=.05)

The highest inhibition was observed for *Bacillus subtilis* (16.25±0.35 mm) and the lowest inhibition was observed in molds where we didn't record any inhibition (*Penicillium chrysogenum* and *Aspergillus niger*). Statistically, there is no difference between the inhibition zone of *Debaryomyces hansenii*^{cd} and the zone of *Listeria innocua*^{c}, but the inhibition sites of yeasts are lower than those of bacteria ($P<0.05$).

The antibacterial and antifungal test results of the plant extract obtained by methanol extract were determined by agar diffusion test as shown in Figure 2.

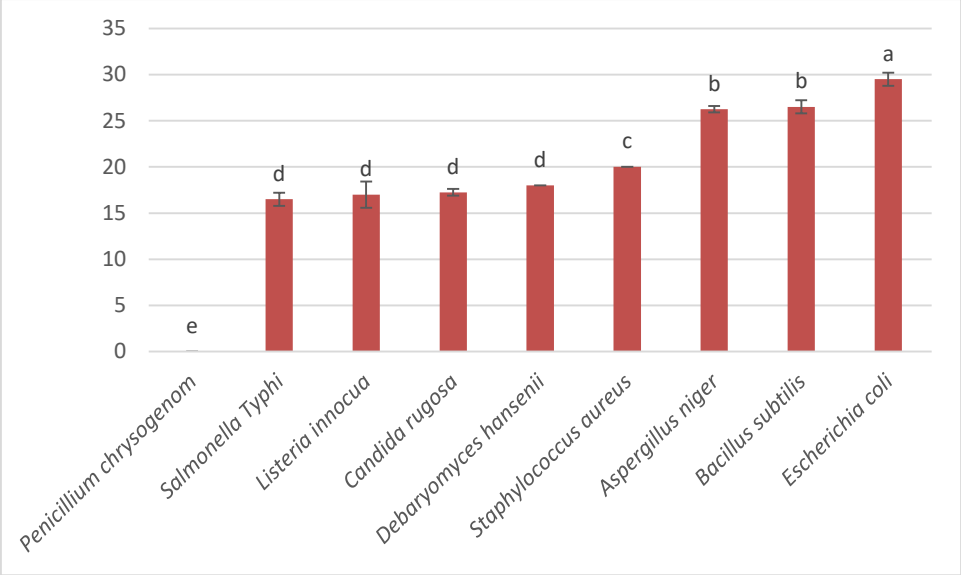

Figure 4: Effect of methanolic extract of Calotropis procera

Mean bars with the same letter(s) are not significantly different (α=.05)

The highest inhibition was observed for *Escherichia coli* (29.5± 0.71mm) and the lowest inhibition was observed with *Penicillium chrysogenum* where no inhibition was observed. There was no statistically significant difference between *Salmonella* Typhi[d], *Listeria innocua*[d], *Candida rugosa*[d] and *Debaryomyces hansenii*[d] inhibition zones. Likewise, there is no significant difference between *Aspergillus niger*[b] and *Bacillus subtilis*[b], which have higher inhibition zones (P<0.05).

However, the Chi-square test comparing the antimicrobial effect toward each microorganism according to the solvent used showed no significant difference for all microorganisms except *Bacillus subtilis*, *Escherichia coli* and *Aspergillus niger* (P<0.005), while according to the classification of Rodríguez, González [18], Bonadè, Murelli [19] allowed the observation of a difference between solvents. As a result, the ethanolic extract was found to be "good" for *Staphylococcus aureus*, while the methanolic extract was "very good". Likewise, for the ethanolic extract which has an "intermediary" inhibitory effect against *Listeria innocua*, *Debaryomyces hansenii* and *Candida rugosa* but has a "good" inhibitory effect on methanolic extract (Figure 5).

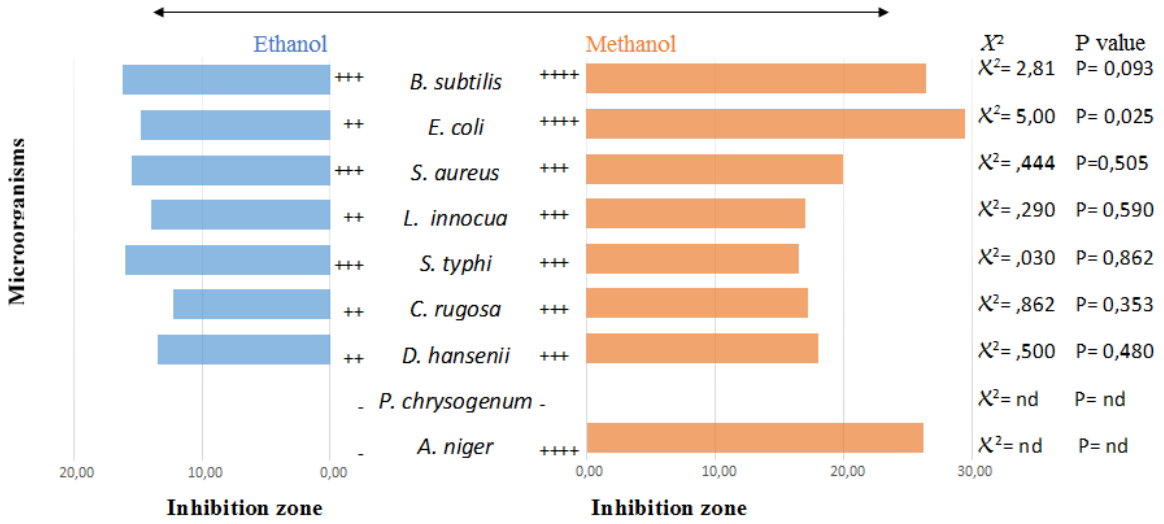

Figure 5. Evaluation of the inhibition ability (Ethanolic and Methanolic extract)

It was also found that the methanolic extract gave more successful results than the ethanolic one for the minimum inhibitory concentration. According to the results of the MIC analysis of the methanolic

extract, there was no inhibition activity at a concentration of 1.6, 16 mg/mL, but it was recorded as a minimum inhibitory concentration of 160 mg/mL in all bacteria and *Debaryomyces hansenii*. In addition, the concentration of 160 mg/mL was found to be a lethal concentration for *Bacillus subtilis* and *Escherichia coli*.

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Determination of Physicochemical Properties of Different Citrus Fruit Wastes

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Abstract

Citrus is one of the most waste producing products in the world. For this reason, the overall utilization of wastes is important in terms of economy, nutrition, and environment. In this study, citrus by-product powders were prepared after bitterness removal, drying, and grinding processes. Moisture content, ash content, water holding capacity and oil holding capacity analyzes were performed in the final products. Moisture contents were calculated as 8.47, 5.20 and 5.62% in lemon, orange, and tangerines by-products powders, respectively. Ash values in dry matter were calculated as 5.17% in lemon, 4.53% in orange and 7.90% in tangerine by-products powder. Whereas, the water activity values were determined as 0.37, 0.30 and 0.32 in lemon, orange, and tangerines, by-products powders, respectively. The values of L*, a*, and b* were determined respectively as 80.18, 3.00 and 29.01 for lemon, 79.19, 5.17 and 43.85 for orange, and 72.62, 10.16 and 39.12 for tangerine by-products powders. Water holding and oil holding capacity values of the samples were in the range of 4.80-5.59 (g water/g dry powder) and 0.87-0.94 (g oil/g dry powder), respectively.

Keywords: Citrus, waste, physicochemical properties

Introduction

Citrus is a plant community which has high economic value with the inclusion of Citrus Aurantium, orange, tangerine, grapefruit and lemon and also citrus genus fruit tree species. Its nutritive value, taste, aroma and unique properties of texture and colors are effective in having a wide usage area of citrus fruits in the world. Citrus, native to China and India is grown in most regions with a temperate climate. With southern and southwestern Anatolia in Turkey is grown in the Mediterranean region [1] Citrus production is carried out in almost all countries. Citrus products, which contain vitamin C and which have important benefits for human health, are evaluated as fruit juice, jam and marmalade industrially besides directly consumption.

According to FAO data, as of 2014, 72.3 million tons of oranges, 30.4 million tons of mandarin, 16.3 million tons of lemons, 8.4 million tons of goldtop and more than 12.4 million tons of citrus were produced in the world [2].

Table 1. World Citrus Production by Species (Tons)

Products	2010	2011	2012	2013	2014
Orange	69.516.079	71.256.326	68.881.509	71.909.516	72.253.965
Mandarin	23.664.411	27.205.032	27.653.751	28.725.241	30.418.767
Lemons	14.853.090	15.070.980	15.013.862	15.231.292	16.254.214
Goldtop	7.573.842	7.940.623	8.263.010	8.358.007	8.397.156
Other Citrus	12.124.631	10.916.839	12.417.487	12.387.415	12.473.165
Total	127.732.05	132.389.800	132.229.61	136.611.471	139.796.997

General Structure of Citrus

Apart from the edible parts of citrus fruits, it largely creates waste from its peels and seeds. The general structure of citrus fruit from outside to inside is flavedo, albedo, segment, segment membrane, fruit juice sac, seed, and central axis [3]. The cross-sectional area of the fruit is as shown in Fig1.

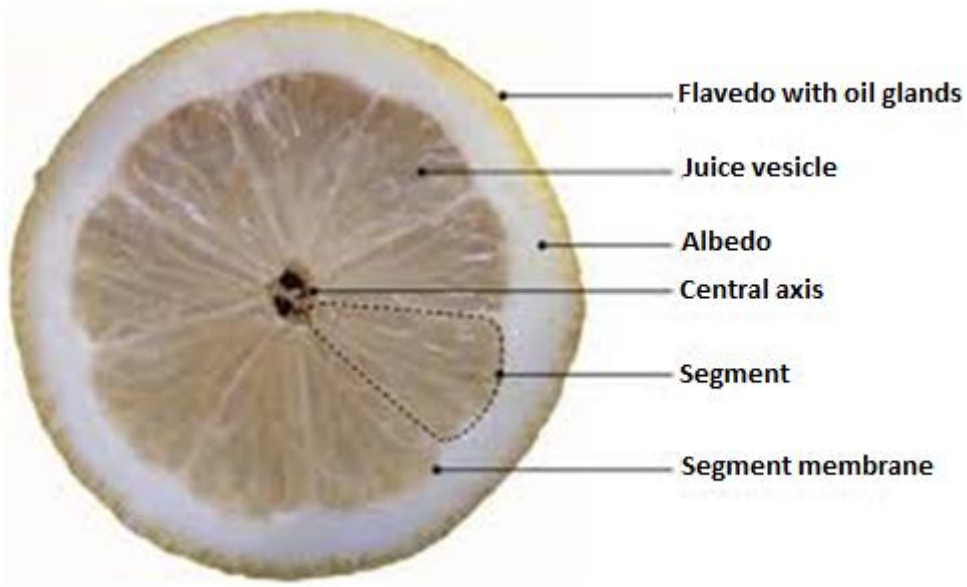

Fig. 1. Cross-sectional area of the citrus fruit [4]

Citrus peels consist of flavedo and albedo layers. Flavedo is the thin outermost layer which has differing color from yellow to red. This layer contains carotenoid pigments and fat cells. Below the flavedo, albedo layer which is white and similar to felt comes. The layer is rich in pectin. The albedo layer consists of larger cells. This layer has got veins that carry nutrients to the water.
In citrus fruits, the flavedo layer constitutes approximately 8-10% of the whole fruit and albedo constitutes 15-30%. So, 20-40% of the citrus fruits constitute the shell. 20-30% of the fruit is composed of slices and other pulp. As a result, about 40-50% fruit juice yield can be obtained from citrus fruits [5].

Wastes of Citrus

Fruit and vegetable shells are rich in bioactive components such as polyphenols, carotenoids, which are called phytochemicals and have various positive effects on health. Since peels have more biological activity than fractions of other fruit and vegetables, their research has been concentrated on their evaluation. Besides the edible part of citrus fruits, the waste part consisting mainly of peels and nuclei is used in the treatment of various diseases among the public. In studies, total phenolic matter, mineral, vitamin contents of peels were found to be higher than fruit and juice [6].

Material and Method

Material
In this study, orange, lemon, and tangerine peel flour prepared by grinding after dried in the oven were used.

Methods

Determination of moisture
Moisture values of orange, tangerine and lemon peel flour samples were measured as percentages by using Denver Instrument (IR-200).

Determination of Ash
Ash determination was carried out according to the AACC 08-01.01 method. Samples were placed on crucible which was brought to constant weighing and burned until white ash was formed at 550-590^{0}C temperature. The samples cooled in a desiccator were weighed with precision a balance [7].

Determination of Color

The color values of the flour samples obtained by drying from citrus wastes to be evaluated as a whole were measured using Hunter Lab Color Quest XE color determination device (Hunter Lab, Hunter Associates Laboratory, Reston, VA, USA). Color readings were made according to the L * a * b * color system. In the system, a* red-green color, b* yellow-blue color, L* gives the value of lightness and darkness [8].

Water Activity
Water activity was measured using the AW-SPRINT (TH-500) instrument.

Water Holding Capacity
The water holding capacity was determined by centrifugation. The samples (0.25 g x 3) were suspended in 2.5 ml of water and stirred at room temperature for 24 hours, and the suspension was centrifuged at 2500 g for 25 minutes. The supernatants were separated and the hydrated fibrous fraction was weighed [9].

Oil Holding Capacity
Oil holding capacity using sunflower oil (1.0054 g / ml density). It was determined under the same conditions as the water binding capacity described in 6.3.7 and expressed as ml oil / g fibrous residue [9].

Result and Discussion
At these stages of the study, moisture values were calculated as 8.47, 5.20 and 5.62% in lemon, orange, and tangerines, respectively. Ash values in dry matter were calculated as 5.17% in lemon, 4.53% in orange and 7.90% in tangerine. Water activity values were calculated as 0.37, 0.30 and 0.32 in lemon, orange, and tangerines, respectively. Color values were measured by using L*, a*, b* parameters. The values of L*, a* and b* were determined respectively as 80.18, 3.00 and 29.01 for lemon, 79.19, 5.17 and 43.85 for orange, and 72.62, 10.16 and 39.12 for tangerine. Water holding capacity and oil holding capacity values were determined as 5.21, 5.59, 4.80 (g water/g powder) and 0.87, 0.94, 0.91 (g oil/g powder) for orange, lemon and tangerine, respectively. According to the data obtained from the study, moisture content of lemon peel is higher than orange and tangerine. Ash, water activity, water holding capacity, and oil holding capacity values were founded similar in all 3 products. According to the results of the color values, the lemon peel is brighter while the tangerine peel is more red-green. When these data were compared with the literature, similar results were obtained. In the next stage of the study, it is aimed to test these samples in various food products and determine their effects on product properties.

Table 2. Moisture, ash, water activity, water holding (WHC), and oil holding capacity (OHC) results of powder samples

Sample	Moisture %	Ash %	Water Activity	WHC (g/g)	OHC (g/g)
Lemon	8,47	5,17	0,37	5,59	0,94
Orange	5,20	4,53	0,30	5,21	0,87
Mandarin	5,62	7,90	0,32	4,80	0,91

Table 3. Color value results of samples

Sample	Color		
	L*	a*	b*
Lemon	80,18	3,00	29,01
Orange	79,19	5,17	43,85
Mandarin	72,62	10,16	39,12

L: Lightness-darkness, a*: red-green color, b*: yellow-blue color

Conclusions

In the next stage of the study, it is aimed to examine the texture and sensory properties of these samples by adding them to various food products and to determine their physicochemical effects on the product properties. It is aimed to improving nutritional values besides improve the sensory physical properties of the products in which the samples are added. So, the nutrients lost in the waste can be recovered.

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Experimental Comparison of Microwave and Radio Frequency Heating of Peanut Butter

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The heating process in food is one of the best-known protection methods. Traditional heating methods have been applied to food from past to present. Although traditional heating methods are low cost, the processing time is long. Food is exposed to high temperatures due to long-term heat treatment. High temperatures cause changes in textural and sensory properties of food and loss of nutritional value. These changes pose a health risk and are not preferred by consumers. In recent years, new systems have been developed which can be an alternative to traditional heating processes to prevent these problems. radio frequency and microwave systems provide volumetric heating in a shorter time compared to conventional heat treatment processes. however, homogeneous heating may not occur in the product. In this thesis, homogeneous heating of peanut butter by using radio frequency and microwave systems is aimed. Peanut butter heating process, radio frequency 127 mm, 132 mm, 137

mm electrode distance; microwave, 0.5 kW, 0.75 kW, 1 kW power levels using the rotary table. 551 g

± 4.41 peanut butter was used for each experiment. Peanut butter was heated in a cylindrical container (diameter: 12.5 cm, height 48 mm) designed from polypropylene. Temperature data were taken from four different points with fiber optic sensors placed in the product. The test was terminated at the latest temperature reached 70 ° C. Immediately after heating, images were recorded from the top and inter surface of the product with the thermal imager. The homogeneity index, which is a measure of homogeneous heating, was calculated using different formulas. Heating operation times at power levels of 0.5 kW, 0.75 kW and 1 kW, respectively 21.75 min, 13.52 min, and 11.12 min; Electrode distances of 127 mm, 132 mm and 137 mm lasted 52.83 min, 59.7 min, and 97 min respectively. Homogeneity index, heating rate and heating time of experimental results were compared. homogeneity index, heating rate and heating times of experimental results were compared and the most suitable process for the product was determined.

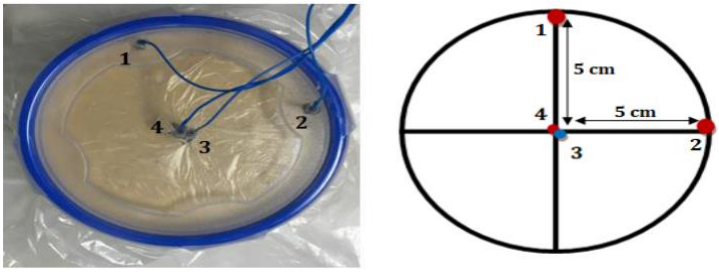
1.Introduction

Contamination during product processing and production has negative effects on both food and urban areas. The depth of contamination means a clearly created inhomogeneous heating which leads to adverse effects on the structure and morphological orientation of the food. Without these negative features, products that need consumption on shelves are not preferred. Alternative radio frequency and microwave heating are becoming common. With these systems provide fast, homogeneous, low and heatable with minimum damage since the food is not exposed to high temperature for a long time In dielectric heating methods, heating takes place with the help of electromagnetic waves. In the microwave and radiofrequency applications which are dielectric heating methods, heating emerges with dipolar rotation and ionic conduction mechanism. Volumetric heating of the product is provided by this feature of dielectric heating. Dielectric heating produces a relatively more uniform heat distribution than conventional heating [1]. These important properties in foods are largely preserved by using different heating systems with different chemical properties (such as vitamins, minerals, essential oils) and physical (color change) properties that are greatly damaged by traditional heating methods. In this study, it was aimed to contribute to the literature by investigating the effect of the methods on homogeneity by comparing two methods in heating with microwave frequency (27.12 MHz) and microwave oven (915 MHz) with a cylindrical cavity on the same samples.

2.Material and Methods

2.1.Material

Gold peanut butter was used in this study. The amount of peanut butter used for each experiment was 551 g ± 4.41. Peanut butter, as given in Figure 2.1 poliporpil fiber optic sensor which is arranged (PP) in the cylindrical container (diameter: 12.5 cm, height 48 mm) was subjected to heat treatment.



Şekil 2.1. Location of sensors in peanut butter

2.1.1. Preparation of Peanut Butter for Heating

Peanut butter is pretreated before heating with both systems. The jar of peanut butter was left in a water bath at 50 ° C to make it viscous. After 15 minutes, the amount was transferred to half of the cylindrical container. After cooling to 4 ^{0}C, a thin pochette was placed on the inter surface. Peanut butter at 50 ^{0}C is transferred back to the top of the container up to the cover level, and a thin pochette is placed on the top surface and the sensor is closed with the cover placed. After 24 hours at 20 ^{0}C climatic test cabinet was made ready for the experiment. The process of keeping the product in the climatic test cabin until the moment of test is to ensure that the initial temperatures of each test are the same. Since the rotary table will be used for microwave heating, the same length sensor is used.

2.2. Methods

2.2.1. Radio Frequency Heating

The radio frequency device used for heating in the laboratory has two parallel electrodes (width: 43 cm, length: 100 cm) (Figure 2.2). The top electrode is in motion and the electrodes have a range of 110-160 mm. The frequency of 12.27 MHz and a maximum power level of the device has two kW (Sonar, Izmir, Turkey). Three different electrode distances were determined for heating. These ranges are 127 mm, 132 mm, 137 mm respectively.

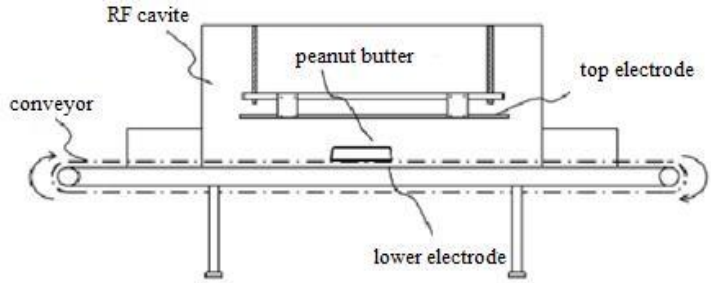


Figure 2.2. Schematic representation of radio frequency [2]

The product stored at 20 ^{0}C is quickly placed in the middle of the belt in the oven. Fiber optic sensors are defined to the temperature measuring device by passing through the product outlet point. The

system is energized and the temperatures of the product at four different points during the heating are recorded every second. The test was terminated when the temperature at the latest reached the temperature of 70 ° C [4,5] and the image was recorded with the thermal imager from the top and inter surface. The peanut butter was heated at three different electrode distances (127 mm, 132 mm, 137 mm) in the radio frequency system. The experiments were performed in two replicates for each electrode distance.

2.2.2. Microwave Heating

The microwave oven in our laboratory is specially designed and operates at 915 MHz with a power of 5 kW (Sonar, İzmir, Turkey). It has a rectangular waveguide and a cylindrical cavity (Figure 2.3). System power can be set at 500 W intervals. The cavity (height 25.4 cm, diameter 55.0 cm) has a 25 mm diameter hole in the center and an openable cover (Figure 2.4). This hole allows the removal of fiber optic temperature sensors from the cavity. The system is equipped with a rotary table (1 revolution 128 sec) for homogeneous heating. In the experiment, the position of the sample in the cavity is designed as follows; A cardboard platform was placed on two superimposed turntables, and after the two turntables were placed on the cardboard platform, the sample was placed on one of these tables. The table under the platform rotates while the table on the cardboard rotates.

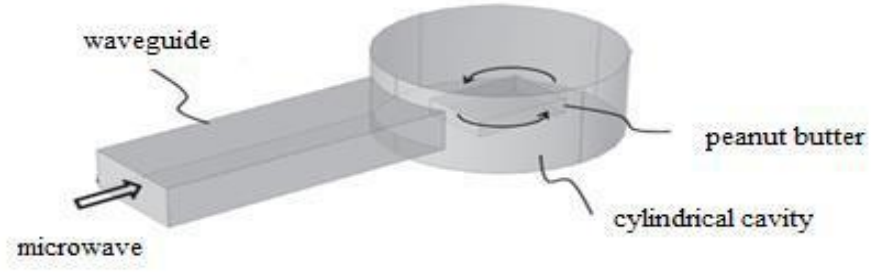
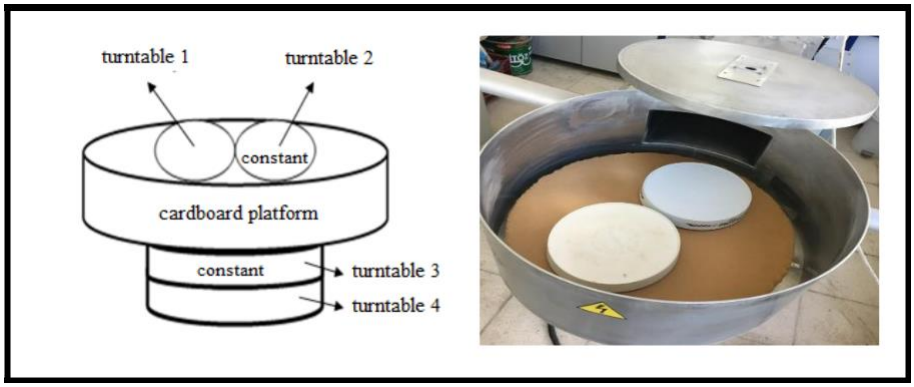


Figure.2.3 Schematic representation of the microwave [3]



Şekil 2.4 Experimental setup in microwave cavity

2.2.3.Temperature Measurement

Temperature measurement in the sample fiber optic probes were placed in four different points at defined depth (UMI-4 FISO, Canada). The sensors are located in the center deep, close to the center surface, edge deep and close to the edge surface in order to indicate the temperature distribution correctly. Probes can measure 17 and 32 mm depth of the product (tables ..). The measurement is in process of heating peanut butter was initiated at the four points are at 20 ^{0}C. Each probe having a sensor code must be defined by the order of the sensor code. Towards the sensor are not defined in the

code causes the incorrect temperature measurements. The sensor codes given in Table 2.1 below are respectively assigned to the temperature measuring device. The temperature measurement device was used to record temperature data once a second.

Tablo 2.1 Sensor codes defined to the temperature measuring device, position and depth of sensors in the product

Sensor number	Sensor code	Location	Depth (mm)
1	4483474	Edge, deep	32
2	4439459	Edge, close to surface	17
3	4536496	Center, deep	32
4	4382429	Center, close to surface	17

Examples of radio frequency and microwave heating is applied peanut butter immediately after heat treatment (within 30 sec) and the top surface of the intermediate for example a thermal camera (Model PI200, Optris, Germany), the image is taken. The location of the thermal imaging camera is kept constant for each experiment. Immediately after the image was taken from the top surface, the pochette placed on the inter surface was lifted by holding the four corners in a short time to maintain the temperature and the image was taken from the inter surface.

2.2.4.Power Measurement

In dielectric heating methods, the energy absorbed in the food depends on the dielectric properties of the food.The dielectric constant is a measure of the material's ability to store electromagnetic energy, while the dielectric loss factor is a measure of the ability of a material to radiate electromagnetic energy to heat [6]. As the dielectric loss factor increases, the energy absorbed by the product is converted to heat more rapidly. As the dielectric properties of the food change with temperature, the energy absorbed by the food also changes. Therefore, in all heating experiments, current values were recorded every two minutes to calculate the power absorbed by the food. The power absorbed by the peanut butter (volumetric power absorption) used for heating was calculated from the relationship P = V.I using the electric current (I) values shown in the radio frequency system. Immediately before heating starts, the recorded current value (no load) is subtracted from the recorded current value every second during heating (charged) and the current values are obtained and multiplied by the voltage value applied to the top electrode supplied by the manufacturer (3000 V).

2.2.5.Heating Uniformity

Temperature uniformity index (λ) value, which is simply the ratio of the rise in standard deviation (σ) to the rise in average temperature (μ) over treatment time ($\frac{\Delta\sigma}{\Delta\mu}$), was defined by Wang et al. (2005) and employed by several researchers (Zhou et al., 2015; Zhang et al., 2015; Chen et al., 2015) in order to assess the uniformity of electromagnetic heating. Smaller index values indicate better heating uniformity [7]. Temperature uniformity index values calculated using the internal temperature readings were used to compare the uniformity of the tempering treatments. Wang et al. (2005), the homogeneity index described in the mathematical modeling of the product is related to only the first and last temperature is thought to give information about all heating. Palazoğlu and Miran (2017) data

obtained during the entire process time they have made studies have identified considering alternative homogeneity index ($\lambda_N = \sqrt{\frac{1}{N}\sum_{I=1}^{N}\left(\frac{\sigma_i}{\mu_i}\right)^2}$) [3]. N is defined as the number of data.

3.Results and Discussion

3.1.Temperature Distribution of Peanut Butter

3.1.1.Radio frequency

In this study, both systems also monitor the temperature of four points along the temperature profile experiment was whether they reflect the temperature distribution of the product. The temperatures of the four points are averaged and the data distributions over time at different electrode distances are given in Figure 3.1, Figure 3.2 and Figure 3.3.

Heating experiments were carried out at peanut butter at 127 mm, 132 mm and 137 mm electrode distances, respectively, for 52.83 min, 59.7 min and 97 min. According to the formula described by John and Rowley, the electric field strength decreases as the distance between the electrodes increases [8].Therefore, the heating of the product is slow. Considering this information in the literature, we can say that the processing times obtained are consistent. Temperature-time graphs at different electrode distances were compared; it is observed that the electrode distance is 127 and 132 mm, where the temperature distribution of the four points is closest to each other. The experiment carried out at 137 mm electrode distance was long and thought to be not homogeneous in terms of temperature distribution.

3.1.2.Microwave

In the microwave heating process, the rotary table was used unlike the radio frequency heating process and the effect of rotation on heating was investigated. These data obtained with different power levels versus temperature distributions in Figure 3.4, Figure 3.5 and Figure 3.6 are given.

In the experiments carried out at 0.5 kW, 0.75 kW and 1 kW power levels in peanut butter, heating process lasted 21,75 min, 13,51 min and 11,12 min respectively. It is known from the studies in the literature that as the power of the system increases, the rate of heating the same amount of mass increases and the duration of food heating decreases [9, 10]. Looking at the process times at different power levels, it is seen that the heating speed increases as the power level increases. The power distribution where the temperature distribution of the four points is closest to each other is observed to be 0.5 and 0.75 kW. Another problem that occurs due to the rapid output of the microwave due to the output power is the inhomogeneous temperature distribution [11]. Therefore, the experiment performed at 1 kW power level is considered to be short and homogeneous in terms of temperature distribution compared to other power levels.

When the microwave and radio frequency systems with the separately heated peanut butter top and intersurface temperature are observed; Examples of different electrode from the microwave radio frequency heated at different power levels compared to the geometric center of the heated sample is observed that remain colder. When the depth of penetration, such as by radio frequency heating performed by the microwave system is less than in comparable food warmer center of the corner roller is known from previous studies to be colder. Therefore these results are obtained is considered to be similar to the literature and the samples are heated with radio frequency is thought that homogeneous heating occurs**.**

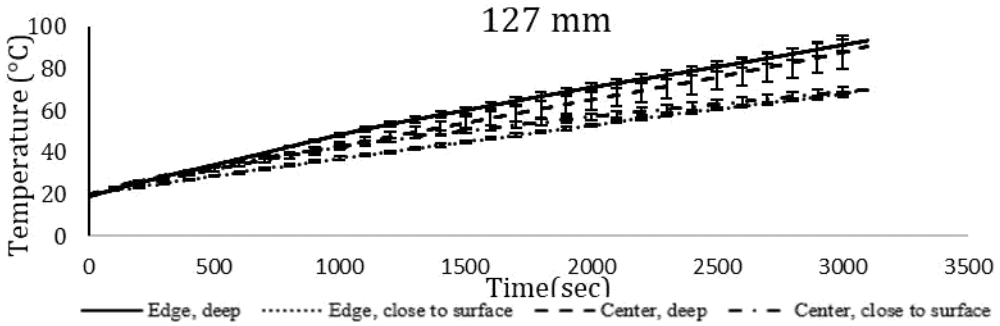


Figure 3.1. Temperature-time graph of four different points at 127 mm electrode distance

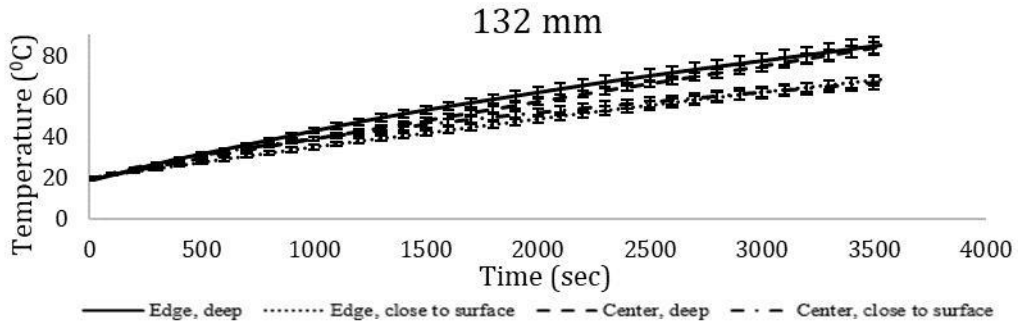


Figure 3.2. Temperature-time graph of four different points at 132 mm electrode distance

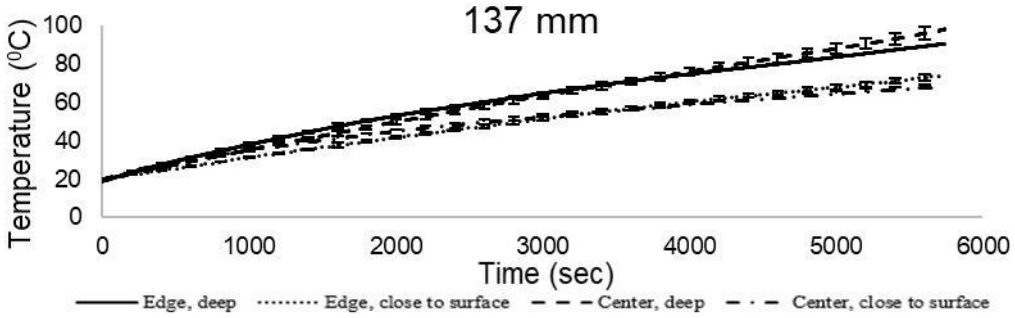


Figure 3.3. Temperature-time graph of four different points at 137 mm electrode distance

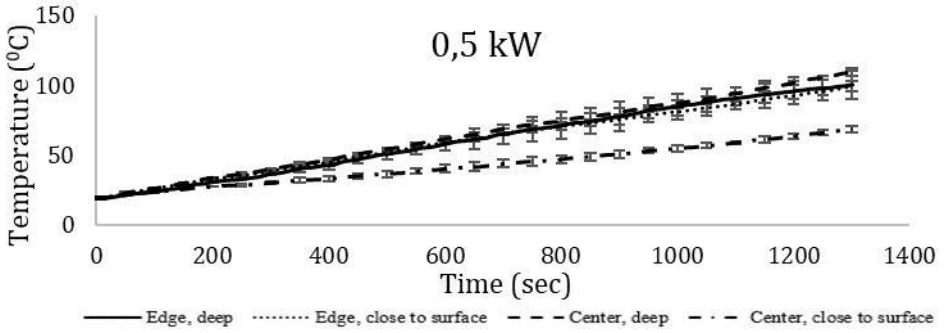


Figure 3.4. Temperature-time graph of four different points of 0.5 kW

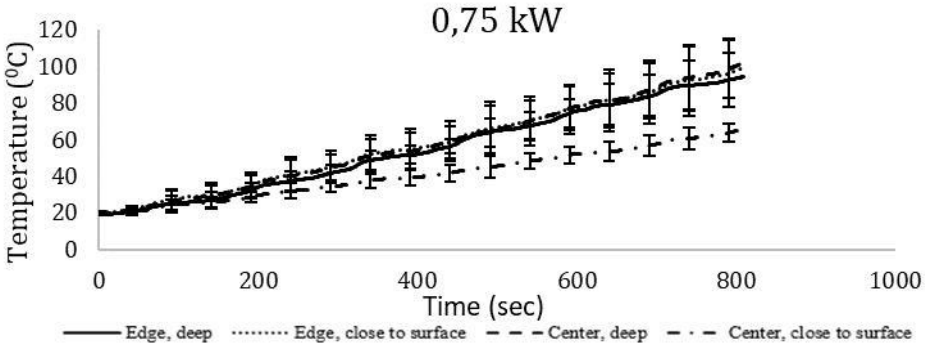


Figure 3.5. Temperature-time graph of four different points of 0.75 kW

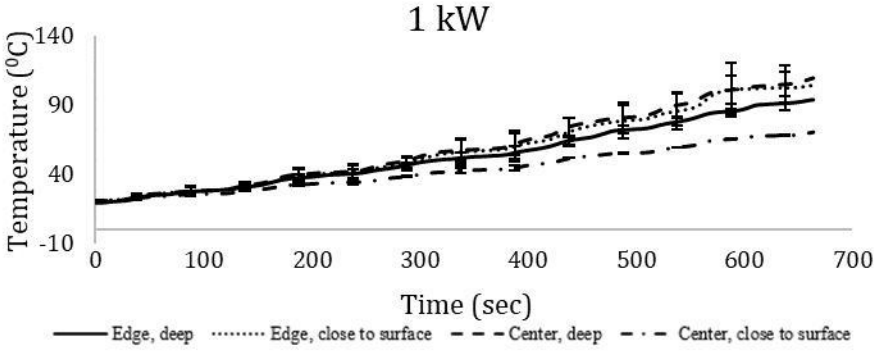


Figure 3.6. Temperature-time graph of four different points of 1 kW

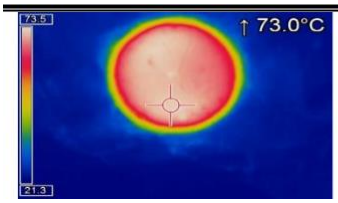
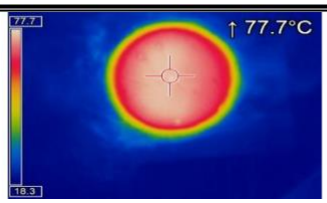
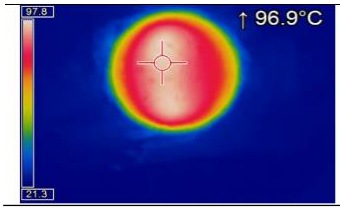
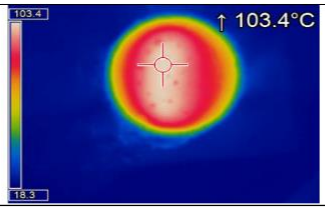
3.2.Heating uniformity

Homogeneity index was calculated by using the experimental data obtained by heating with microwave (0.5; 0.75 and 1 kW) and radio frequency (127, 132 and 137 mm) and given in Table 4.3. By comparing these values of two methods, it is stated which method provides more homogeneous temperature distribution. The low homogeneity index is indicative of a more homogeneous heating. We can say that the two methods compared with radio frequency electrode distance of 132 mm by heating to provide a more uniform heating than all other experiments. The sample having homogeneous heating according to the figure according to the surface temperature distribution recorded by the thermal camera is peanut butter heated by 132 mm.

Tablo 3.1.. Homogeneity index of microwave (0.5; 0.75 and 1 kW) and radio frequency (127, 132 and 137 mm)

	MW			**RF**			
	0,5 kW	**0,75 kW**	**1 kW**	**127 mm**	**132 mm**	**137 mm**	**References**
Homogeneity index	0,207	**0,194**	0,202	0,174	**0,019**	0,187	Wang e.t ., (2005)
	0,145	**0,114**	0,122	0,1	**0,084**	0,104	Palazoğlu and Miran.,(2017)

Table 3.2. Top and inter surface temperature distributions of peanut butter after radiofrequency heating (132 mm)

1.Repetation	**2.Repetation**	
		**Top surface**
		**Inter surface**

4.Conclusion

It is belived that heating that occurs in RF system, 132mm electrical range, has the best outcome when compared with parameters like; its index, depth of penetration and duration of the experiment. The intended end of temperature in the heating process which is coldest point reaches to 70 C in product. Thus, in peanut butter when the coldest point of the product reaches to 70 C all other points would have already reached this temperature. However until the coldest point reaches this temperature the overheating has already occurred at the other points and after the heating process distribution of overheating is observed in the surface temperature displayed by the thermal camera. It is known from the previous studies that the coldest point of the food heated using traditional heating methods is the geometric center. However, in dielectric heating systems such as radio frequency and microwave, the

coldest point in food cannot be determined. It is thought that by taking advantage of traditional methods, the problem of slow and non-homogenous heating can be solved by preheating with radio frequency and microwave systems and also it is thought it can be used in combination with traditional methods.The homogeneity of the heating process is very important for the quality of the food. In this thesis, among this two different heating systems the parameters for speed and homogeneity are determined. The selected system and parameter can be used as an alternative solution to traditional food processing methods. This study aimed to improve the food processing by determining the proper heating process, RF/MW oven parameters, dielectrical properties at the food and usage at traditional heating methods as a preheating process by elliminating its non- Homogeneous and slow heating disadvantages as well as modeling of RF and MW heating for further industrial usage.

5.Acknowledgment

This study was supported by Mersin University Scientific Research Projects Coordination Unit as 2018-1-TP2-2849 project.

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Production of Phenolic-Rich Pregelatinized Starch

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Abstract

Cold water swelling capacity and low gelatinized temperature make pregelatinized starch desirable. The aim of this study was to produce phenolic rich pregelatinized starch. Therefore, corn, wheat and potato starches were processed in pomegranate, cherry and black mulberry extracts. This process followed by drying and grinding. The pasting properties of the phenolic-rich pregelatinized starch were determined in the rapid visco-analyser (RVA). The pasting and gel properties of the phenolic rich pregelatinized starch samples were different than the control (pregelatinized starch prepared in water). It was thought that the organic acids in the phenolic extracts reduced the pH, which decrease the viscosity of starch paste. Therefore, an acidity (pH) adjustment is required for the phenolic extracts before the RVA analysis.

Keywords: Pregelatinized Starch, Extracts, Phenolic

Introduction

Pregelatinized starch is a kind of physically modified starch. These starches have cold water swelling properties [1]. The pregelatinization process includes heating the dispersed starch with water, causing the starch granules to lose their polarization crosses and disintegrate into smaller granular fragments [2].

Pregelatinized starches are widely used in many food applications. It is widely used in instant (dry prepared) foods, cake mixtures, frozen foods that require a preserved texture, and gelatin formulations prepared for desserts [1]. Gluten-free doughs are more liquid than normal dough due to the lack of gluten network and pregelatinized starch can be utilized in this formulas. In addition, the gas holding forces are lower. The use of pregelatinized starches as a tool for the stabilizing mechanism is recommended [3]. It is also concluded that pregelatinized starch is the most effective type of starch that delays staling process [4].

Phenolic compounds are present as secondary metabolites in the structure of plants. They play an effective role in protecting plants from insects, animal and other pests. Many foods contain different type and amount of phenolic substances. The source of the astringent taste in fruits and vegetables is also the phenolic compounds. Phenolic compounds serve as a kind of colorant for foods to have their specific colors. It also causes color changes with enzymatic browning. Polyphenol oxidase enzymes (PPO) catalyze reactions that cause oxidation of phenolic compounds [5]. Phenolic compounds have antioxidant effects. Antioxidants inhibit or stop reactions caused by free radicals. Thus plays an important role in the prevention of diseases [6].

In this study, starch samples were heated to a certain amount above the gelatinization temperature in phenolic extracts. Following drying and grinding processes, it is aimed to produce phenolic rich pregelatinized starch.

Materials and Methods

Materials

Pomegranate, cherry and black mulberry fruits were supplied from the local markets and used as raw materials. Pomegranate, sour cherry and black mulberry fruits were stored in refrigerator at +4 °C until the juice was extracted. Wheat, corn and potato starch were used in the production of pregelatinized starch and they were supplied from a local distributor (Tito A.Ş. İstanbul).

Methods

In the current study it was aimed to prepare pregelatinized starch in phenolic rich fruit juice extracts. However, the sugars in the extracts prevent the crispiness at the end of the drying process and obstruct the grinding process. Thus, the sugar found in phenolic rich fruit juices were eliminated by fermenting it using

the wine yeast, *Saccharomyces cerevisiae* (Proferm-W, Germany). Briefly, the fruit juices squeezed by the aid of a clean cheese cloth manually and fermented at 25˚C for 7-10 days in a laboratory oven [7]. The alcohol was removed by using a rotary evaporator at the end of the fermentation process.

Acidic forces of pomegranate, sour cherry and black mulberry extracts were determined by a pH meter. pH is a unit of measure by definition that describes the degree of acidity and the alkaline of a solution (although it is a selective measure of hydrogen ion activity) [8].

Wheat, potato and corn starches were dispersed at 10% (w/w, db) solids in pomegranate, sour cherry and black mulberry extracts and a little above the pasting temperature pregelatinized in a hot plate for 5 or 10 min with continuous stirring. The entire dispersion was transferred into a metal tray and dried at 60 °C in a laboratory oven. After drying process, the pregelatinized starch sample was ground in a grinder and passed through a 212-micron sieve [9]. As a result of this method, pregelatinized starches were obtained.

The pasting properties of the pregelatinized starches were conducted by rapid visco-analyser (RVA). In this study, the method modified properly. 3 grams of sample was used and 27 ml of purified water was added. Pasting properties of starches samples were determined using the "Standard 1" profile of the device (Table 1) [10].

Table 1. "Standard 1" profile (temperature-speed change in RVA)

Time Hour:Min:Sec	**Criterion**	**Value**
00:00:00	Temperature	50 °C
00:00:00	Speed	960 rpm
00:00:10	Speed	160 rpm
00:01:00	Temperature	50 °C
00:08:30	Temperature	95 °C
00:13:30	Temperature	95 °C
00:21:00	Temperature	50 °C
00:23:00	Temperature	50 °C

Results and Discussions

The pH values of pomegranate, cherry and black mulberry extracts are given in Table 2. It is seen that all extracts show acidic character. The most acidic is sour cherry extract.

Table 2. Acidity-Alkalinity pH values of extracts.

	Pomegranate extracts	**Sour cherry extracts**	**Black mulberry extracts**
pH values	3.71	3.47	4.02

The effect of acetic acid on the physical properties of pregelatinized wheat (PGWS) and corn starch (PGCS) gels was investigated. Increasing the concentration of acetic acid causes the pH value to decrease. Low pH can cause changes in the physical, viscosity and gelling properties of the samples by hydrolyzing the starch molecules [11].

Peak viscosity values of plain pregelatinized starches were higher than native starches. But peak viscosity values of phenolic rich pregelatinized starches were lower than native starches and plain pregelatinized starches (Figure 1).

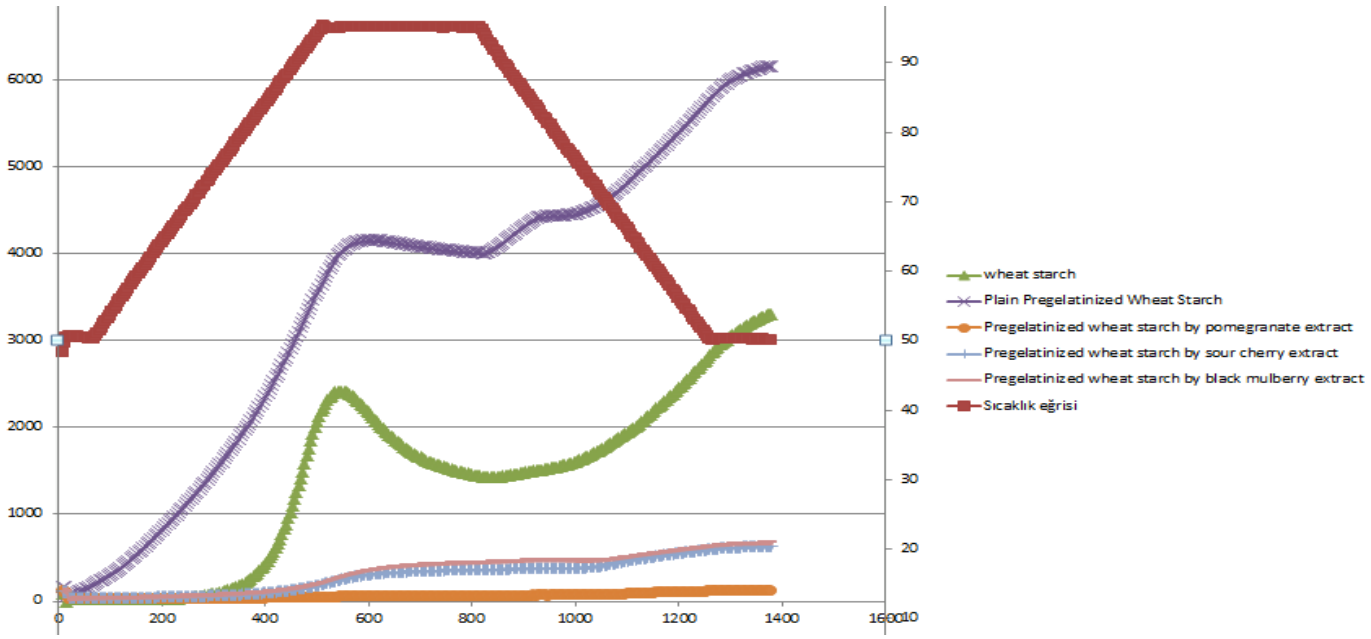

Figure 1. RVA pasting properties of native starches and phenolic-riched pregelatinized starched.

The effect of dry heating on the physicochemical properties of pregelatinized rice starch was determined in another study. The peak viscosity and final viscosity values of pregelatinized rice starches were found to be higher than natural rice starches [9].

Two phenolic compounds affected sorghum and maize starch pasting properties. Catechin and ferulic acid did not cause a significant change in the peak viscosity (PV) value of corn starch. However PV was markedly decreased for sorghum starches when ferulic acid was included [12].

The effect of acetic acid on the physical properties of pregelatinized wheat (PGWS) and corn starch (PGCS) gels was investigated. The addition of acetic acid to the pregelatinized wheat and corn starch resulted in a significant reduction in cold water viscosity (25 °C). The decrease in cold viscosity was found to be 8.11% in PGWS and 23.67% in PGCS. It was found that PGWS had higher viscosity than PGCS at various acetic acid concentrations. This is due to the fact that PGWS has higher water absorption and a larger molecular size. As a result, these starches in the presence of acetic acid exhibited lower viscosity than expected and produced softer and less cohesive gels [11].

Addition of acetic acid, malic acid, citric acid, lactic acid, tartaric acid and ascorbic acid caused a decrease in viscosity at low pH values. It has been found that the addition of these organic acids hydrolyses the amylose and amylopectin chains in the starch [13].

Conclusion

In phenolic rich pregelatinized starches, due to the low pH of phenolic extracts, the peak viscosity was found to be quite low. The low pH value directly affected the pasting properties of phenolic rich pregelatinized starch. It is thought that this problem will be solved by adjusting the pH of phenolic extracts (increasing the alkalinity of the extracts) and retrying. The study will be improved by determining the phenolic content and antioxidant capacity of the phenolic rich pregelatinized starch.

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Heat Induced Gelation Time Profile for Salep and Konjact Glucomannan

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Salep is an important polysaccharide rich in glucomannan (GM), widely used in dairy products in Turkey and have been previously reported that its consumption of about 2- 4 g per day good in reducing plasma lipid, body weight, fasting blood glucose and blood pressure. Considering consumers' requirement awoiding on some chemicals like gluten or lactose is an important for food engineers who are aware of global health challenges.

Commercially available salep (CS) and root grounded (RS) are being used in different areas in relation with dairy products such as producing hot beverages during winter time and making ice cream in summer.

Aim

The aim of the study is to investigate the production of GM rich CS or RS without the use of dairy product but water based on rheological test with gelation profile. This study seems to find answers to the following questions: Is it possible to consume "salep" in water instead of dairy product to enable persons who suffer lactose intolerance? How much salep is needed to obtain the same flow conditions? Therefore, gelation of these solutions were tested respect to different ratios and results compared with well know hydrocolloid as konjact glucomannan (KG). Materials & Method CS, RS and KG were used as received from market; CS and KG were tested from 0.5 to 3.0 % while RS in a larger weight percentage from 0.5 to 15%.Oscillation measurements were performed using a rheometer (AR-G2 Model TA Instruments) using a 40mm parallel plates and 1mm gap.

Results

CS hydrocolloids change reversibly from a sol state to a gel by lowering or raising the temperature, which depends on nature of secondary or non-covalent forces such as hydrogen bonds or hydrophobic interaction. Consequently, it was reported that, RS added aqua system has thermo-reversible gelling behavior. It might be an indication that the system has not been formed together and phase separation occurred.

Conclusion

CS and RS 'weight percentages is about to get similar properties or slightly increased with about 2% in accordance with colloid system gelation profile data. Furthermore, as indicated KG has an better gelation profile.

Key Words: Salep, Kastamonu, rheology, heat induced gelation, water

Determination of Protein Fraction Profiles of Concentrated Kefir Produced by Different Methods

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Milk, is the only food that is released from mammary glands of female mammals immediately after birth and contains sufficient and balanced proteins, lipids, carbohydrates, mineral substances, vitamins and many other nutrients that can meet the offspring's life needs. No doubt people have a vital importance in the nutrition of the milk consumed as fluid milk, which has the best shape in the body of assessment. However, if necessary precautions are not taken, the inability of the milk to maintain its quality for a long time requires that the milk produced is processed in suitable ways to the consumer and presented in a durable form [1].

One of the methods of converting the milk into stable form is to maintain the milk by concentrating. Concentration of the milk is not only preservation but also changes in flow behavior. Because in the evaporation process, the removal of water leads to a reduction in the space between particles such as casein micelles, fat globules, whey proteins, lactose and minor components [2]. Kefir is one of the most well known fermented dairy products. In recent years especially, with the introduction of beneficial health effects, an increase in consumption is observed. Kefir, kefir grains or kefir starter cultures using ethyl alcohol and lactic acid obtained from fermentation, a very old history, originating from the Caucasus region and is a light gas fermented milk product [3]. According to the Turkish Food Codex of Fermented Dairy Products Notification ; kefir is a fermented milk that use the fermentation of strains in contains fermentation specifically Lactobacillus kefir, Leuconostoc, Lactococcus and Acetobacter strains and fermenting lactose (Kluyveromyces marxianus) and non-fermenting lactose by yeasts (Saccharomyces unisporus, Saccharomyces cerevisiae and Saccharomyces exiguus) [4]. Protein, vitamins and mineral substances in a balanced manner, the synthesis of certain metabolites during the fermentation process, partial degradation of proteins and lactose and easy to digest factors such as the health of kefir reveals its importance [5]. It has been reported that kefir has antihypertensive, antibacterial, anticarcinogenic, hypocholestromic, antiinflammatory, antimutagenic, antiallergic, antidiabetic, scanvenging , β-galactosidase activity, lactic acid content, protection against apoptosis, bacterial colonization (beneficial bacteria) [6]. By concentrating the fermented dairy products obtained as a result of lactic acid fermentation, it is intended to be kept for a longer time. Locally concentrated fermented dairy products are generally obtained using a filter bag. However, in industrial production, apart from the use of filter bag, many concentration processes are applied [7]. In this study, six different concentrated kefir productions were made by using semi-fat cow's milk, starter culture and kefir grain and three different methods. These methods are as follows; The production of concentrated kefir by increasing the rate of dry matter by evaporating the milk to the desired level, filtering the produced kefir by the traditional (bag) method and evaporating the produced kefir.

Materials and Methods

Material

Semi-fat UHT cow milk used in kefir production was obtained from the markets in Antalya, kefir grain from Akdeniz University Food Engineering Department and kefir starter culture (Kefir D culture) was obtained from Danisco-Türker Industry Technical Machinery and Trade Limited Company (İstanbul). Kefir production was carried out in the laboratories of Akdeniz University, Faculty of Engineering, Food Engineering Department.

Methods

Kefir Production

In this study, milk containing 1,5% fat and total dry matter 11% were used in kefir production. Concentrated kefir production was carried out according to three different methods by using kefir grain and kefir starter culture for each method separately.

The first methods is to prepare the milk by evaporating for production of concentrated kefir. For this purpose, the milk was heat-treated for 5 minutes at 90 ° C, evaporating at 40 ° C, 150 rpm rotation speed and

60 mBar pressure. Afterwards, the milk cooled to 25 ° C was divided into two equal parts, one of the portions was added by 0.015g / L kefir starter culture and the other was injected with 3% kefir grain. The inoculated milk was incubated at 25 ° C until the pH reached 4.6. The kefir obtained after incubation was matured at 4 ° C for 24 hours.

For the production of concentrated kefir by evaporating the obtained kefir, under aseptic conditions, semi-fat UHT milks were divided into two equal portions, one of which was inoculated with kefir starter culture at 0.015g / L and the other with 3% kefir grain. The inoculated milks were incubated at 25 ° C until the pH reached 4.6. The incubated kefir samples were evaporated on a rotary evaporator at 40 ° C at 150 rpm and 60 mBar pressure conditions until the dry matter value was approximately 20%.

The kefir produced from calf and culture was incubated at 25 ° C until the pH reached to 4.6, inoculated and incubated under the same conditions as described in the two previous methods. The kefir produced was filled into traditional bag pouches and filtered at 4 ° C until the dry matter levels were approximately 20%.

Physicochemical analyzes were performed after the production of all kefir samples.

Analysis

Total dry matter content (%) of milk used in production was determined by gravimetric method given in TS 1018 Raw Milk Standard [8], fat content (%) according to Gerber method [9], ash content (%) was determined by gravimetric method [10]. The pH values of milk samples were determined by Orion 2 Star pH meter (Thermo Scientific, Bremen, Germany), protein content (%) was determined by Kjeldahl method [10], titration acidity (%) was determined by Soxhlet-Henkel method specified in TS 1018 Raw Milk Standard. . The results of titration acidity values were calculated in% lactic acid [9]. Dry matter content of Kefir samples according to TS 1018 Raw Milk Standard [9], fat content (%) according to Gerber method [9], ash content using gravimetric method [10], protein content (%) according to Kjeldahl method [11] and titration acidity values of the samples were calculated in% lactic acid [11]. pH values of Kefir samples were determined using Orion 2 Star (Thermo Scientific, Singapore) brand pH meter. The values of the rheological parameters of the samples can be found in Canquil et al. It was determined using the Brookfield R / S plus rheometer (Brookfield, Middleboro, MA, USA) according to the method described in 2007 [12]. The protein fractions of the concentrated kefir produced were determined using sodium dodecyl sulfate polyacrylamide (SDS-PAGE) gel electrophoresis [13].

Results and Discussion

The average values of the dry matter, total protein, fat, ash, titration acidity (% lactic acid) and pH values of the milk used in the production of kefir were 11.35 ± 0.05%, 2.81 ± 0.01%, 1.50 ± 0.00%, 0.65 ± 0.01%, 0.23 ±%, respectively. 0.02 and 6.60 ± 0.03. According to the Turkish Food Codex Notification on Raw Milk and Heat Treated Drinking Milk, the amount of protein in cow's milk should be at least 2.8% and the titration acidity should be between 0.135-0.20% in terms of lactic acid. According to the results, the values determined in the milk used in kefir production were found to be consistent with the values specified in the standard.

Table 1 shows the values of dry matter, fat and protein content of concentrated kefir samples. As it can be seen from the table, the values of dry matter, fat and protein ratios of the samples varied between 18.99% - 19.87%, 2.00% - 2.50%, 4.16% - 5.62%, respectively. Titration acidity and pH values of concentrated kefir samples were determined between 1.33% - 1.46% and 4.38-4.55%, respectively. According to the Turkish Food Codex notified on Fermented Dairy Products, the protein content of kefir should be at least 2.7% and the fat content should be at most 10%. According to the obtained results, it was determined that the values determined in the concentrated kefir produced were consistent with the values stated in the said notification.

Table 1: Kefir samples dry matter (%), fat (%), protein (%), titration acidity (%) and the average values of pH values

Samples	Kurumadde (%)	Fat (%)	Protein (%)	pH	TA (%)
ES	19,83± 0.04	2,50± 0.12	4,85±0.17	4.38±0.01	1,46 ±0.01

ED	19,82± 0.02	2,20 ± 0.15	4,64±0.13	4.55±0.00	1,16±0.02
SEK	19,63± 0.13	2,50 ± 0.01	5,62±0.05	4.40±0.00	1,43±0.00
DT	18,99± 0.06	2,00 ± 0.02	4,16±0.10	4.48±0.01	1,34±0.01
TS	19,87± 0.14	2,00 ± 0.06	4,41±0.07	4.50±0.02	1,40±0.02
DEK	19,84± 0.01	2,00 ± 0.00	5,54±0.14	4.48±0.02	1,33±0.01

ES: A sample of kefir concentrate prepared with starter culture by evaporated milk, ED: Sample of kefir concentrate prepared with grain by evaporated milk, SEK: Concentrated kefir sample produced as a result of evaporation of kefir prepared with starter culture, DT: Concentrated kefir sample produced by filtering the kefir produced with grain in the bag, TS: Concentrated kefir sample produced by filtering the kefir produced with starter culture in the bag, DEK: Sample of concentrated kefir produced by evaporation of kefir prepared with grain.

The viscosity, thixotropy and consistency coefficients of the samples were determined between 0.1099 Pa.s - 2.2019 Pa.s, 157.359 Pa / s - 804.962 Pa / s and 0.2177 Pa.s - 0.3890 Pa.s, respectively. The flow behavior index is a parameter that shows the tendency of fluids to Newtonian flow behavior. In this study, it was determined that flow behavior index values of concentrated kefir samples varied between 0.08 and 0.37 and it was concluded that the samples showed pseudoplastic flow behavior (Figure 1). The increase in viscosity is thought to be related to fractions of milk proteins identified in concentrated kefir in relation to improvements in gel structure.

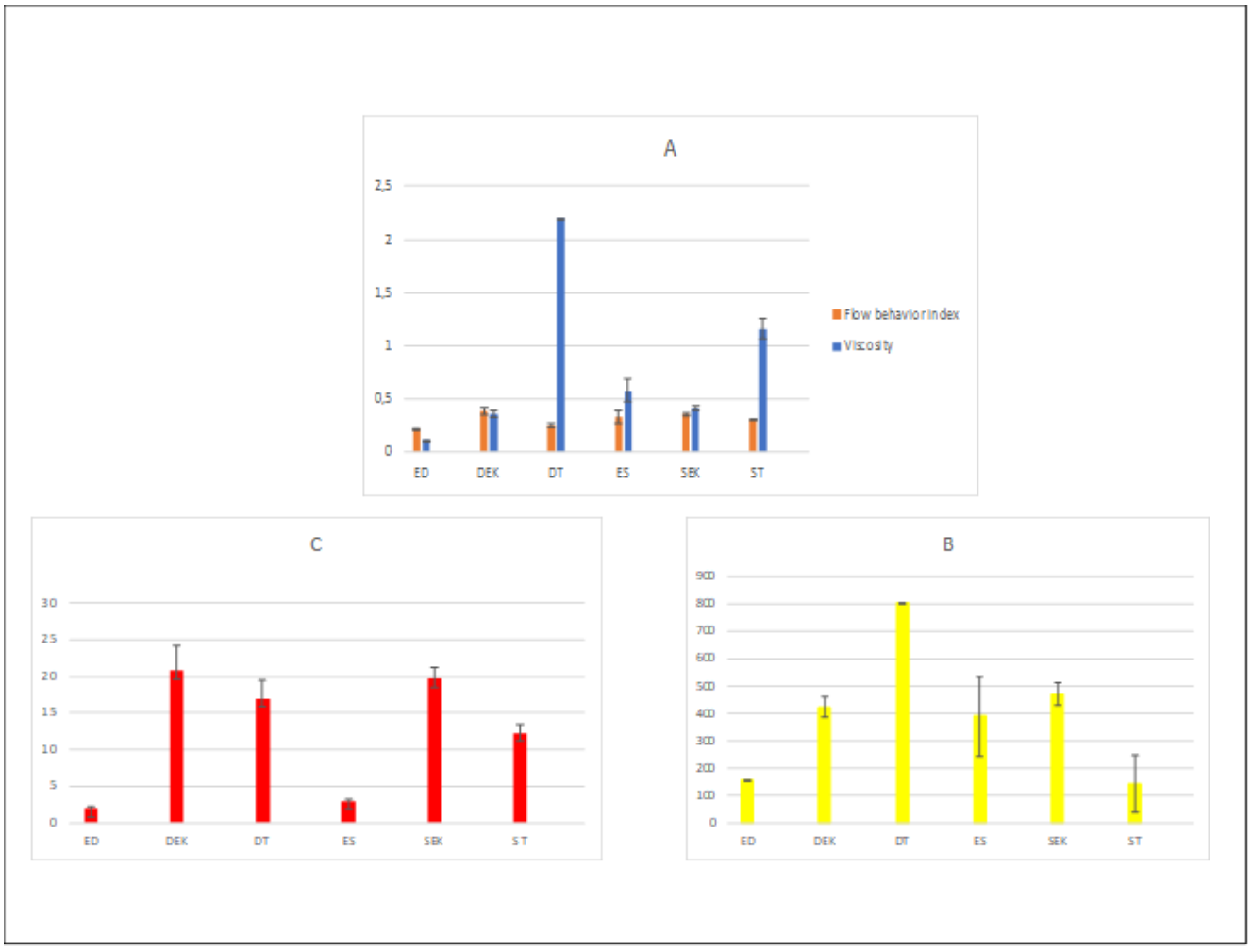

Figure: (A): viscosity and flow behavior index of the samples, (B): thixotropy, (D): consistency coefficient values ; ES: A sample of kefir concentrate prepared with starter culture by evaporated milk, ED: Sample of kefir concentrate prepared with grain by evaporated milk, SEK: Concentrated kefir sample produced as a result of evaporation of kefir prepared with starter culture, DT: Concentrated kefir sample produced by filtering the kefir produced with grain in the bag, TS: Concentrated kefir sample produced by filtering the kefir produced with starter culture in the bag, DEK: Sample of concentrated kefir produced by evaporation of kefir prepared with grain.

According to the results of SDS-PAGE analysis, the molecular weights of casein fractions were 30 kDa, whey protein fractions -lactoalbumin and -lactoglobulin had molecular weights of approximately 12 kDa and 19 kDa. As a result of SDS-PAGE analysis, whey protein fractions could be determined in concentrated kefir obtained by evaporation of produced kefir, whereas whey protein fractions could not be clearly seen in the concentrated kefir produced traditionally (by bag filtration) (Figure 2). As a result; it is thought that the increase in viscosity of concentrated kefir samples obtained by evolving the kefir produced may be due to the interaction between whey proteins and k-casein. Thick protein bands around 30 kDa were observed in concentrated kefir produced as a result of the kefir evaporation due to the interaction between whey protein fractions and k-casein.

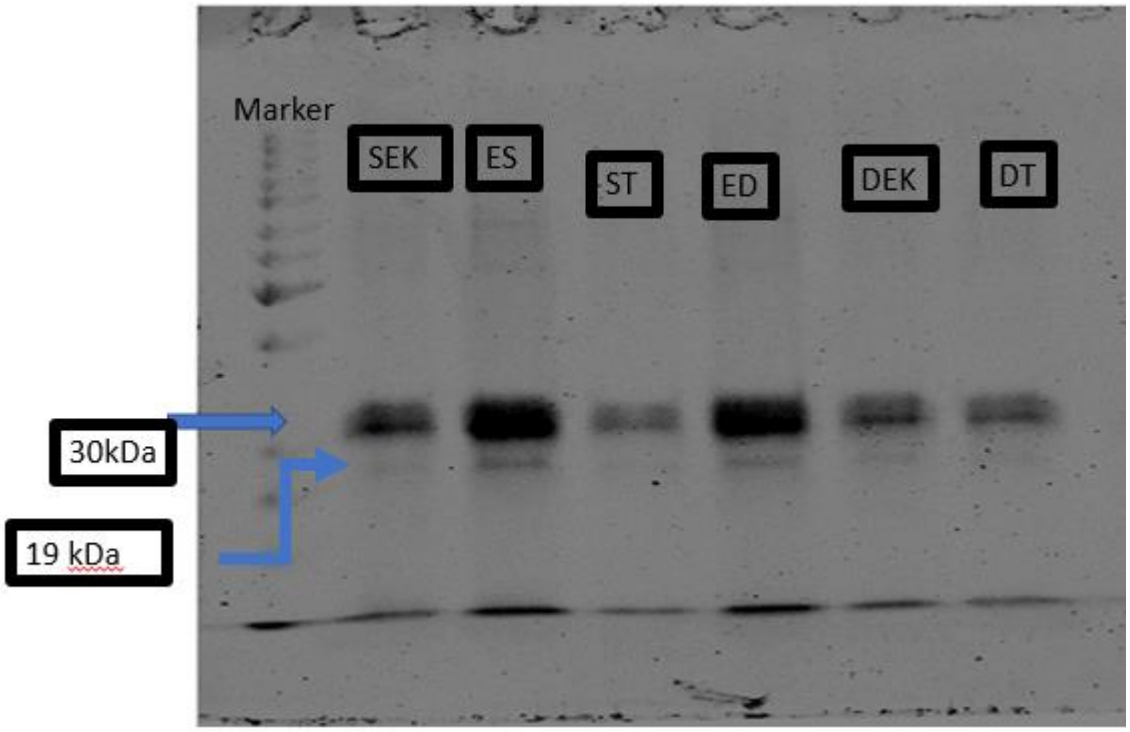

Figure 2: SDS -PAGE analysis results of concentered kefir samples ; ES: A sample of kefir concentrate prepared with starter culture by evaporated milk, ED: Sample of kefir concentrate prepared with grain by evaporated milk, SEK: Concentrated kefir sample produced as a result of evaporation of kefir prepared with starter culture, DT: Concentrated kefir sample produced by filtering the kefir produced with grain in the bag, TS: Concentrated kefir sample produced by filtering the kefir produced with starter culture in the bag, DEK: Sample of concentrated kefir produced by evaporation of kefir prepared with grain.

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Development of Nanofiber Based Colorimetric Sensors for Detection of Fish Freshness

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Fish is an important food consumed in the world but it spoils very easily. The concentration of the total volatile basic nitrogen compounds (TVB-N) increases as a result of microbiological degradation of fish protein. The aim of this study was to produce a sensor by electrospinning method for the detection of TVB-N resulting from the spoilage of fish. Zein, phenol red (PR) and methyl red (MR) were used for the development of fiber composites to form the sensor structure. The morphology of the nanofibers was determined by a scanning electron microscope. The produced membrane was cut into 1 x 1 cm pieces and put into jars containing fresh and spoiled fish. The response time of sensor was monitored as the time required to change the color of the membrane from orange to yellow as a result of the effect of released TVB-N from the fish. In the first part of this study, the effect of PR and MR dyes, sensitive to pH change, on the zein nanofibers was investigated. For this purpose, 4 different sensors were produced by adding MR:PR dyes to the structure of the sensor at ratios of 0:100, 25:75, 50:50 and 100:0, respectively. The average fiber diameters of the produced sensors were determined as 607.6, 473.75, 457.87 and 190.25 nm, respectively. As a result, the average fiber diameter decreased as the MR content of the sensor was increased. In the second part of the study, the usability of these sensors was investigated to determine the freshness of the fish. There was no change in the color of sensor placed in the jar containing fresh fish because the amount of TVB-N released from fresh fish was very small. However, the color of MR-containing sensors changed from orange to yellow due to TVB-N released from spoiled fish. When the MR content of the sensors increased from 25 to 100%, the response time of the sensor also increased from 95 to 153 s. As a result, the developed fish freshness sensor may help to produce new sensors for food safety.

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Keywords: Fish, total volatile basic nitrogen compounds, colorimetric sensor, electrospinning.

Introduction

Freshness is one of the main characteristics used to determine the quality of food products. Food quality control is a major concern due to the increasing demand from consumers for quality and healthy food products (Chan et al. 2006). Sensory analysis is the most important quality control method in terms of determining the freshness of fishery products. For this reason, sensory analysis is performed by specially educated people who evaluate fishing products according to their characteristics such as texture, appearance, smell and flavor (Ünlüsayın and Erdilal 2008). Odor is often considered an important parameter for the determination of fish freshness and can be easily determined by consumers. Volatile amines include trimethylamine (TMA), ammonia (NH_3) and dimethylamine (DMA), total volatile basic nitrogen compounds (TVB-N), which are characteristic substances responsible for fish odors. The TVB-N content is recognized as a seafood spoilage index and volatile amines are directly related to the sensory quality of fish (Heising et al. 2011, Pacquit et al. 2007). Among the TVB-Ns, the TMA concentration has been proposed as a relevant parameter because TMA is a volatile amine produced immediately after fish death and is responsible for the characteristic "fish" smell (Heising et al. 2011, Béné et al. 2001). The compound trimethylamine N-oxide (TMAO) is known as an oxidation product of TMA and is a common metabolite found at high levels in animals, especially in deep-sea fish and crustaceans. When the fish is stored, TMAO is converted to TMA by bacteria (Byrne et al. 2002). In general, after collection of fish, a particular group of bacteria known as specific degradation organisms (SDO) produces chemical changes that cause degradation, particularly on the skin and gill surfaces. These specific microorganisms are generally known as *Pseudomonas spp*., regardless of the origin of the fish aerobically stored under cooled conditions (Koseki and Isobe 2005, Olafsdottir et al. 2006).

Intelligent food packaging systems can be defined as a packaging system that can perform intelligent functions such as detection, recording, monitoring and communicating to improve food safety and quality and to facilitate decision making. In addition, intelligent food packaging systems can alert people to potential

problems (Yam 2005). A simple pH indicator that allows fish freshness to be determined by color change has already been identified in a number of previous studies (Pacquit et al. 2007, Byrne et al. 2002). Because the pH value of newly caught fish varies between 6.0-6.5, after storage, this value increases to 6.8-7.0 which is the upper limit of consumability of the fish (Ludorff and Meyer 1973). Thus, when a fish product deteriorates, a pH increase resulting from the production of TVB-N can be detected by a pH sensitive sensor which detects the chemical composition in the packaging gap. The main principle of this freshness sensor is a pH sensitive dye that changes color when placed in an acidic or basic environment. The response of the freshness sensor can be monitored at regular intervals using a colorimeter to represent fish freshness (Pacquit et al. 2007, Byrne et al. 2002). Although such systems have been developed in recent years, they are not widely used (Carsol and Mascini, 1998; Niculescu et al. 2000; Pacquit, 2006).

Among the diversity of nano structured materials, nanofibers produced by electrospinning have been the focus of increasing interest over the last decade and have been extensively studied in terms of technique, installation, mechanism, applications, advantages, technical issues and future developments (Sun et al. 2014, Ding et al. 2010). Electrospinning is a suitable and powerful technique for producing large scale uniform nano and micron scale fibers from a wide variety of polymers in a continuous process. Fiber membranes exhibiting large surface areas can be produced on a support or used as self-standing surfaces (Sun et al. 2014, Stepanyan et al. 2014). Compared to commonly used techniques for fiber production (drawing, template synthesis, phase separation, self-assembly), electrospinning has many advantages such as simplicity, versatility and low cost, and scalability of sequential and complex nanofibers. Nanofibers have shown high potential for a wide range of applications such as drug distribution (Pelipenko et al. 2015, Khalf and Madihally 2017), tissue engineering (Pelipenko et al. 2015, Quirós et al. 2016, Khorshidi et al. 2016), water treatment (Ray et al. 2016), energy conversion and storage (Lu et al. 2017, Sun et al. 2016) and sensor (Zhang et al. 2017). Due to their large surface area, high porosity and ease of functionalization, nanofiber membranes produced by electrospinning are increasingly being used to improve the performance of analytical instruments and to develop highly sensitive sensors (Sapountzi et al. 2017). The homogeneous distribution of active substances in the sensor is achieved during production by the electrospinning method, which allows the sensor to react quickly with target compounds. In addition, increasing the surface/volume ratio with nanofiber surfaces increases the sensor's ability to respond correctly to the target material. When these factors coexist, a highly functional sensor can be designed. Therefore, the aim of this study was to design nanofiber based sensor structures using electrospinning for the detection of fish freshness. In the first part of this study, the effect of pH-sensitive phenol red (PR) and methyl red (MR) dyes on zein nanofibers was investigated. For this purpose, four different sensors were produced by using MR:PR dyes in the ratio of 0:100, 25:75, 50:50 and 100:0 respectively. In the second part of the study, the usability of these sensors was evaluated to determine the freshness of the fish.

Material and Methods

Zein, phenol red (PR) and methyl red (MR) were used for the development of fiber composites to form the sensor structure. The zein solution was prepared in acetic acid-ethanol (20:80) at a concentration of 36% (w/v). The ratios of PR:MR dyes used in the zein solution were 0:100, 25:75, 50:50 and 100:0, respectively. The solutions were stirred with a magnetic stirrer at room temperature for 15 min. Electrospinning unit (İnovenso, Ne100, Turkey) designed in vertical position was used to produce the sensor membranes. The flow rate was kept constant at 1.5 mL/h during the electrospinning of the prepared solutions (Figure 1). In addition, the distance between the collector and the needle was kept constant at 20 cm. The applied voltage was at 19 kV.

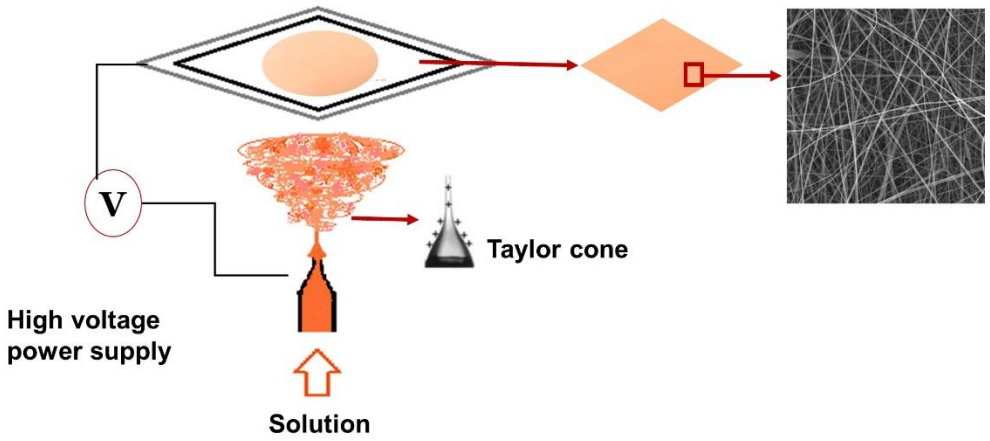


Figure 1. Electrospinning setup for the production of nanofiber based sensors.

The morphological structure of the produced sensor was determined by scanning electron microscope (SEM) (Quanta 650, FEI, USA). Fourier transform infrared (FT-IR) spectrophotometer (Perkin Elmer, USA) was used to determine the effect of sensor components in the structure of the sensors developed by electrospinning method. To test the designed sensor, the membrane produced by electrospinning was cut into 1 x 1 cm pieces. Then, these sensors were placed into jars containing fresh and spoiled fishes. The response time of the sensor was monitored as the time required to change the color of the membrane from orange to yellow as a result of the effect of volatile basic amines (TVB-N) emitted from the fish. A HunterLab colorimeter (ColorQuest XE, USA) was used for color measurements of membranes. The total color changes in the sensors were calculated as the ΔE value of the data obtained as a result of the color measurements performed. The total color change (ΔE) value was calculated using the following formula:

$$\Delta E = \left[\left(\Delta L^*_{\text{sensor}_{1,2}}\right)^2 + \left(\Delta a^*_{\text{sensor}_{1,2}}\right)^2 + \left(\Delta b^*_{\text{sensor}_{1,2}}\right)^2\right]^{0.5}$$

where "sensor_1" indicates initial color values of the sensor before use and "sensor_2" is the color measurement values of the sensor after use.

Results

In the first part of this study, the effect of pH-sensitive MR and PR dyes on electrospun zein nanofibers was investigated. The FTIR spectra of the membranes with pure MR and PR dyes were shown in Figure 2. Peaks of Amide A, Amide I and Amide II that were specific for the protein bands contained in the zein polymer were found at 3302, 1650 and 1536 cm^{-1}. When the MR content of the sensors decreased from 100% to 0%, the peak of Amide A which was N-H stretching vibration was found to shift from 3301.26 cm^{-1} to 3288.86 cm^{-1}. Also, the peak of Amide I assigned to C=O stretching vibration was shifted from 1649.7 cm^{-1} to 1644.05 cm^{-1}. However, there was no significant shift at the peak of Amide II. The increased sharpness of the peaks with various shifts in the reported peak positions was due to changes in the MR and PR ratios in the sensor. The FTIR results showed that the interaction between MR, PR ve zein affected Amide A and Amide I which were specific for the protein bands contained in the zein polymer. When SEM images and diameter distribution graphs of four different fish freshness sensors produced with electrospun zein nanofibers were examined (Figure 3), it was observed that the dyes used had a significant effect on nanofibers. The average diameters of the fibers with a MR:PR ratio of 0:100, 25:75, 50:50 and 100.0 in the structure of the sensors were found as 607.6, 473.75, 457.87 and 190.25 nm, respectively. According to SEM results, it was determined that the average fiber diameter decreased as the MR content of the sensor increased.

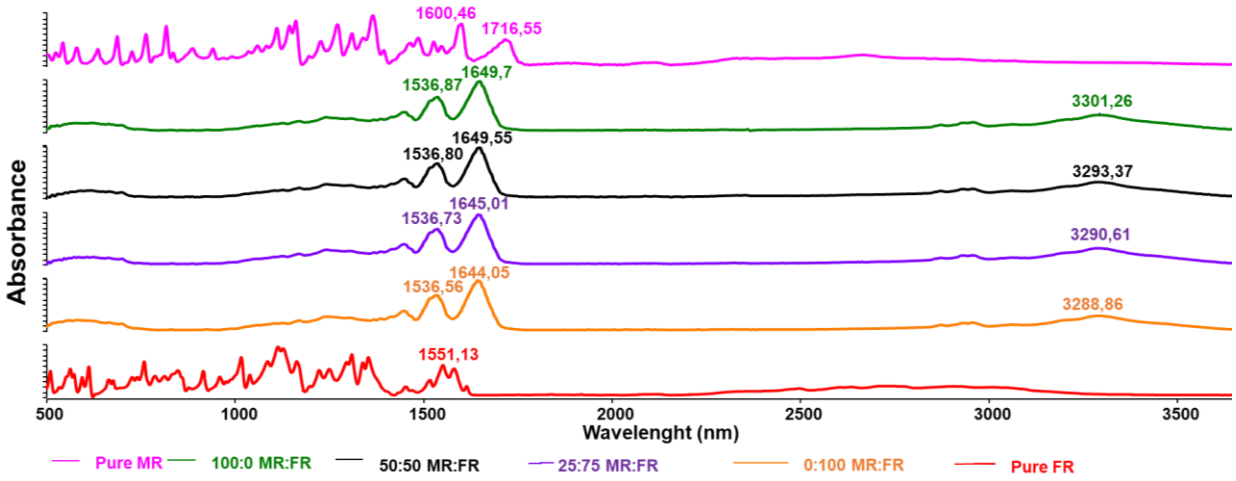
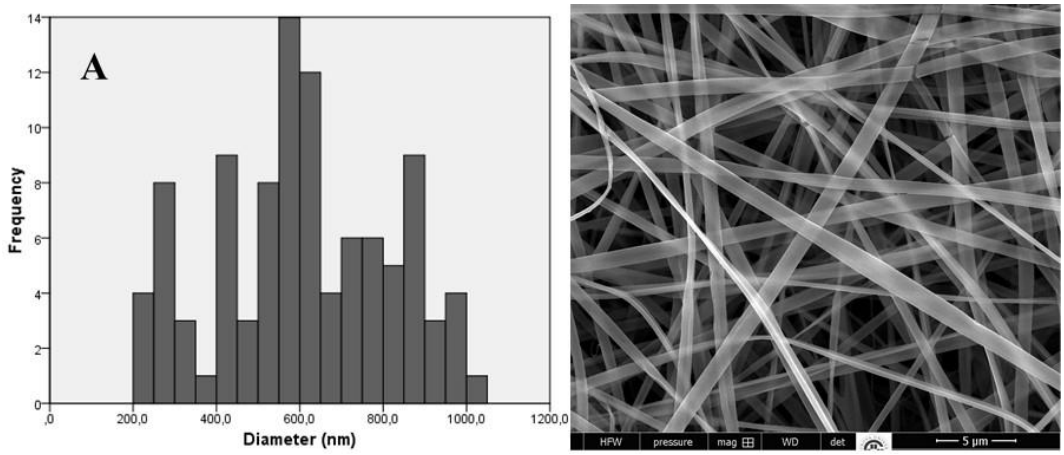


Figure 2. FT-IR spectra of fish freshness sensors produced by electrospinning with pure MR and PR.

In the second part of the study, the usability of sensors which were contained the different ratios of MR and PR dyes to determine the freshness of fish was investigated. For this purpose, four different sensors were produced by adding MR:PR dyes to the structure of the sensor at ratios of 0:100, 25:75, 50:50 and 100:0, respectively. The pH of the fresh fish was determined as 6.04 and the pH of the spoiled fish was 6.86 in this study. There was no observed change in the color of all of the sensors placed in the jar containing fresh fish, possibly because the amount of TVB-N released from the fresh fish was too small. However, when these sensors were placed in the jar containing the spoiled fish and then waited for a short time, the colors of those containing MR dye turned from orange to yellow. The response times of the sensors produced in various ratios of MR:PR including 100:0, 50:50 and 25:75 were found as 153.7, 141.6 and 95.0 s, respectively (Table 1). According to this results, it was determined that the response time of the sensor decreased as the MR content of the sensor decreased. As a result, while the original orange color of the sensors in the jar containing fresh fish did not change, it was noticed that the color of these sensors in the jar containing the spoiled fish changed color from orange to yellow for a short time.



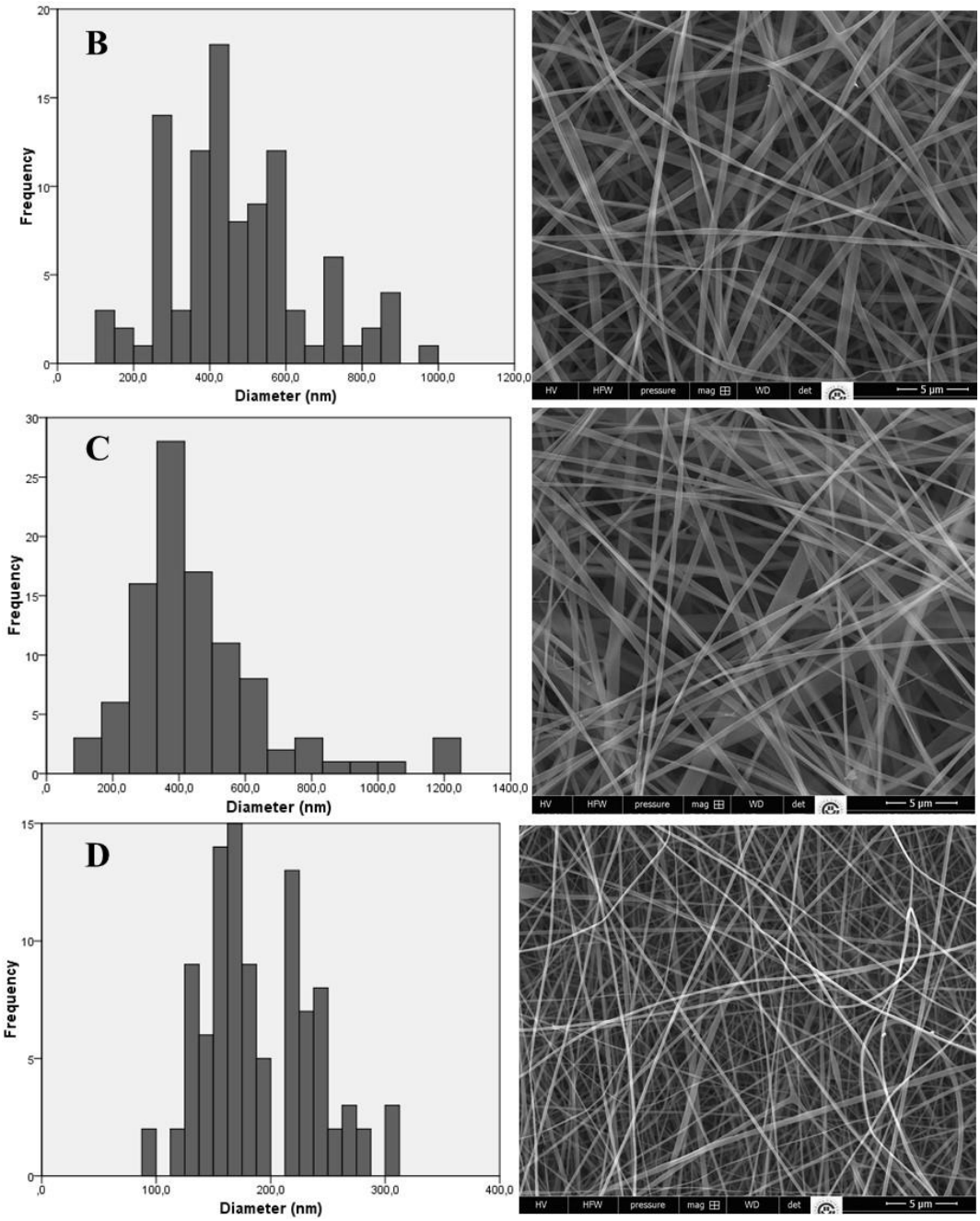


Figure 3. SEM images and diameter distributions of fish freshness sensor produced by electrospinning. The MR:PR ratios are: A) 0:100, B) 25:75, C) 50:50, D) 100:0.

These observed color change showed that sensors containing MR dye could successfully detect the freshness of the fish. In addition, there was no color change when the sensor with the MR:PR ratio of 0:100 was placed in the jar containing the spoiled fish. Because, the MR dye was red color at a pH below 4.2; but it was yellow color at a pH above 6.3. Also, the PR dye was yellow color at a pH below 6.4; however, it was red color at a pH above 8.0. The amount of TVB-N released from the spoiled fish placed in the jar did not increase to a pH value which could change the color of the sensor with an MR:PR ratio of 0:100. Therefore, this sensor was not shown any color change in jars containing both fresh fish and spoiled fish. Fish freshness sensors designed in previous studies were developed for use as an intelligent package device (or material) (Pacquit et al. 2007, Kuswandi et al. 2012, Chun et al. 2014). However, the difference of the sensors produced in this study from the previously reported sensors were no need to store the fish with the sensor until it deteriorated.

Table 1. The response times of sensors, pH values and chromaticity of the sensor in response to fresh and spoiled fish.

MR (%)	PR (%)	pH	L^*	a^*	b^*	ΔE	The response time of the

								sensor (s)
Fresh fish	100	0	6.04	85.86	13.36	5.84	-	-
	50	50	6.04	85.96	8.36	9.96	-	-
	25	75	6.04	85.59	8.75	16.08	-	-
	0	100	6.04	91.32	-3.43	16.19	-	-
Spoiled fish	100	0	6.86	88.89	6.66	11.59	9.33	153.7
	50	50	6.86	87.46	4.05	14.94	6.75	141.6
	25	75	6.86	86.65	3.91	20.73	6.77	95.0
	0	100	6.86	91.57	-3.38	16.09	0.27	-

Conclusion

The zein nanofiber-based sensors that were sensitive to the TVB-N released from fish, which easily showed the freshness of fish (which made a certain color change from orange to yellow) were successfully produced at the end of this study. The most important feature of the sensors developed in this study were that it did not need to be stored with the fish for days to determine the freshness of the fish. To detect the spoilage of the fish, it was enough to put the sensor in a jar where it could come into contact with the TVB-N which released from the fish and wait a short time for the color change. If the fish was fresh, the color of the sensor remain orange and there was no color change. However, if the fish was spoiled, the color changes from orange to yellow, which means that the tested fish was not suitable for consumption. Nanofiber based sensors developed as a result of this study can help to design new sensors or improve existing analytical devices in studies such as shelf life of foods, quality control, safety and traceability.

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Possibility of Using Textiles as Casing Materials in Fermented Sausages

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As an alternative to the commonly used natural and artificial materials sausage casings, this research aimed to compare new casing types made of different fabrics with similar or enhanced properties. The effects of fabric type, structural features and fabric thread density on the quality of the fermented sausage were studied.

Two different types of traditional sausage with starter culture (SC) and without starter culture (WSC) were produced, and the sausage dough was filled into 6 different casings materials including natural (intestine), artificial (collagen) and 4 different fabric materials (100% cotton case with NE20 yarn number (YN) , 100% cotton case with NE30 YN, 100% polyester case with NE20 YN, 35% cotton / 65% polyester with NE50 YN). After filling, the sausages were allowed to ferment for 12 days and then stored at +4 ° C for up to 32 days. Then the sausages were subjected to some physicochemical (% dry matter, ash, protein, fat content, TBA, pH and color) , microbiological(TMAB, LAB, yeast and molds counts) and sensory analyses during the fermentation (at 2nd, 4th, 6th and 12th days) and the storage (at 18th and 32th days) periods.

In 32th day , TMAB, LAB and yeast & mold counts were in the range of 8.30-9.15 log cfu/g, 8.20-8.22 log cfu/g 4.41-6.94 log cfu/g in the samples respectively. pH values, % dry matter, % ash, % weight loss, % protein and fat values were between 4.91-5.40, 77.29 -79.90 %, 3.82-4.59%, 37.87-41.22%, 41.40-47.85% and 26.43-29.58% respectively in the samples while TBA values were in the range of 0.48-0.67 mg malonaldehyde/kg. Moreover, L*, a* b* color values of the samples were between 48.38-45.12, 6.14-8.98 and 10.80-13.05 respectively. According to the results of sensory analysis, K2 sample [collagen casing with SC] was the favorite sausage, while K3 [100% cotton case with NE20 YN with SC] sample was the most popular sausage among cloth casing sausages.
In short article proposes that innovation in mixing the components of casing tissue designed for sausages may enhance the quality parameters of the sausage which results in better perception of consumers.

Utilization of apple and pomegranate peels for production of pectinase by Aspergillus spp.

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Apple and pomegranate peels are waste materials and large amounts of wastes remained after juice processing. These wastes can be used for production of bioactive compounds such as organic acids, phenolic compounds, proteins and enzymes. Pectinolytic enzymes have been used in fruit juice extraction and clarification process. The present study was undertaken for production of pectinase by four newly-isolated Aspergillus section Nigri members utilizing apple and pomegranate peels in solid state fermentation. Mineral supplementation of wastes was required for sufficient growth of Aspergillus spp. Therefore, peels were mixed with water and some minerals and fermented by molds for 3 and 7 days at 30°C. Mold-free media were used as control. Pectinase activity was measured in mold-free filtrate. Pectinase was produced by the molds in apple and pomegranate peels compared to the control medium without mold. Among the tested molds, pectinase production by A. niger ZDM2 was the minimum in both medium. Highest pectinase production was obtained by A. aculeatus ZGM6 in both medium after 7 days of incubation and it is followed by A. japonicus ZGM4 in apple peel, and A. tubingensis ZDM1 in pomegranate peel. All strains except A. japonicus ZGM4 produced pectinase on the medium with pomegranate peel, however at a lower activity compared to those on the medium with apple peel. Industrial plant wastes can be used in fermentation medium that could allow production of industrial enzymes at low cost.

Effects of Different Starch Types on Retardation of Staling of Cakes

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Abstract
In this study, it was aimed to determine the physical, sensory and textural properties of cakes produced from wheat starch, acetylated modified wheat starch-1 (MS-1) and acetylated modified wheat starch-2 (MS-2). Starches are important for quality of cake products. Different type of starches like modified ones can be used to improve the quality of end products. Therefore in the present study acetylated wheat starches (one of them is soluble in hot water and the other in cold) were used in the cake formulations instead of conventional wheat starches and quality characteristics of the cakes were compared. The cake formulations consisted of 9% starch (wheat starch for control cake, Emerald modified wheat starch for MS-1, Solaris wheat starch for MS-2), 30% flour, 20% whole egg, 25% sugar, 1% emulsifier and 15% palm oil. After sugar, whole eggs, and cake emulsifier were mixed thoroughly for 5 min at speed 6 in the mixer (KitchenAid, St Joseph, MI, USA), the shifted flour and palm oil were added separately and homogenised for 1 min at speed 1. Finally, batter was measured into a baking pan and baked in a convection oven (Inoksan Convection Oven, Turkey) which was pre-heated at 160°C for 25 min. The specific gravity, water activity, moisture content (%) of the batter and cake were determined. The texture properties were measured one day after baking via a TA-XT2i texture analyser (Stable Micro System Ltd., Surrey, UK). According to the results of sensory analysis, all of the cakes produced were accepted by panelists. In terms of sensory parameters such as color, aroma and texture, the highest score was obtained for the cakes produced with MS-2. MS-1 and MS-2 included cake products had lower moisture content and lower water activity values with respect to those of control cakes. This caused softer cakes and texture measurement showed that showed that the control cakes became harder. Consequently, it has been understood that usage of modified starch makes more alluring for consumers and modified starched can be used in cake formulations to improve some quality parameters.

Key words**:** Modified starch, cake, quality, texture

Investigation of Ultrasound Assisted Enzymatic Collagen Extraction and Its Effects on Collagen Characterization

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Aim of the study: Collagen constitutes an important part of the extracellular matrix called connective tissue, besides it has many functions such as relieving joint pain, improving digestion, and improving skin and tissue flexibility. The high cost of raw materials and production to achieve collagen has led the current market to search for new sources and production methods. Ultrasonic sound wave is an effective non-thermal alternative method of extracting. Since the cell wall is removed, extraction by this method is faster than other methods. In this study, ultrasound assisted (35 kHz, 140/560 W) enzymatic extraction was performed using chicken feet, an animal by-product. The effect of different conditions on collagen protein structure was investigated.

Method: The chicken feet taken from a local butcher were chopped and homogenized with 0.05 M Tris-HCl buffer solution (pH 7.5) to precipitate the proteins. The fat was removed with ethanol and the non-collagen proteins were removed with NaOH to complete the pretreatment. Pretreated samples were mixed in 5% lactic acid containing 0.1% (w/v) pepsin at 4°C for 6 hours. Then ultrasound assisted extraction was performed at different temperatures (20-25-30°C) and times (20-40-60 minutes) and suspensions were salted out. After purification by dialysis, it was lyophilized. Fourier transform infrared (FTIR) spectroscopy analysis was performed to determine the functional groups of the samples. The quality, purity and consistency of the protein were determined by sodium dodecyl sulfate polyacrylamide gel electrophoresis (SDS-PAGE).

Result and Conclusion: The FTIR spectra of all collagen showed specific peaks of amides A, B, I, II and III. On SDS-PAGE, three regions were observed, including α, β and γ regions, proving that the samples are Type I collagen. Similar molecular sizes were observed in all parameters. The absence of molecules smaller than 116 kDa showed that extraction was performed without denaturation. No significant difference was determined in protein structure depending on the duration and temperature of the ultrasound.

Keywords: collagen, chicken feet, ultrasound, extraction

Effect of Different Drying Methods on The Essential Oil Content and Composition of Kumquat (Fortunella margarita Swingle)

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Kumquat (Fortunella margarita Swingle) is included in the Fortunella genus. It is believed to be native to China. Kumquat fruits are suitable for essential oil production as the other citrus fruits. Kumquat essential oil possess health promoting effects such as antibacterial, antifungal, antiviral, anti-inflammatory, therapeutic properties against allergic disorders, beneficial effects on capillary fragility and arteriosclerosis. It is widely used in both the perfumery and food industries. Dried kumquats are used in the traditional medicine of many countries for the treatment of a variety diseases. The effect of three drying methods (hot air drying, vacuum drying and microwave assisted hot air drying) on essential oil content and composition of kumquat fruit was evaluated. The essential oils of fresh and dried kumquats were obtained by hydrodistillation and analyzed by GC-FID and GC–MS. The results showed that significant differences in the essential oil content of the samples. The highest essential oil content was observed in the fresh fruit (7.94%) followed by the vacuum dried sample (3.49%). Seven components were identified in the essential oils of fresh and dried samples. The major components of the essential oils were limonene (95.10-96.25%), β-myrcene (1.72-1.81%) and germacrene-D (1.26-1.57%). The drying methods had a significant effect on the essential oil composition and proportion of the various components.

Keywords: Kumquat (*Fortunella margarita* Swingle), drying, essential oil, GC-MS

Determination of Drying Characteristics of Crimson Seedless Grape Variety

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Grape is one of the most produced fruit worldwide both as areas and quantities. Mankind has been using grape for different processes, such as making wine, vinegar, grape juice, raisin etc. during the ages. Drying is also an tarditional preservation technique on fruits and people has been drying various grapes in different ways. In this study drying characteristics of "Crimson Seedless" grape variety were determined. "Crimson Seedless" is commonly known as a table grape. Despite that it is a seedless and colorful variety and also it is thought that flesh of the grape is suitable for drying. The grapes were harvested at approximately 20.2 0 Brix and then dipped in solution containing % 5 K2CO3 and % 1 olive oil. Dipped grapes were dried in tray drier. Three different temperatures (40-50-60 0C) and air velocity (0.5-1.0-1.5 m/s) were used as drying conditions. The process were ended when raisins arrived at % 13 moisture. Drying time changed among 87.5 and 20.5 h. It is determined that drying time is effected by temperature and increasing temperature decreases drying time. Color properties of raisins also investigated and correlation between browning and drying temperature were found. On the other hand five different mathematical drying models were fitted into drying curves. Model coefficients and also effective diffusion coefficients were calculated. As a result in this study drying behaviors of "Crimson Seedless" in drier conditions were revealed.

Keywords: Crimson Seedless, drying characteristics, mathematic models, tray drier

Effect of Different Drying Techniques On Some Functional Properties of Semidried Fig

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Fig as one of the major export products of our country deteriorates very quickly due to its perishable nature. For this reason it is utilized as dried fruit. Drying of figs in traditional method is made by spreading the intermediate moisture figs under the sun after losing their water on tree and being fallen to ground. In this method sometimes adversities seen arising from climate, particularly in the drying season, there are quality losses due to the effects of rainfall. Although solar drying is economical, it has adverse effects such as the fruit's exposure to pests and unwanted contaminants like soil and dust, the interruption and time extension of drying in rain and extreme wind conditions and also susceptible to fungal infections occurring due to the high sugar content. With this study fresh figs were dried until they reach 30-35% moisture content by using different immersion solutions both under the sun and in the cabinet type dryer at 2015 to 2017. Potasa and alkaline ethyl oleate dipping solutions were used for shorten the drying time. Additionally, ¼ cut fruits was dried in both methods without using solutions. Cabinet type dryer reduced the drying time compared to drying under sun. The immersion solutions were effective in reducing the drying time of the figs whereas the shortest drying time was detected in ¼ cut fruits.

The effect of both drying methods and pretreatments on total phenolic content was found to be statistically significant. According to the total phenolic content, lowest value 235.0 mgGA/100g DW were determined in figs used potasa dried under sun while highest value 309.88 mgGA/100g DW were determined in ¼ cut figs dried under sun.

Fatty Acid Composition of Fig Seed Oil Obtained by Different Methods

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Considering the rich fig heritage of Turkey, there is no product diversity except to be washed and only packaged. Approximately 10,000 tons of the average 80,000 tons of dried figs produced in Turkey are low quality figs which are classified as industrial figs in the TSE classification. In this study, the methods of obtaining fig seed oil from industrial figs and the fatty acid composition of fig seed oil were determined. Chopped figs with knife were left for maceration for 3-4 hours with 1/5 ratio of water and the seeds separated from fruit pulp collapsed into solution base. After cleaning the pulp from the surface, the filtered seeds were dried until the moisture content was below 10%. Oil of dried fig seeds was extracted by cold extraction and soxhlet extraction methods. The total oil yield was 20% in the cold pressing process at 30 ° C while the soxhlet extraction method using n-hexane was determined as 22.4%. In the analysis of GC-MS / FID to determine the composition of fatty acids, the values of linolenic acid (18: 3), linoleic acid (18: 2), oleic acid (18: 1), palmitic acid (16: 0), stearic acid (18: 0), *cis*-11-eicosadienoic acid (20: 2), arachidonic acid (20: 4n6), palmitoleic acid (16: 1), margaric acid (17: 0) were determined as 40.06%, 31.01, 7.26, 2.81 0.27, 0.18, 0.08, 0.06 in cold press while in the soxhlet extraction they were determined as 39.82%, 31.11, 18.41, 7.34, 2.85, 0.28, 0.19, 0, 0, respectively. As major fatty acids in fig seed oil, oleic acid from unsaturated fatty acids and linoleic acid (omega-3) and linolenic acid (omega-6) from polyunsaturated fatty acids were determined. The fact that essential fatty acids are more than 70% in the product and the omega6 / omega3 ratio is lower than 1 indicates that the potential of fig seed oil is high as a supplementary food component.

Investigation of the changes on some quality parameters of semi-dried figs during storage period

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The research was carried out in Fig Research Institute between 2017-2018. The intermediate moisture figs with a moisture content of 40-50% was harvested from trees and dried in a cabinet type oven drier until they reach a moisture content of approximately 30%. The samples were packed with modified atmosphere and vacuum packaging machine and put in 0.5 kg polyamide / polyethylene (PA/PE) packages for storage. In addition, 100 cc capacity oxygen scavenger was used for vacuum packages.

Semi-dried figs with a moisture content of 30% were heat treated at 80 oC, were stored at 4 ± 2 oC for 9 months. During the storage period pH, titratable acidity, fruit colour change (L*a*b*), alcohol soluble color ındex (ASCI) values of fruit samples were determined at 45 days intervals.

The decrease in the minolta L* value during storage was statistically significant. In terms of minolta a*/b* values, it was observed that the value a increased during the storage period while the value of b decreased. The ASCI value were increased during storage period due to the browning of fruit samples and it was statistically significant. However, when the L and ASCI values which represents the fruits color were examined, it was observed that the values determined up to the 6th months were within acceptable limits. During the 9-month storage period of the semi-dried fruits, the pH values were decreased while the% acidity values were increased.

Use of Fining Agents in Fig Juice Production

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Fig is one of the earliest cultivated fruit in Anatolia and an improtant crop for both dry and fresh consumption. In terms of nutrition, fig fruit is one of the superior source of dietary fiber, mineral and polyphenols. With this study, it is aimed to process a functional food fig to fruit juice thus, to increase product variety. However, pectic substances such as hemicellulose, cellulose, lignin and starch, polyphenols, proteins, carriages, tannins and substances such as metals in the fig lead to turbidity in fig juice.

In order to produce a clear and stable juice, these colloids must be broken down into small molecules. For this purpose, figs were left for maceration for 3-4 hours with 1/3 ratio of water at 70 ° C and fining agents pectinases (Ultra AFP - Ultra Clear), Bentonite, Gelatin, Kiselzol (Baykisol-30) were added to fig juices in certain proportions that obtained by hydraulic press. It was planned to determine the most appropriate fining agents in terms of TSS and turbidity (NTU). The fining agents were added in 10 different ratios to fig juice. The pectinase ultra-AFP enzyme were added in the range of 0.25 - 5ml / kg fig, the pectinase ultra Clear enzyme were added in the range of 0.1 - 2.5 ml / kg fig, bentonite were added in the range of 0.2 - 3.3 g / kg fig, gelatin were added in the range of 0.02 - 0.5 g / kg fig; 0.1 - 2.8 ml / kg fig and lastly kiselzol were added in the range of 0.1- 2.8 ml/kg fig. With the addition of fining agents, it was determined that the amount of TSS was decreased to %14.8±0.2 from %15±0.2 and the amount of turbidity was decreased to 9.8±0.4 NTU from 62.4±0.8 NTU, thus, 0.2 ml pectinase ultra APF / kg fig, 0.1 ml pectinase ultra Clear / kg fig, 1.5 g bentonite / kg fig, 0.15 g gelatin / kg fig, 1 ml kizelsol / kg figs were found proper for usage in fig juice.

The Role of Dairy Products on weight management and obesity

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Obesity is main health problem in our century. It is related with several medical complications. Most of metabolic diseases are usually occurred because of abdominal obesity and boosted waist circumference. Main reason of the obesity is alteration of energy balance. Energy balance is the key factor that indicates weight loss or gain, and change in energy balance with reduction in physical activity while increasing in energy intake. Obesity is measured according to the body mass index (BMI) which is a person's weight (in kilograms) divided by the square of his or her height (in metres). A person with a BMI of 30 or more is mostly regarded obese. The accumulation of adipose tissue mass causes obesity and it results increasing in adipocyte size (hypertrophy), and adipocyte number (hyperplasia). More than 70% of body mass could be accumulated as fat in the obese people. An anti-obesity effect of dietary calcium and dairy products have confirmed in animal studies, observational and population studies, and randomized clinical trials. Milk nutrients' able to reduce hunger by increasing satiety. Also milk constitutes have anti-inflammatory effects and can impact on the microbiome. Furthermore, dietary calcium has an effect on energy metabolism due to regulating adipose tissue fat store location and expansion. Several researches indicated that calcium increases fat oxidation and decreases waist circumference. An enhance dietary calcium prevents against excessive adipocyte lipid storage. Therefore, dairy products import for weight management and controlling obesity.

Determination of Crystallization Parameters and Textural Stability in Soft Caramel Dragee Confectionery

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Abstract

Soft dragee confectionery has a novel technology industry when compared to hard candy sugar and still have know-how in base recipe ingredients, formulation and the process parameters. In accordance with the customer needs and worldwide sugar confectionery trends, it is aimed to integrate the flavor and texture of caramel sugar into the industrial production process of hard coated soft dragee confectionery. In this study it was aimed to clarify the effect of caramel sugar on structural stability and textural properties of a dragee product. The process parameters were determined in both *Lab Scale Batch Cooker* and *Lab Scale Crystallizator*. In order the process parameters to be optimized, the test analysis results obtained from *TA.XTplus Texture Analyser* will be used after cooking and crystallization. In this study, it is aimed to determine the crystallization parameters by optimizing the time and temperature in cooking step and by eliminating the stickiness comes from caramel sugar during crystallization, obtaining a chewable, non-sticky stable texture in soft dragee confectionery.

Keywords: Crystallization, Chewy Dragee, Caramel, Confectionery, Textural Stability

Introduction

Caramel candy structures are widely used as glazing agent and for coating, molding etc. as a flavor enhancer agent. It is generally used in toffee and hard candy products, because the caramel sugar bonds are suitable for processing in the current technologies. However, there are limited of studies on adding caramel sugar in the base recipe of soft dragee candy. Due to the literature review on the chemistry of caramel, most of the applications like milk treatment on caramel sheets (William R.1993), originated from starch derivatives the process of molding caramel sugar and using it as a coloring and flavor enhancing agent in traditional hard sugar candies (Toshiaki 1977).

With this study, the structure of the final product is aimed to be as soft and chewable as the current most known dragee products. The recipe enhancing studies include two basic agents to be used: milk protein and sugar. The usage amount and the crystallization parameters are important since the structure is directly evaluated. Caramel is generally manufactured by heating a mixture of glucose syrup, milk and vegetable fats at a temperature ranging between 118 and 130°C (Minifie 1989). Based on the trial and error studies, proceeded under the light of the literature review, caramel is formed during cooking, where the aqueous milk solids meet with sugar. In this step, milk solid amount and the sugar amount is optimized in order to obtain a base sugar dough which does not stick into teeth, soft and chewy. The cohesiveness is analyzed in order to confirm the stickiness in the structure of base recipe. In this step, the dragee nucleus is formed and the final touch in the mouth occurs within the sensory analysis. When the caramel structure is analyzed in detail, the molecular bond structure clarification becomes a milestone for the study. The strength is a measure of the stress force on the dragee coating layers and the nucleus. After cooking tests, it is needed to be proceed test analysis on contingency and viscosity index from the texture analyzer machine. The structural quality is observed by texture, color and moisture analyses.

Crystallization is a process in soft sugar confectionery, where the time and sugar amount added in the base recipe is critical for long lasting structure. In this study, the process parameters are optimized by RSM. The experimental test results are observed by texture analysis and color detector (Konica Minolta).

Materials and Methods

For the determination of base recipe and the using ratio of structural agents in the formulation, *Mixture Design Optimization* was used in the experimental design. The effect of each ingredient was observed in pre-

trial studies, in order to obtain the milk and caramel based soft structure. In this step, the compatibility of each agents with each other and the process parameters is critical. The observation studies continued both individually and the combinations in the experimental design.

The base recipe was formed on the high sugar components, sugar and glucose syrup; the structural ingredients like sorbitol, vegetable oil, dextrin, maltodextrin, modified starch and glycerol monostearate. In this study, caramelized based structure and flavor enhancers; skimmed milk and butter was added in the recipe in cooking phase. The compatibility of new agents on cooking parameters, crystallization step and after treatment processes (rapid cooling, drum cooling and pre-coating) was practiced to clarify the *know-how* of the study.

For cooking tests to be performed, *Lab Scale Vacuum Controlled* Batch Cooker was used in order to optimize temperature and vacuum variables for a consistent product behavior, to be proceeded in crystallization step. The sugar dough obtained from the cooking phase was observed and test analysis studies was applied in different cooking parameters. In the studies, Consistency(N.s) and Viscosity Index (N.s) (*TA.XTplus Texture Analyser)* and humidity data was obtained. The structural stability was confirmed by the moisture detection method and different moisture content was quantified using 'Karl-Fisher Titration Method' in *KF Titrator-Metrohm USA* . The Response Surface Methodology (Table-1) was used to obtain an experimental design. The color analysis was proceeded with *Konica Minolta (CM-700D) Spectrophotometer*, using 'Hunter Lab Analysis Method [(1)]'. *L**, *a**, *b** values of pre-treated base dough sugar, proceeded to be nucleus of the hard coated soft dragee products. The experimental studies took place after cooking of the base syrup into sugar dough, in order to observe and avoid any Maillard Reaction due to high temperature treatment on milk and sugar based syrup.

Table-1: Face Centered Response Surface Design for *Temperature (°C)* and *Vacuum (-Bar)* parameters.

Test No:	Cooking Parameters		Texture		Moisture (%)	Hunter Lab Color Analysis		
	Temperature (°C)	Vacuum (-Bar)	Consistency (ForcexTime)	Viscosity Index (ForcexTime)		L*	a*	b*
1	110	0,3	8115,12	1865,28	6,74	62,17	0,42	10,11
2	130	0,3	9127,68	2263,78	6,27	63,33	0,44	10,48
3	110	0,7	9514,54	2136,52	6,24	62,66	0,45	10,78
4	130	0,7	10042,63	3042,28	5,88	63,53	0,46	10,88
5	110	0,5	8745,90	1969,87	6,57	62,73	0,43	10,51
6	130	0,5	9912,44	2267,96	6,11	62,84	0,44	10,42
7	120	0,3	8587,94	1876,41	6,44	62,42	0,43	10,60
8	120	0,7	10142,46	3184,23	6,24	63,8	0,46	10,68
9	120	0,5	9465,28	2078,42	6,31	62,71	0,43	10,36
10	120	0,5	9467,41	2044,36	6,34	62,73	0,43	10,36
11	120	0,5	9448,73	2019,58	6,31	62,68	0,43	10,38
12	120	0,5	9442,75	2055,55	6,33	62,63	0,43	10,35
13	120	0,5	9494,80	2061,20	6,32	62,64	0,42	10,37

*(1) Hunter L*a*b* (CIELAB) L* scale: Light vs. dark where a low number (0-50) indicates dark and a high number (51-100) indicates light. a* scale: Red vs. green where a positive number indicates red and a negative number indicates green. b* scale: Yellow vs. blue where a positive number indicates yellow and a negative number indicates blue.*

The crystallization parameters was determined, by optimizing the sugar usage amount in base recipe and the time required for crystallization period. The process step was held in time and temperature controlled *Lab Scale Crystallizator.* The final structure was observed via *TA.XTplus Texture Analyser,* obtaining the strength (g) for determining the chewiness and toughness. Biting and cutting force was obtained as strength

data to evaluate the non-sticky structure that was aimed at the beginning of the study. The final caramel nucleus color was detected as a sensory parameter with 'Hunter Lab Analysis Method'.

Table-2: Face Centered Response Surface Design for *Amount of Sugar(%)* and Crystallization *Time(min)* parameters.

Test No:	Amount of Sugar (%)	Time (min)	Texture Strength (g)	Hunter Lab Color Analysis L*	a*	b*
1	0,50	10	1690,57	81,14	0,48	9,91
2	10,00	10	1502,27	81,88	0,49	9,93
3	0,50	30	1482,23	80,26	0,47	9,86
4	10,00	30	1294,13	79,03	0,51	10,22
5	0,50	20	1596,42	84,23	0,53	10,35
6	10,00	20	1395,04	80,08	0,45	9,96
7	5,25	10	1507,38	82,92	0,46	9,98
8	5,25	30	1341,86	81,36	0,47	10,16
9	5,25	20	1445,68	83,18	0,48	10,12
10	5,25	20	1444,08	83,71	0,49	10,15
11	5,25	20	1482,74	83,83	0,49	10,13
12	5,25	20	1441,93	83,49	0,51	10,08
13	5,25	20	1474,27	83,38	0,50	9,98

Results & Discussion

According to the optimization formulas (*p value<0.05*) obtained from RSM modelling for cooking and crystallization process steps, the consistency and viscosity changes in directly proportional to the applied temperature and vacuum while the moisture content was determined to be inversely proportional. As a result of the test analysis studies, obtained data and optimization, cooking parameters for caramel dragee is 120 °C for temperature and (-)0.5 bar for vacuum pressure. For crystallization process, regarding the texture value of the product changes inversely proportional to the amount of the added sugar and crystallization time, textural and surface color parameters of the pre-coating product were optimized with 5.25% sugar ratio for 20 minutes.

The studies showed that the cooking and crystallization process parameters of hard coated caramel soft dragee products can be determined via test analysis studies. The skimmed milk, butter and sugar combinations in soft candy products was observed and processed in base recipe. Any Maillard reaction was not observed due to heat treatment during the cooking and crystallization processes. The intended caramel colored, chewable, non-sticky soft structure was obtained and confirmed with the test and sensory analysis at the end of the study.

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Investigation of the Effects of Ultrasonic Treatment on Collagen Stability

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Scope and objective of the study: Collagen is a fibrous protein found in different connective tissues such as the skin, bone, cartilage tendon and contains about 30% of the total protein in mammals. There is a high demand for collagen in the food industry due to its high protein content and water absorption capacity, gel formation and functional properties such as forming and stabilizing emulsions. In this study; the use of ultrasonication in the enzymatic extraction of lamb feet collagen and the effects of different extraction conditions on collagen stability are investigated.

Method: Lamb feet, purchased from a butcher, were cut into small pieces and homogenised with 0.15 M NaCl in 0.05 M Tris-HCl (pH 7.5). Afterward, defatting process continued to take place with ethanol and non-collagenous proteins were removed with NaOH. The pre-treated samples mixed in %5 lactic acid containing 0.1 (w/v) pepsin at 4°C for 6 hours and then ultrasound-assisted extraction (35 kHz, 140/560W) was performed at three different temperatures (30, 40, 50 °C) and times (20, 60, 90 min). The mixtures were centrifuged and the suspensions were salted out by adding 2.5 M NaCl and subsequently dialyzed in 0.1 M lactic acid for 24 h and in distilled water for 48 h. The dialyzed supernatant was lyophilized by vacuum freeze drying. Protein content was determined by Dumas method. Protein distributions were determined by sodium dodecyl sulphate polyacrylamide gel electrophoresis.

Results and conclusion: Ultrasonication was effective in collagen extraction as shown by the protein content of samples. On the other hand, electrophoresis results showed that collagen denaturation started with increasing temperature. While ultrasound application at 30°C for up to 60 minutes did not affect the protein, but denaturation was observed in 90 min. Collagen was completely degraded at temperatures above 30°C and contained small protein fragments (less than 116 kDa). This study shows that intense ultrasonication adversely affects protein structure. Therefore, protein stability should be controlled when ultrasonication is used.

Organic Acid Compositions of Sultani Çekirdeksiz and Cabernet Sauvignon Sour Grape Juices

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Organic acids are one of the main components in fruits. Their types and amounts vary according to the variety and they affect taste balance of grapes. Sour grapes (Vitis vinifera L.) are a rich source of organic acids. The organic acid amounts in the grapes are decreasing depend on the maturation period. Especially, tartaric and malic acid amounts rapidly reduce until harvest. For this reason, harvest maturation is very important for sour grape juice production. In this study, it was aimed to determine the organic acid composition of the Sultani Çekirdeksiz and Cabernet Sauvignon sour grape juices. Sultani Çekirdeksiz is a white and seedless grape variety and it is generally consumed as fresh grape and raisin. On the other hand, Cabernet Sauvignon is a red and seeded variety that used for winery. In sour grape juice production, harvested sour grapes were washed, crushed and pressed. Then, depectinization, clarification, detartarization, filtration and pasteurization were performed respectively. Organic acid compositions (tartaric, malic and citric acids) of the samples were analyzed by using HPLC-DAD (Agilent 1260 infinity). At the end of the study, it was determined that Sultani Çekirdeksiz sour grape juice consisted of 49 % tartaric, 43 % malic and % 8 citric acids; whereas Cabernet Sauvignon samples had in 58 % malic, 36 % tartaric and % 6 citric acids. As a conclusion, the major organic acid was found tartaric acid and malic acid in Sultani Çekirdeksiz and Cabernet Sauvignon samples, respectively.

Determination of the Correlations between Total Phenolic Content and Antioxidant Activity in the Grape Juice

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Grape juice is a rich and natural source of antioxidant polyphenols. These compounds have a preventive effect on human diseases related to oxidative stress, improve endothelial functions, inhibit platelet aggregation, and decrease plasma protein oxidization and low-density lipoprotein oxidization. In this study, it was aimed to find out the relationships between total phenolic contents and antioxidant activities in the grape juice. For this purpose, 24 different grape juice were analyzed. Total phenolic content was determined according to Folin-Ciocalteu colorimetric method and antioxidant activities were performed with CUPRAC, FRAP, DPPH and ABTS methods. The Pearson correlation was carried out by using SPSS program. The significant positive correlations were determined between the total phenolic content and CUPRAC, FRAP, DPPH and ABTS results at $p \leq 0.01$ levels in the grape juice ($r=0.984$, $r=0.969$, $r=0.932$ and $r=0.926$). Additionally, similar positive correlations were also observed between antioxidant activities. These correlations were the highest between FRAP and CUPRAC ($r=0.97$) and the lowest between ABTS and DPPH ($r=0.86$). As a result, it was revealed that the analyzed grape juice samples had noticeable amount total phenolic content, considerable antioxidant activity and relationships between these parameters were significant as statistically. On the other hand, the results obtained from four different antioxidant activity methods in the grape juice were also found similar and compatible.

The Effects of Antimicrobials in Food on Probiotic Bacteria

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Nowadays, there is an increasing trend in health protection and healthy nutrition among consumers. In recent years, one of the prominent issues in terms of healthy nutrition and public health is probiotics. Probiotics are known as living microorganisms which have beneficial effects on the health of the host, that adhere to a human intestinal cell by implantation or colonization, which may multiply in the gut. A microorganism must have certain properties in order to be identified as probiotic. The strains with beneficial properties, potential sources of probiotics, most frequently belong to the genera Bifidobacterium and Lactobacillus.

After health benefits of probiotics have been scientifically proven, probiotic products have been bringing into the market. Moreover, nutritional supplements as probiotics are also recommended to support the development of present probiotics in the gut microflora and the formation of the dominant flora.

Unfortunately, while diets that support probiotics are recommended, there are some applications that reduce the number and activity of present probiotics. Pharmacologically active substances, for example antibiotics, used for treatment and other purposes have a harmful effect on probiotics. In addition, antimicrobial compounds are may be present in foods. One of these is antimicrobial additives, added to food to inhibit to the spoilage microorganism and some pathogens. Moreover, it is also known that spices and some edible plants are naturally the sources of potential antimicrobial compounds or substances. Both the antimicrobial additives and the natural antimicrobial compounds are likely to cause a bacteriostatic or bactericidal effect on probiotics if they pass without being affected by the processes of preparation of food and the activities in the digestive system. Moreover, there are studies that strengthen this possibility in the literature. In this study, the effects of the consumption of antimicrobial foods and additives on probiotics were reviewed by literature.

Fed Batch Production of Polygalacturonase and Pectin Lyase Enzymes Using Apple Pomace as Feedstock

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Apple pomace is a by-product of apple juice and cider, which accounts for 25-35% of dry mass of the apple resulting in about 17-24 million metric tons per year worldwide. The total apple production of Turkey was 3,625,960 tons in 2018, and this means an annual apple pomace generation of 900,000-1,270,000 tons. A low fraction (20%) of apple pomace is used in animal feeds and the remaining is disposed of, which poses environmental and health problems. Thus, apple pomace is a sustainable and renewable source for production of enzymes.

Enzymes are generally produced through batch, fed-batch and continuous fermentation while fed-batch and continuous methods are usually advantageous over batch method. The major advantage of fed-batch is the ability to adjust the substrate concentration in the culture broth to a value suitable for cell growth and production. In this study, apple pomace was used as a carbon source for production of polygalacturonase (PG) and pectin lyase (PL) enzymes using Bacillus subtilis by fed-batch submerged fermentation. The batch method was also carried out as control. The fed-batch trials were conducted at pH 5, 7, 9, and initial sugar concentration of 10, 20, and 30 g/L, at 30oC and 130 rpm for 3 days in 100 mL cultures, which were fed after 24 h for once. The change in enzyme production, reducing sugar concentration, and biomass were daily monitored. The DNS method was used to determine the activity of PG while the TBA method was used for PL assay. One unit of PG activity was defined as the amount of enzyme, which releases one micromole of D-galacturonic acid per minute under assay conditions and one unit of PL activity was defined as the amount of enzyme, which causes one unit change in absorbance at 550 nm per minute. The results of the study revealed that maximal PG and PL activities of 18.18 and 4.53 IU/mL were obtained at pH 9.0 with initial sugar concentration of 30 g/L, while in batch method the maximal results were 17.85 IU/mL for PG and 4.11 IU/mL for PL production. Hence, this study showed that fed-batch method could be an effective option for pectinase production.

Comparative Study of Microbial Oil Production
Using *Lipomyces starkeyi* and *Rhodosporidium toruloides* Yeasts

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Microbial oil is stored in cells by various microorganisms such as yeasts, bacteria, and microalgae at high carbon to nitrogen ratio. It is also called single cell oil. Fatty acid profile of microbial oil and vegetable oils is similar.

In this study, microbial oil production capacity of *Lipomyces starkeyi* and *Rhodosporidium toruloides* yeasts were investigated in fermentation media, which contained glucose, galactose, fructose, xylose and 1:1 combinations of these sugars. *Lipomyces starkeyi* and *Rhodosporidium toruloides* yeasts were grown in synthetic sugar fermentation media for 8 days at 25oC and 130 rpm in a shaking-incubator. Optical density, biomass, reducing sugar and lipid yield were monitored during fermentation. At the end of the fermentation, all media were centrifuged at 10000 rpm to collect yeasts, which were consequently washed twice with distilled water. Yeasts were dried at 70oC for 24 h afterwards. Since microbial oil is stored inside the yeasts cells, dry yeast cells were disrupted with acid solution and then mixed with hexane for extraction in the Soxhlet-apparatus. Microbial oil was obtained by evaporating hexane in the oven and the lipid yield was calculated.

The results showed that the lipid yield of *Rhodosporidium toruloides* was higher than that of *Lipomyces starkeyi* in all sugar types. Maximal lipid yield of *Rhodosporidium toruloides* was 59.5% in glucose-galactose medium while *Lipomyces starkeyi* gave the highest yield of 41.8% in glucose-fructose medium. Further studies will be carried out with *R. toruloides* to enhance the microbial oil yields.

Effects of Microwave Heating On Electrospinning of Carob Bean Flour Based Nanofibers

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Electrospinning is a cost-effective and advantageous method for obtaining nanofibers. By using the electrospinning method, it is possible to produce controlled-release nanofibers with larger surface to volume ratio. Although electrospinning method in the food industry is not so common, there is a growing interest in biopolymer-based packaging materials due to environmental concerns. For that purpose, starch and carob flour are good sources for nanofiber formation. Additionally, biofilms are known to have weaker functional properties compared to plastic films. To increase the functional properties of biofilms, solutions will be preheated using microwave or conventional heating methods. Microwave heating has not been used so far prior to electrospinning. Microwave heating has some advantages like energy and time saving; moreover, it has also known to influence some functional properties of starch and proteins. As independent variables carob flour concentration (3% and 5% (w/v)), rice starch concentration (0 and 0.5% (w/v)) were chosen. Samples were either microwave heated at 450W with microwave heating time of 2.5 minutes or conventionally heated at 80°C for 2 hours. Prepared solutions were tested for viscosity, surface tension and electrical conductivity. After electrospinning, obtained nanofibers were tested for water vapor permeability, scanning electron microscopy, x-ray diffraction, glass transition temperature, FTIR and mechanical tensile test. As a result, it was observed that microwave heating increased electrospinnability of samples. Also, it was seen that samples containing 3% flour and 0.5% starch combination and treated with microwave heating gave better results in mechanical and water vapor permeability tests as compared to conventionally heated sample. Additionally, samples treated by microwave heating had higher viscosity value than conventionally heated one. To conclude, it can be suggested that solutions prepared with microwave heating can be used as an alternative to conventional heating to obtain nanofiber.

Key Words: Electrospinning, carb flour, microwave

Textural Properties of Pastırma Types with Transglutaminase

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Abstract

In this study, the effect of using transglutaminase enzyme on textural properties of different types of pastırma (sırt, kuşgömü, şekerpare, kürek and bohça) has been investigated. Two different beef carcasses utilized for this study. One of two meat pieces, taken from beef carcass, was regarded as the control group (without enzyme), while the other one was used for the treatment group (with enzyme) for each pastırma type. Treatment group was treated with 0.50% transglutaminase enzyme. The pastırma production was carried out according to the traditional method. The production was repeated twice. At the end of the production, texture profile analyzes as well as cutting and stress relaxation tests were performed. Firmness, adhesiveness, cohesiveness, springiness, gumminess and chewiness were not affected by the enzyme application ($P>0,05$). There are significant differences between pastırma types in terms of textural parameters except adhesiveness ($P<0,05$). Among pastırma types with transglutaminase bohça and sırt showed higher value in terms of chewiness compare to other types of pastırma. In control groups, however kuşgömü, şekerpare and kürek had high chewiness values. On the other hand, an increase in the maximum cutting force was observed in presence of transglutaminase. Moreover, minimum cutting force value was detected from kuşgömü pastırma type. Stress-relaxation parameters of pastırma types with and without the application of the enzyme were not found different from each other ($P>0,05$).

Keywords: Cutting Test, Pastırma, Textur Profile Analysis, Transglutaminase

Textural Properties of Pastırma Types with Transglutaminase

1. Introduction

Pastırma is a traditional dry-cured meat product made by curing, pressing, drying and covering with pasta (çemen) (Tekinsen and Dogruer 2000; Kaban 2009; Gökalp *et al.* 2012; Akköse and Aktaş 2014). Chemical and physicochemical changes occur during the production of the dry-cured meat products made from whole pieces (Lorenzo *et al.* 2008). Proteolysis known to be effective on the texture has great importance for sensory quality characteristics of the final product. Textural problems are closely related to proteolysis occurred in advanced degree (Harkouss *et al.* 2015; Żochowska-Kujawska 2016; Pérez-Santaescolástica *et al.* 2018). In addition, the composition of the product and production stages also play an important role in the textures of meat products. The curing, pressing and drying of pastırma production stages cause water loss of the product and many changes in proteins, so that these stages affect the texture of the product (Akköse *et al.* 2018). The incision process is applied in order to better penetrate the curing components into the meat. For this purpose, the deep incisions are made on only one surface of the meat piece in the direction of the muscle fibers. (Tekinsen ve Dogruer, 2000). However, this application might cause especially appearance defects in the final product. In this study, transglutaminase enzyme, provides cross-linking between lysine and glutamine, was used in order to solve this problem.

There is only one study on the use of transglutaminase enzyme in dry-cured meat products processed from whole pieces (Bergamin Filho *et al.,* 2010). However, there is no study on the use of transglutaminase enzyme in pastırma production.

The aim of this study was to eliminate the appearance defects originating from incision by using transglutaminase enzyme and to investigate the effect of this enzyme on the textural properties of the final product. For this purpose, transglutaminase enzyme (%0-control and %0,50) was used in the production of 5 different types of pastırma (sırt, kuşgömü, şekerpare, kürek and bohça). At the end of the production, pastırma samples were subjected to texture profile analysis, stress-relaxation and cutting tests.

2. Material and methods

Material

Meats for pastırma production that were provided from the right and left side of middle-aged beef were used in the study. Therefore, two pieces of meat for pastırma were obtained from one carcass for each pastırma type. While one of these pieces was regarded as the control group, other piece was treated with ¼ solution of 0.50% transglutaminase enzyme preparation (Ajinomoto Activa GS).

Method

The production of pastırma was carried out by the traditional method. Meat pieces obtained from different parts of the carcass were incised, and were cured by using 8% salt, 0.3% sucrose and 150 mg/kg nitrite. Cured meat pieces were then applied washing, 1st drying, (15-22°C/8 days), 1st pressing (11°C/19 hours), 2nd drying (18-20°C/3 days), 2nd pressing (15°C/1 hour), 3rd drying (18-20°C/10 days), covering with pasta (çemen) and drying with çemen (8°C/5 days), respectively. 500 g flour ground from seed (*Trigolella foenum graecum*), 150 g hot/sweet powdered pepper and 1200 mL water were used in the preparation of çemen. Enzyme application was performed after 1st drying stage. Meat pieces treated with enzyme were immediately taken to the pressing stage. Texture profile analysis, cutting and stress-relaxation tests were performed on the pastırma types at the end of the production.

In pastırma samples, TPA, stress-relaxation and cutting tests were performed using the device of TA.XT plus Texture Analyser (Stable Micro Systems Ltd. Godalming, Surrey, U.K.). The test conditions were given in Table 1.

Table 1. Application parameters of TPA, stress-relaxation and cutting tests

	TPA	**Stress-Relaxation Test**	**Cutting Test**
Probe	P50	P50	Special (cutting) knife sets
Sample Size (widthxlengthxheigh)	2x2x1,4	2x2x1,4	1x2,5x1
Test spead	1,00(mm/sn)	120(mm/dak)	3,33(mm/sn)
Post-test spead	1,00(mm/sn)	180(mm/dak)	10(mm/sn)
Targed mode	Strain	Strain	Distance
Strain/ distance	20%	25%	40 mm
Resting time	5,00 sn	4000 min	-
Triggering force	10,0 g	5 g	10

In this study, five types of pastırma (sırt, kuşgömü, şekerpare, kürek and bohça) with 0.50% transglutaminase and without transglutaminase (control) were produced. Experiments were performed as two replication according to the randomized complete block design. Variance analysis was applied to the obtained results, and results were compared with the Duncan multiple comparison test (SPSS 20.0).

3. Results and discussion

The results of TPA, cutting and stress-relaxation tests of pastırma types were presented in Table 2. According to these results, firmness, cohesiveness, springiness, gumminess and chewiness were significantly affected by the factor of the pastırma type ($P < 0,01$). Sırt pastırma showed the lowest average values for cohesiveness and springiness. The highest average values for springiness, gumminess and chewiness were detected kuşgömü type pastırma (Table 2). Akköse *et al.* (2018) determined the lowest firmness and chewiness values in kuşgömü type in a study conducted on pastırma types (kuşgömü, sırt, bohça, kürek and şekerpare) produced using the water buffalo meat. It was also reported that kürek type had the highest firmness, and the mean value was not different from the average values of kuşgömü and bohça types.

In the şekerpare type pastırma, the highest average value for maximum cutting force was determined. However, the difference between şekerpare and kürek types was not significant. In stress-relaxation test, maximum and minimum force of kuşgömü and bohça types were higher than other pastırma types.

Table 2. The results of TPA, cutting and stress-relaxation tests in pastırma types

Textural Properties	**Sırt**	**Kuşgömü**	**Şekerpare**	**Kürek**	**Bohça**	**Significiance**
Texture Profile Analysis						
Firmness	38,018±14,103ab	47,684±11,592a	31,075±6,486b	29,905±5,356b	39,464±9,453ab	**
Adhesiveness	1,979±1,732a	1,666±0,602a	1,680±1,430a	1,722±1,245a	0,743±0,682a	NS
Cohesiveness	0,553±0,047c	0,733±0,020a	0,726±0,031a	0,647±0,031b	0,680±0,046b	**
Springiness	0,611±0,041c	0,808±0,024a	0,727±0,111b	0,692±0,064b	0,727±0,068b	**
Gumminess	20,503±6,336c	34,808±7,860a	22,571±4,928bc	19,284±3,128c	26,973±7,617b	**
Chewiness	12,431±3,277c	28,099±6,357a	16,522±4,758bc	13,360±2,597c	19,841±6,915b	**
Cutting Test						
Max. Cutting Force (N)	25,484±3,859bc	18,542±4,055d	30,252±5,704a	28,277±4,863ab	23,539±1,885c	**
Stress-Relaxation						
Maksimum Force (N)	46,835±8,360b	69,649±12,106a	45,362±15,937b	42,658±14,355b	78,213±16,037a	**
Relaxation Time(sec)	62,670±10,381a	97,451±29,688a	77,532±23,120a	76,435±38,367a	81,834±21,850a	NS
Minimum Force (N)	13,695±2,518b	21,797±3,372a	14,013±5,506b	13,020±5,374b	23,984±4,954a	**

a-d: any two means on the same line having to the same letters are not significantly different (P>0,05)

The results of averages of firmness, adhesiveness, cohesiveness, springiness, gumminess, chewiness, maximum cutting force, max. force, relaxation time and minimum force values of the pastırma samples produced by using different levels of transglutaminase enzyme are showed in Table 3. As can be seen in the table, it was determined that the transglutaminase application affects cutting force at a level of P<0,01. Maximum cutting force increased with the use of the enzyme (Table 3).

Table 3. Duncan multiple test results of mean values of TPA, cutting and stress-relaxation tests of pastırma samples produced by using different level transglutaminase enzyme

Textural Properties	**Control**	**0,50%**	**Significiance**
Texture Profile Analysis			
Firmness	37,874±9,645a	36,584±13,221a	NS
Adhesiveness	1,660±1,199a	1,456±1,286a	NS
Cohesiveness	0,667±0,075a	0,668±0,077a	NS
Springiness	0,719±0,087a	0,707±0,097a	NS
Gumminess	25,410±7,893a	24,246±8,678a	NS
Chewiness	18,722±7,619a	17,379±7,463a	NS
Cutting Test			
Max. Cutting Force (N)	23,672±5,995b	26,765±5,213a	**
Stress-Relaxation Test			
Maksimum Force (N)	58,847±20,331a	54,240±19,053a	NS
Relaxation time(sec)	85,567±37,076a	72,802±9,042a	NS
Minimum Force (N)	18,180±6,821a	16,424±5,855a	NS

a-b: any two means on the same line having to the same letters are not significantly different (P>0,05)

Enzyme application x pastırma type interaction had a significant effect on chewiness (P<0.05). According to this result, while the chewiness value was detected as higher in bohça and sırt types of pastırma in enzyme-containing groups, control groups showed higher average value in kuşgömü, şekerpare and kürek types.

4. Conclusion

Pastırma types were different from each other in terms of texture parameters. In addition, enzyme application increased the value of maximum cutting force in all pastırma types.

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Investigation of the Liquid Form of Energy Drinks Composition in Terms of Inositol, Taurine, Glucoronolactone

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In this study, it is aimed to optimize method and determine the amount of taurine, glucoronolactone (GlcLA) and inositol in energy drinks. The analysis were carried out by liquid chromatography tandem mass spectrometry (LC-MS/MS) using an electrospray ionization source (ESI)for both inositol and GlcLA in negative mode and for taurine in positive mode. The separation of GlcLA and inositol was achieved using a Merck ZIC-HILIC analytical column (100 x 2.1 mm, 3,5 µm). For GlcLA mobile phase was composed of water(A) with 10 mM amonium formate and 0.1% formic acid and acetonitrile (B) at a flow rate of 0.3 ml/min with gradient elution in 12 min. For inositol mobile phase was composed of water (A) with 0.1% ammonia and acetonitrile (B) at a flow rate of 0.3 ml/min with gradient elution in 6 min. The separation of taurine was achieved using GL Sciences Inertsil SIL100A analytical column (150 x 3 mm, 3µm) and a mobile phase was formed from water (A) with 40 mM amonium formate and 2% formic acid and acetonitrile (B) with 2% formic acid. Matrix-match calibration curves were created using the standard addition in a concentration range from 0.5 to 8 mg/l for GlcLA (R2 >0.997), from 4 to 40 mg/l for inositol (R2 >0.99), from 10 to 160 mg/l for taurine (R2 >0.992).The limits of detection (LOD) and the limits of quantitation(LOQ) were 2.4 and 8 mg /100 ml for taurine, 0.25 and 0.82 mg/100 ml for GlcLA and 0.62 and 2.1 mg/100 ml for inositol, respectively. The validated method was applied to the analysis of fifty commercial energy drinks and the contents of taurine, inositol and GlcLA were found to be 392.6 to 796.8 g/l, from 8.7 to 385 mg/l, from 1.3 to 5.4, respectively.

Key words: Energy drinks, taurine, inositol, glucoronolactone

The Importance of Innovative Entrepreneurship in Food and Beverage Businesses and a Successful Case Study

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Enterprises have to create an appropriate innovation environment to provide competitive advantage in the globalized food and beverage market. For this reason, in recent years the enterprises in the food and beverage sector; It makes radical changes in its products, presentation styles, marketing strategies, rewiev at business models and cares about innovation work.

It was aimed to evaluate the effect of innovative initiatives in the development of sustainable competition in terms of food and beverage enterprises in this study. In this context, a real innovative entrepreneurship story applied in Mersin was examined using case study method. The research design of the case study, which was determined as the research method, was formed in two stages. In the first step, was obtained during the establishment phase of the business the datas about the business plan. In the second stage, the acceptability of the innovative business idea by the customer, experience and problems of the innovative business idea were investigated. It is considered that working with the current situation can guide those who want to make a new innovation enterprise.

The results of the case study showed that innovation has a positive and significant effect on sustainable competitive advantage. In this context, it can be said that food and beverage establishments can achieve sustainable competitive advantage through innovation and innovation plays a very important role in achieving sustainable competitive advantage. It is seen that creating a value proposition based on the needs and problems of people is very important for generating innovative business ideas and making these business ideas successful. Differentiation can be achieved by employing qualified and trained personnel, managing the enterprise with an innovation-oriented management style, adopting a resource-oriented production process that provides resource efficiency with Industry 4.0, creating an innovation climate in the enterprise and attempting to create corporate identity related to the enterprise.

Effect of Fat Content on Aroma Release and Rheological Properties of Dairy Desserts

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Abstract

In recent years, consumer demand for low and zero fat products has been increasing for many different reasons such as nutrition, health and weight control. Reducing fat in food products often leads to undesirable changes in the structural properties of foods. Changes in the component concentrations or properties of foods can affect consumer taste by changing the rheological and sensory properties of semi-solid dairy desserts. Some fat substitutes are commonly used to compensate or reduce problems associated with reducing fat content in foods. The use of whey protein-pectin complexes (WPPC), short and long chain inulin mixtures, λ-carregenan, κ-carrageenan and starch as fat substitutes affect the rheological properties and sensory properties of dairy desserts.

Due to the role of fat in food, the amount of fat in low-calorie product formulations can cause changes in color, appearance, mouthfeel, texture and flavour in semi-solid dairy products. Milk fat content and aroma-compound lipophilicity are effective on volatile compound concentration, flavour release and detection in dairy desserts. These characteristics can affect in vivo flavour release and sensory detection mechanisms in aroma added semi-solid milk products. The type of milk (whole-fat, low-fat or non-fat) used in the production of dairy dessert affects the flavor release, flow behavior, viscoelastic properties, type and concentration of thickener (starch, κ carrageenan, carboxymethyl cellulose), and the taste intensity perceived in the mouth. Thickener type and concentration were found to affect texture and rheological behavior in low fat dairy dessert, but also did not significantly affect the perception of taste density. In this review, it was aimed to examine the effect of reduced fat content on aroma release and rheological properties in dairy desserts.

Keywords: dairy desserts, fat reduction, aroma release

Effect of Fat Content on Aroma Release and Rheological Properties of Dairy Desserts

Introduction

Dairy desserts are defined as products that are prepared and eaten by mixing milk and main nutrients such as sugar, flour, starch, eggs, rice, as well as aroma and other additives given in the Turkish Food Codex (Seçim, 2011). Dairy desserts have an important place in Turkesh culture. Dairy desserts, which are important in Turkish cuisine, are lighter, easier to digest and have high nutritional values compared to dough and syrup desserts (Hut and Ayar 2013). In the last two decades, with the increase in consumer demand for low and zero fat products, it is observed that there are increasing efforts to develop these products low fat products. In the formulation of such products, fat affects the appearance, texture, mouth feeling and especially flavor (Doyen et al., 2001). In addition, consumers are looking for healthy foods with satisfactory sensory properties and properties similar to traditional products (Verbeke, 2006). Elimination or reduction of fat changes the composition, structure, and also the expected interactions between the components of dairy products. It often leads to noticeable changes in color, flavor and texture (Bayarri and Costell, 2009). The structure of a starch-based milk dessert is defined as a fat globule web dispersed in an adhesive aqueous phase. Therefore, the development of low-fat desserts having the desired structure is a challenge for food technology due to disruption or absence of the fat globe network and can seriously affect the texture of this product (Aime et al., 2001). The use of fat substitutes or fat mimics is one of the most commonly used strategies to compensate for fat reduction (Sandrou and Arvanitoyannis, 2000). Among fat substitutes, carbohydrate-based substances such as starch, cellulose, pectin, inulin, xanthan gum or carrageenan are of interest because they have health-friendly properties as well as physicochemical properties (Warrand, 2006).

Fat substitutes are substances that can mimic the physical and sensory properties of fat but provide less calories (Zoulias et al., 2002). A fat substitute, should be safe for health, be a physiologically inert substance, provide functional and sensory properties close to a full-fat product and be able to achieve a calorie reduction

in food compared to a full-fat product (Grossklaus 1996). The main point in using fat substitutes instead of fat in food products is to provide positive properties of food while removing fat from foodstuffs (Huyghebaert et al., 1996). Fat substitutes are generally divided into three groups according to their composition as lipid, protein and carbonhydrate based substitutes. Each has different functional properties and can be used alone or as a mixture (Lucca and Tepper, 1994; Ognean et al., 2006). Carbohydrate-based fat substitutes include different types of maltodextrins, cellulose derivatives (microcrystalline cellulose, methyl cellulose and hydroxypropyl methyl cellulose), inulin, pectin, polydextrose and other dietary fibers (Goff and Hartel, 2013). Protein based fat substitutes are generally produced from whey protein concentrate (WPC). Depending on their particle size, they cause creaminess or sandy texture. Lipid-based fat substitutes include emulsifying agents, medium chain triacylglycerols or structural lipids having an active surface and which can stabilize emulsions (Lucca and Tepper, 1994).

In ice cream ; maltodextrin, polydextrose (Güzeler ve ark., 2011), starch (Aime ve ark., 2001), milk proteins (milk protein concentrate, whey protein) (Mostafavi ve ark., 2016), soy proteins (Liu ve ark., 2018), in cheese; konjac glucomannan (Dai ve ark., 2019), simplesse and novagel (Romeih ve ark., 2002), in yogurt; whey protein (Fang ve ark., 2019), konjac glucomannan (Dai ve ark., 2016), in dairy desserts; the mixture of short and long chain inulin (Tarrega ve Costell, 2006a; Gonzalez-Tomas ve ark., 2009; Bayarri ve ark., 2010; Arcia ve ark., 2011) and WPPC (whey protein-pectin complexes) (Protte ve ark., 2019) is widely used as fat substitutes. It was found that the use of substitutes in dairy products increased the stretch performance and solubility of cheese (Dai ve ark., 2019), increased the hardness and melting resistance of ice cream, the textural properties (Akalin ve ark., 2008) were positively affected and improved the sensory perception in structure (Romeih ve ark., 2002; Arcia ve ark., 2011; Dai ve ark., 2016). Low fat content can cause changes in color, appearance, mouth feeling, texture and flavor in semi-solid dairy products. Milk fat content and aroma-compound lipophilicity are effective on volatile compound concentration, flavor release and perception in dairy desserts. In this review, it is aimed to give information about the effects of reduced fat content on aroma release and rheological properties of milk desserts with reduced fat content.

Fat Content, Aroma Release, Rheological and Sensory Properties of Dairy Products

Aroma components are one of the most important quality criteria of fresh and processed foodstuffs. Aroma ingredients are organic compounds with different polarity and reactivity, which are usually found in low concentrations such as ppt and ppb in complex food matrices (Kataoka et al., 2000). The effect of fat content on aroma release was investigated using in vitro model systems and in vivo by monitoring volatile compounds in the nasal cavity while consumption of foods (Hatakeyama et al., 2014). Fat was found to play a key role in changing the physical properties of foods such as mouth sensation, appearance (brightness, color, opacity), structure (texture, consistency, melting profile), heat transfer and saturation. Fat is also important as a pioneer of flavor, flavor carrier and flavor. Fat has been reported to affect qualitative, quantitative and temporary flavor perception in products (Brauss et al., 1999). For example, flavor release of lipophilic aroma compounds has been shown to decrease with increasing lipid levels in the food matrix (Miettinen et al., 2002; Gonzalez., 2007; Linforth et al., 2010). The type and concentration of fat changes the physical properties of foods and affects flavor perception in terms of flavor release and textural changes (Malone et al., 2003; Bayarri et al., 2006; Bayarri et al., 2007). Fat is effective on emulsion texture, creaminess, smoothness or fatty perception which may change the flavor perception in emulsions during oral intake (Buettner et al., 2002; Bayarri and Costell, 2009; Chen, 2009). When flavored emulsions with different fat and hydroxypropyl methyl cellulose (HPMC) content are formulated to provide the same flavor release in vivo, a decrease in flavor intensity has been found as intraoral viscosity increases (Bayarri et al., 2006). It was found that there was no significant difference in the perceived intensity between the samples in emulsions containing the same oral viscosity, in vivo release flavor, but there was a significant difference in the perceived fruity flavor and sweetness (Bayarri et al., 2007).

Milk fat content, thickener type and concentration are the most important composition factors that affect color, texture, flavor release and perception. Fat content contributes to texture (Villegas and Costell, 2007) while whitening the color of milk and dairy products (Arancibia et al., 2015). Fat plays an important role directly as a solvent for lyophilic compounds affecting flavor and indirectly because of its effect on product texture. Previous studies have shown that milk fat content and aroma-compound lipophilicity have an effect on flavor release in milk desserts (Ruth et al., 2004; Gonzalez-Tomas et al., 2007; Kersiene et al., 2008).

The structure and perceived texture of foods are properties that may play a role in the sensory presence of flavor compounds during food consumption. Studies have been carried out on the factors affecting the aroma release such as physicochemical properties of aroma compounds and food components and rheological behavior of the matrix (Guichard, 2002). Retention of the aroma compound in the matrix can be explained by a decrease in the diffusion of aroma compounds with increasing viscosity, interactions between thickeners (polysaccharides or proteins) and aroma compounds (Decourcelle et al., 2004; Seuvre et al., 2006). The effect of fat on the volatility of strawberry aroma, tapioca starch and κ-carrageenan-containing strawberry flavored custard desserts were investigated in the model systems. It has been observed that the use of κ-carrageenan does not affect the in vivo release of volatile substances in whole-fat milk systems, but does affect aroma release, particularly ethyl hexanoate release (Gonzalez-Tomas et al., 2007). The addition of κ-carrageenan and increase in starch concentration increases the consistency index values (K) and viscoelastic parameters G ′, G ″ and η *, while decreasing the flow index values (n). In general, thickeners do not affect the head space or the in vivo release of volatile compounds (ethyl hexanoate, ethyl iso-pentanoate, ethyl butyrate and cis-3-hexen-1-ol). The grading of the R-index analysis with sensory data showed that there were significant differences in thickness between the samples, but no difference was detected in the intensity of strawberry flavor. In the case of milk type, sensory testing has been found to have a significant effect on the in vivo release of volatiles and headspace, especially for more lipophilic compounds. Skimmed milk samples were found to have higher perceived taste independent of starch and carrageenan concentrations (Gonzalez-Tomas et al., 2007; Martuscelli et al., 2008; Gonzalez-Tomas et al., 2008).

The rheological behavior of milky desserts and the release of aroma compounds were monitored simultaneously using an oral simulator. It has been found that under a constant shear rate and temperature, the aroma compounds cause an increase in the partition matrix and a decrease in the viscosity of the matrix. By increasing the temperature rapidly, the effect of the matrix on rheological behavior and taste release appears to be less important than the heat transfer in the product and its effect on the separation of aroma compounds. Custard with the lowest texture level was found to show the highest kinetic release for all aroma compounds examined (Lubbers et al., 2010). A study showing the effect of bilateral interactions (texture-taste, texture-aroma and aroma-taste) on milk desserts, which varies in viscosity, sucrose level, and aroma, was found to affect the taste intensity but did not affect the aroma intensity. It has been found that texture-flavor interactions are mainly associated with a change in composition and that texture changes may have less effect on flavor perception due to a mechanical process. It has been stated that the decrease in viscosity due to a mechanical process has different effects on taste release and taste perception (Tournier et al., 2009).

The effects of the use of okra gum instead of milk fat in frozen chocolate milk dessert were investigated on sensory properties and melting characteristics of milk dessert. In the sensory test performed with 56 consumers using hedonic scale, color, smell, texture, flavor, taste in the mouth and general taste were evaluated and it was found that the sensory properties other than the taste in the mouth were similar. It was determined that consumer preference was significantly lower for dessert where 100% okra gum was used instead of milk fat. Although the melting points of all products were the same, it was found that the melting rate was lower in desserts where okra gum was used in high concentration. It was determined that okra gum significantly increased the flow stability of the dessert ($p < 0.05$), and that okra gum could be used as a substitute for milk fat (Romanchik-Cerpovicz et al., 2006).

In a study conducted by Gonzalez Tomas et al. (2009), inulin (long chain and short chain) with different starch concentrations as fat substitute was added to milk desserts formulated with whole or skimmed milk. It was found that the long chain inulin-free skimmed milk dessert and non-inulin-full-fat milk dessert showed similar flow behavior. It was determined that both dessert samples had the same creaminess and consistency, but the smoothness increased with the addition of long chain inulin. In a study with a low-fat prebiotic milky dessert with different inulin, sucrose and lemon aroma, it was found that inulin-added low-fat dessert had a stronger lemon aroma, more consistency and creaminess (Arcia et al., 2011). In another study in which stevia (St) and sucralose (Water) were added as sugar substitutes to milk dessert supplemented with inulin, the highest sensory acceptability was found; 50% St + 50% Sa, the highest consistency factor and viscosity; %100 St and %50 St+%50 Su combination. Inulin-added desserts show an increase in consistency by confirming the effect of polysaccharide as fat substituting agent. Compared to the low fat semi-solid milk desserts containing inulin mixture and λ-carrageenan, compared to the whole-fat control samples, slight differences were observed when inulin mixture was added to λ-carrageenan-free milk dessert, while a significant increase in thixotropy, consistency and flexibility was observed in carrageenan-containing

samples. Semi-solid dairy desserts containing a mixture of λ-carrageenan or inulin and low-fat carboxymethyl cellulose (CMC) (Bayarri et al., 2010) exhibit rheological behavior similar to full-fat control desserts. Inulin added, skimmed milk desserts containing different starch concentrations show lower consistency and lower shear thinning than whole milk or inulin added skimmed desserts (Tarrega and Costell, 2006a). In general, desserts having the same rheological behavior but different fat content were found to have similar thickness, creaminess and smoothness. The substitution of fat with λ-carrageenan or inulin affects perceived sweetness and flavor (Tarrega and Costell, 2006a; Bayarri et al., 2010; Tarrega et al., 2010). In a study investigating the applicability of reconstituted, thermally stabilized whey protein-pectin complexes (WPPC) as fat substitute in dairy-based desserts, the aroma profile of WPPC dominated the milk properties and showed textural properties similar to high-fat products. When the rheological measurements of liquid and semi-solid systems were examined, it was found that low-fat products using substitutes had similar viscosity properties as whole-fat milk, cream and high-fat products. In liquid and semi-solid systems, the effect of WPPC is based on the ability of thickening of unbound pectin. In gelled matrices, it is suggested that unbound pectin and starch molecules cause softening of the puddings (Protte et al., 2019).

Arancibia et al. (2015) found that the effects of milk fat content, thickener type (starch and carboxymethyl cellulose) and concentration on color and rheology were statistically significant. The thickener type, concentration and fat content were important in in-vivo flavor release, whereas perceived differences in color, texture and flavor characteristics were affected by changes in ingredient differences. When the interactions between λ-carrageenan concentration, cross linked starch and milk fat were evaluated in dairy desserts during cooling, samples with higher λ-carrageenan concentration reached the highest apparent viscosity at higher temperatures than samples without λ-carrageenan. For samples containing less than 0.1% λ-carrageenan, G′ (storage modulus) values recorded at 1 Hz increased with carrageenan concentration, the viscosity of in skimmed milk and whole-fat milk desserts increased by increase in λ carrageenan concentration (Tarrega and Costell, 2006b). Kersiene et al. (2008) found that the presence of milk fat had the highest effect on the release of taste compounds and that milk fat protected flavor compounds through hydrophobic interactions. Increasing the concentration of tapioca starch from 4% to 8% in milk desserts prepared with skimmed milk increased gel strength in the product while increasing starch concentrations and low aroma concentrations increased flavor release.

Conclusions

With the changes in consumers' awareness and expectations in recent years, the demand for healthy food products with reduced fat content in the food industry has been increasing in order to reduce fat intake. Reduction of fat in food products is known to cause undesirable changes in the structural properties of foods. While reducing fat in foods, the rheological and sensory properties of the prepared foods should be preserved. Therefore, some fat substitutes are commonly used in semisolid dairy desserts to compensate or reduce the problems associated with reducing fat content in foods. Fat content can cause changes in color, appearance, mouth sensation, texture and flavor in low calorie dairy dessert formulations. When fat substitute added skimmed dessert and whole fat dairy dessert samples were compared, they showed similar rheological behavior, and desserts having the same rheological behavior but having different fat content were found to be of similar viscosity, creaminess and smoothness. It has been found that reducing fat content in dairy products reduces volatile compound concentration, but the use of fat substitutes significantly increases taste release. Therefore, the use of fat substitutes in dairy products is one of the effective solutions to achieve fat reduction. It has been found that different results were obtained by using thickeners, fat substitutes and concentrations under similar conditions. For this reason, more researches are needed on the subject and bring innovations to the scientific world.

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Utilization of fruit and vegetable wastes for production of lignocellulosic materials and its potential use in food industry

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Excessive amounts of solid and liquid waste occur in food processing plants that uses fruits and vegetables as raw material. When these wastes are released directly to the environment, they can cause environmental pollution, besides; wastes that can be used for the production of valuable biomass and nutrients will be lost. For this reason, valorization of food industry wastes provides added value in economic terms.The components of major importance in fruit and vegetable wastes are lignocellulose, fiber, pectin and sugar. Lignocellulosic materials consist of cellulose, hemicellulose and lignin. Hemicellulose is a complex structure that enters into cellulose molecules, holds them together and prevents them to break down into their monomers. Recently, waste utilization can be performed by the use of different methods such as extraction, purification and fermentation. In order to degradation of lignocellulose, various treatments can be applied using enzymes, acid / base hydrolysis, vaporization and high temperatures. However, pretreatments are necessary to modify the lignocellulose properties and enhance the accessibility of the enzymes.In recent studies, thermal or non-thermal processing methods like microwave, ultrasound, are applied as an alternative pretreatments for the production of lignocellulosic materials from wastes. After these treatments performed to waste, cellulose can be obtained from this waste. It is used to edible food packaging and raw material for biofuel production. Also fermentable sugar (e.g. Glucose, xylose, etc.) -is recycled from cellulose- is used as a food sweetener like glucose syrups and raw material for biofuel production. Glucose syrups are used in confectionery, biscuit and bakery products, processed ready foods, jam, halva, ice cream and beer This review describes the types and composition of fruit and vegetable wastes, the lignocellulosic materials in the wastes, their novel extraction techniques, and the potential utilization of the obtained lignocellulose in food industry.

The Molecular Imprinting Method: A Rapid and Easy Method for the Detection of Microorganisms in Food

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The development of rapid and easy techniques for the detection of bacterial species for food safety has great importance. The conventional counting and identification methods of microorganisms are laborious and time consuming. For these reasons,in recent years, a method called "molecular imprinting" has been developed by creating internal cavities of targets in polymeric matrices with various advantages such as low cost,easy synthesis,adaptability to extreme conditions. Molecular pressure of polymers is considered as one of the detection methods recommended by the HACCP program for selective recognition of undesired components and concentration control.The molecular imprinted polymer (MIP) used in the method is polymeric materials having specific recognition areas complementary to the shape, size and functional group for the template molecules. Firstly,microorganism imprinting process, which is a subbranch of molecular printing technology, was started by Dickert using yeast by surface printing of polyurethane in 2001. Subsequently,in most of the experimental studies where molecular surfaces of polymers were pressed with microorganisms used as pattern,the focus was on evaluating the effect of surface chemistry and special chemical additives on the qualitative properties of the polymer.In these studies,the printed cavities of MIP are dispersed on the surface which facilitates easy removal of the pattern and diffusion,as well as the development of sensors for microorganism detection. In addition, various sensors such as fluorescence, electrochemical, piezoelectric are combined with MIP for analytical detection of microorganisms in this technology. Thus,the target microorganism becomes highly sensitive and can be detected in a short time.As with all new technologies, some problems can be encountered with molecularly imprinted polymers. Some of them are how to scale up and ensure that each imprint is the same as another. Researchers working in this field are constantly developing new ways to solve these problems and open doors to novel applications.

Ultrasound Applications for Surface Cleaning In Dairy Industry

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In dairy industry, the use of effective cleaning applications with the efficient technologies are essential for continuous productions. Because in competitive environment, the time allocated for cleaning is desired to be as short as possible by dairy plants due to the need for efficient use of production line capacity. Also, the hygiene of surfaces and equipment in the food industry essentially affects the safety of the products processed. And control of biofilms and milestones is important because of microorganisms can easily adhere to inert surfaces. Currently, microbial safety of the products is ensured by Cleaning In Place (CIP) processes in continuous processing lines. Ultrasonic cleaning is an established technological method for removing micron size contaminants or larger from hard surfaces. The ability of ultrasound to be applied for microbial inactivation is linked with phenomenon called acoustic cavitation. Ultrasound generates sufficient cavitational bubble activity by acoustic cavitation to remove biofilms from metal, glass and plastic surfaces. Assisted ultrasonic treatment processes such as pressure, heat and antimicrobial solutions could drastically enhance cleaning capabilities by increasing the diffusion of antimicrobial solutions in surfaces. Moreover, these technologies are eco-friendly and considerable energy and water saving. This review presents an overview of the ultrasonic cleaning applications to contamination control in food industry.

Hydroxymethyl Furfural Formation in Grape and Pomegranate Juices over Heating Treatments

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Hydroxymethyl furfural (HMF) occurs as an intermediate product by breaking down sugars in acidic media or during the Maillard reaction. The formation of HMF is used as a chemical index to determine the storage time of food products and to determine if the heat treatment is performed properly to the food products such as fruit juices, milk, honey, cereal products and jams. Fruit juices are conducive to the formation of HMF due to its high sugar content. In fruit juice production, heat treatments are applied for inactivation of enzymes, prevent harmful microorganism growth and concentration process. Since high temperature and pH value above 7 accelerates the formation of HMF, the main parameters (temperature and time) in heat treatments should be controlled to limit the formation of HMF.

In this study, it was investigated the formation of hydroxymethyl furfural due to heating process in white grape, red grape juice and pomegranate juices. The fruit juices were heated at 200 °C and HMF occurrence was analyzed over period for different raw materials. Temperature, pH value and Brix˚ values of the samples were also measured. Heating was continued until the Brix˚ of the grape juices reached at 68 and pomegranate was 37.5. The initial HMF content of white grapes, red grapes and pomegranate, juices which are sold in the market were found as 21.44, 26.46 and 27.32 mg/kg, respectively. As a result of heating treatment at 200 °C, the Brix˚ value was reached to 68 and the HMF content of white and red grape juices were increased to 3292.01 in 190 min and 2741.61 mg/kg in 220 minutes, respectively. For the same target Brix˚ value of pomegranate juice was reached to 37.5 at 360. min and the HMF value were found 2867.79 mg/kg. Consequently, the HMF content of white grape, red grape and pomegranate juices was increased 153, 103 and 104 times higher than their initial content by long term heating process under atmospheric conditions. The raw materials composition and time effects were determined.

Keywords: Hydroxymethyl furfural**,** HMF, heat treatment.

Training Materials for Bakery Sector

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Bread could have been one of the first food processed by man and it has been around for thousands of years. It is the only food material that people from every race, culture and religion in the world consumes in common and is one of the most important and economical energy source of the human body. Bakery represents a major component of food production. Bakery sector employees are mostly primary school graduates and young. These young people have difficulty in reaching a limited number of educational materials related to their occupations. Besides, it has been observed that bakery owners do not have enough knowledge on bread production legislation.

"Enhancing YOUTH (18-26) Employability in Bakery Sector" Project which is aimed to increase the knowledge and skills of employees in bakery sector by innovative, smart, free of charge, easy to use, accesible, user friendly training materials, is funded by the Erasmus+ Programme of the European Union in the field of Strategic Partnership for youth, The Project is coordinated by Bursa Buyuksehir Belediyesi, Bursa Ekmek ve Besin Sanayi ve Ticaret A.S in partnership of Central Research Institute of Food and Feed Control, General Directorate of Agricultural Research and Policies, Bursa Directorate of Provincial Agrıculture and Forestry, Center of Food and Fermentation Techniques from Estonia and National Institute of Research and Development for Food Bioresources from Romania. In scope of the Project four handbooks have been developed related the sector in Turkish, English, Romanian and Estonian languages; Best Bread Production, Sensory Assesment, Hygiene and Sanitation, EU and Turkey Legislation. And all prepared training materials have been shared by an e-learning platform and a smart-phone applications.

Date Seed Coffee

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Date is a fruit grown in the date palm and used in human nutrition. A fleshy pericarp and a seed consist 85-90% and 10-15% of the fruit weight, respectively. The palm seed contains nutrients such as protein, carbohydrate, fat and ash in varying proportions. In addition, dietary fiber and polyphenol content of seeds increases the nutritional value of them. The date seed is considered a waste product of many date processing plants. Currently, date seed powder is used as an animal feed for camel, sheep, poultry and cattle. Date pits have been used for centuries in the Arab world to make a caffeine-free drink and marketed as a non-caffeinated coffee. Roasted and powdered date seeds are used by some rural communities as coffee substitutes and coffee-like preparations made from date seeds are available in some Arabian markets in the Kingdom of Saudi Arabia and United Arab Emirates. Intake of coffee is one of the most common trends in world to support our daily activities. People used it frequently as a tonic for staying active and healthy. Drinking coffee is considered as a sign of friendship and socialization. Coffee has some advantages like wakefulness during fatigue restore mental health and drowsiness. On the other hand coffee is a major source of caffeine. Although caffeine is a substance that is used daily it is still an addictive drug. Caffeine is a psychoactive drug that has been associated with negative health outcomes such as raised blood pressure and panic attacks. Investigations have shown that date seed coffee powder contains 0% caffeine. Therefore, date seed coffee can be considered as an alternative product for those who want to enjoy coffee without increasing the caffeine intake level. In this study, it is aimed to give information about date seed coffee.

Gilaburu Fruit

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Viburnum opulus L. fruit, which is known as “Gilaburu”, “Gilabu”, “Gilaboru”, “Gilabba”, “Girabolu” in Turkey and “European cranberrybush”, “Guelder Rose”, “European Highbush Cranberry”, “Rose Elder”, “Whitsun Rose” in the world belongs to Caprifoliaceae family. More than 230 species of the genus Viburnum have been identified. Species belonging to this genus grow in temperate or subtropical regions, especially Asia and North America. Gilaburu is widely grown in Turkistan, Europe, Northwest Africa and Canada. Gilaburu tree can reach 4 m in length. It is also grown as an ornamental plant with its white flowers, bright red berries and leaves turning red in autumn. Gilaburu fruits' colour is greenish first and the fruit ripens to a bright red. The fruit is 0.8-1 cm in diameter and contains only one flat seed. the Size of fruit is like chickpeas and fruit ripens in August-September. About 30-40 of the fruits form a bunch and have a bitter taste. This fruit species is widely grown in Central Anatolia and Black Sea Region in Turkey, particularly in Kayseri and Erzincan. In Central Anatolia region, the traditional drink gilaburu is obtained from gilaburu fruit. The fruit is also used locally for preparing jam, jelly and marmalade. Gilaburu fruits are traditionally used in the treatment of kidney problems and kidney stones. Additionally, it has sedative effects, acts as a vasodilator and an effective antispasmodic that helps to relieve muscle cramps and spasms. In this study, it is aimed to give information about gilaburu fruit.

Innovative Packaging Application in Meat Technology

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Microbial contamination, lipid and protein oxidation in meat products are major risks in food safety and quality. Because of these high risks, different protection and packaging methods are used. In recent years, new methods have been developed by using bio-based materials in packaging, vacuum skin packaging and nano-technological packaging. Due to the environmental pollution caused by plastics, trends in the packages are towards to biodegradable or recyclable properties. Biodegradable or edible nanocomposite films obtained from natural sources such as animal or vegetable proteins, hydrocolloid polysaccharides can provide a sustainable alternative to petrochemical-based plastics. Active package is one of the innovative packaging to extend the product shelf life and/ or create a barrier to the outside of packaging. The use of combined methods of nanocomposite films containing antimicrobial properties in the packaging of meat products is being investigated. Nano-technological improvements in meat packaging are depends on challenges such as public acceptance, legal issues and whether toxic accumulation on food product. Intelligent packaging is a packaging system that can perform the functions of intelligence (such as detection, recording, monitoring, communication and scientific reasoning) to improve the quality of the product, increase the safety, extend the shelf life, inform and warn about possible problems. Although intelligent and active packaging techniques are not widely used, researches are being made on these techniques and there are developments in the use of integrated with other new techniques.

Effect of Formulation on the Glass Transition Temperature of Sugar Confectionery during Storage

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Glass transition temperature (Tg) is a physicochemical parameter, which is a good indicator of food stability and safety during storage as temperature difference between Tg and storage temperature was found to control the rates of biological, physical and chemical changes. Jelly gums are sugar confectionery products having different types in the food market based on formulation and processing. Sensitive interactions between ingredients in the complex sugar confectionery system during production process and storage are not known very clearly. The studies on formulation impacts on Tg of confectionery products during storage are very scarce in the literature. The objective of the study is to determine the effects of glucose syrup:sucrose ratio (1.1 and 1.5), starch content (0%, 1% and 1.5%) and gelatine content (3%, 4.5% and 6%) on Tg during storage of jelly gums. Tg of different formulations were measured by using differential scanning calorimetry (DSC) before and after storage at 18.5±3.5°C and 35±5% RH for 53 weeks. It was observed that Tg increased for all of the formulations after storage and jelly gums with glucose syrup:sucrose ratio of 1.1 had higher and positive Tg values, whereas formulations with glucose syrup:sucrose ratio of 1.5 had lower and negative Tg values both in fresh and aged samples. In the experiments, it was seen that measured Tg values of sugar confectionery samples were much lower than the Tg values of the main ingredients used in the formulations. As the samples having glucose syrup:sucrose ratio of 1.5 had significant differences in Tg values with respect to different starch and gelatine levels, starch and gelatine effects on Tg were investigated for these formulations. It was observed that the trends of aged samples with respect to starch and gelatine levels were different than those of fresh samples, especially at the lowest levels. In the light of the results of this study, measurement of Tg is useful for storage stability of sugar confectionery products.

Keywords: sugar confectionery, glass transition temperature, glucose syrup, sucrose, starch, gelatine

Physicichemical Properties of Starch Gels Prepared in Milk Samples with Different Fat Content

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Starch is an important carbohydrate source that is highly involved in human nutrition and is a natural component found in most plants. It has a very important place in human nutrition and industrial use by separating it from other nutrients by its chemical and physical properties. Starch; wheat, cereal grains, rice, tapioca, potato or corn, and some similar products obtained from some tubers. Starch has many uses. Some of these are milk desserts. There are a number of milk products where the starch is used in their formulations. Pasting of starch is generally effected by the fat in the formulations. For these reasons, it is aimed to increase the quality of the final product by determining the potatoes, corn, tapioca, wheat and rice starch in the milk in different fat ratios.

In this study, potato starch, rice starch, wheat starch, corn starch, tapioca starch, full fat (at least 3% fat), semi-fat (at least 1.5% fat) and fat-free (lower than 0.15% fat) milk samples were used. Pasting properties of potato starch were determined in these three different milk samples by using the Rapid Visco Analyzer (RVA; Model RVA-4, Newport Scientific, Australia). With this method, the maximum viscosity at 95°C, the breakdown viscosity, the final viscosity and the pasting temperature values were determined and the changes due to fat content of milk were investigated.When the RVA graphs of different starch samples were examined, it was observed that the viscosity values of wheat, rice and corn starches were close to each other. The most significant difference seen in potato starch is that the thinning value is higher than the other starches. Another important difference in the evaluation of potato starch is that the viscosity values are higher than the other starch samples. Another starch source was tapioca starch. The viscosity of the tapioca starch samples in the cooling section, which is the final stage of the grinding process, has reached very high values. The color and texture of the starch gels obtained after RVA analysis were also determined to evaluate the effect of milk fat on the gel properties of starch.

Keywords: Starch, Milk, Pasting, Viscosity.

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Physicochemical Properties of Crouton Produced From Full and Par-Baked Bread

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Bread is one of the most important food sources for people. It is good source of protein, carbohydrate, vitamins and some minerals. Bread, which has such an important place in human nutrition, is one of the most wasted food. The economic value of wasted bread is very high. Therefore, the aim of this study is to utilize the surplus bread into crouton which is both delicious and can be stored for a long time. Within this scope, the quality parameters of croutons obtained at different temperatures (170ºC, 185ºC, 200ºC) from half-baked and fully baked stale breads were investigated.

In the first part of the current study, the moisture and color analysis were studied. After that, texture, acrylamide content, peroxide value, p-anisidine value, starch digestibility and sensory analysis will also be examined.

In the first stage of the study, the moisture content was determined as 3.30, 3.28, 2.85% for the croutons prepared from par-baked bread at 170ºC, 185ºC and 200ºC, respectively. These values were obtained as 2.54, 2.39 and 2.32%, respectively for the croutons prepared from fully baked bread. Color analysis of the crouton samples were conducted after grinding and sieving from 212 micrometer laboratory sieve. The instrumental color evaluation of the samples were examined by using the Color Quest XE colorimeter (Hunter Lab., Reston, VA., USA). L, a* and b* values were obtained for the samples. According to color analysis of the croutons obtained from par-baked bread, the L values were determined as 77.50, 75.37 and 69.06, for the samples baked at 170, 185 and 200ºC, respectively. These values were respectively as 3.24, 5.78 and 7.55 for a*, and 21.29, 23.97 and 24.46 for b*. In the case of the croutons prepared from fully baked bread, L values were 74,38, 66.65 and 63.58 for the samples baked at 170, 185 and 200ºC, respectively, whereas, a* values were 4,96, 9.00 and 9.87, and b* values were 23,44, 26.20 and 27.23, respectively.

Keywords: Bread Waste, Color Amount, Moisture Content

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Development of Soft Textured Ready-To-Eat Intermediate Moisture Mango Products by Pasteurization: A Comparative Study with Different Caltuvars

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Mango (Mangifera indica L.), which is one of the well-known tropical fruit, is currently grown in over 80 countries especially in India and Southeast region where an appropriate climate allows its growth. One of the most common and widely used form of processing is drying in the mango production. In this study, three different dried mango varieties (Brooks, Amelie and Kent varieties) which are harvested in different periods in Burkina Faso were processed into ready-to-eat intermediate moisture pasteurized fruit products with the controlled rehydration. The most suitable variety for processing was then determined by characterization of quality parameters of the final products. During processing, different varieties of dried mangoes were rehydrated at 25°C separately for 45 seconds and then packed as 25 grams into the flexible retort pouches. The pouches were pasteurized at 85°C for 10 minutes in the horizontal steam retort. The rehydrated and pasteurized fruits were then compared with their respective dry (unrehydrated) controls for their sensory and physical (water activity, pH, brix, hardness measurement) properties and microbiological qualities (TVC, total yeast and mould).

As a result of the study, the perceived organoleptic properties from sour to sweet taste were Brooks, Amelie and Kent, respectively. The moisture contents of three different varieties were between 21 – 25 % with no significant differences in their textures. On the other hand, the intermediate moisture pasteurized mangoes (moisture content: >25 – 29%) showed a significantly softer texture than the pasteurized fruits having lower moisture content (moisture content: 21-25%) and control dry fruits (8 – 10%). The range of water activity of intermediate moisture pasteurized mangoes (moisture content: >25 – 29%) is 0,82-0,86. No yeast and mould were detected in the pasteurized products, but a TVC of <500 cfu / g was determined for these samples.

Phenolic compounds of *Eremurus spectabilis* Bieb. From Liliaceae family

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"Bioversity for Food and Nutrition" Project funded by Global Environment Facility which aims to increase information about nutritional value of agrobiodiversity, associated traditional knowledge and awareness about the conservation and sustainable use of agrobiodiversity in Brazil, Turkey, Sri Lanka and Kenya. Totally 43 species including wild edibles plants and landraces were selected from Mediterranean, Aegean and Black Sea regions in Turkey to gather information on nutrient content, bioactive compounds and traditional knowledge. Among these species "Foxtail lilly"was selected as target species from the Mediterranean Region for further ethno-botanical and nutritional studies. Eremurus spectabilis Bieb. (Foxtail lily) which is a member of Liliaceae family locally known as 'Çiriş otu, çireş, dağ pırasası, yabani pırasa, güllük, kiriş, sarı çiriş, sarı zambak'. Foxtail lily, has 1 m plant height with 70-200 cm glabrous flower stem and is a perennial herbaceous plant. It grows at 1000- 2750 m in steppe, open scrub, limestone rocks and screes, flow-ering in May-July. It is geographically distributed in the region of South Asia and Central Asia and consumed as vegetable and used in the treatment of various diseases.

In this study phenolic compounds of foxtail lily was determined by liquid chromatography/quadrupole time-of-flight mass spectrometry (LC/QTOF-MS). The chromatographic profiling revealed that high content of D-(+) malic acid, caffeic acid, rutin, isorhamnetin 3-O rutinoside, qurcetin 3-D-xyloside, p-coumaric acid and ferrulic acid in methanolic extracts of foxtail lily samples. The results suggest that E. spectabilis could be a valuable source of phenolics.

Food Allergens and Bioinformatics Methods

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Abstract

Food allergen proteins bind immunoglobulins via their specific active sites called epitopes and cause allergenic reactions. Similar epitope sequences cause cross-reactivity and thus allergenicity can be predicted based on sequence homology. Allergome and AllergenOnline are allergen databases which can predict allergenicity risk of a given protein sequence. In this study, the most common food allergens and epitopes were described; well known peanut allergen protein Ara h isoforms and variants were listed. Furthermore, allergen databases and prediction tools were investigated; as a sample case Arah3 sequence was used to find similar allergens and nut protein Cora9 was identified as a similar allergen. The structure of Cora9 was modeled and epitopes of Arah3 were shown on the three-dimensional protein structure.

Method

Amino acid sequence of Arah3 was accessed from NCBI database. AllergenOnline was used for determination of allergenicity risk and to find other allergens with similar sequences. Protein structure of Arah3 was obtained from PDB (3c3v) and the structure of Cora9 was modeled by Raptor-X. PyMOL graphics was used for protein structure analysis.

Results and conclusion

In this study important bioinformatics tools for allergen search and prediction were presented. Allergen protein source, sequence, structure and function of the allergen proteins can be accessed through databases. These tools allow researchers to predict allergy risk of a novel protein source or product and therefore are gaining importance. Here the sequence of allergen Arah3 was used in database search and Corylus avellana (nut) Cora9 protein was obtained as a similar allergen; verifying the peanut and nut cross reactivity. Furthermore the epitopes of Arah3 were mapped on a structural model of Cora9, providing a visual prediction of allergenicity. These type of structural biology based approaches should also be taken into account in developing new allergen prediction databases.

Characterization of the filamentous fungal flora of Konya mold-ripened tulum cheese

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Konya mold-ripened tulum cheese is famous variety of Turkish mold-ripened cheeses, which is produced by cutting the mature Konya tulum cheese into pieces to let the molds grow on the surface in the cool and humid atmosphere of cellars or caves. In this study, it was aimed to determine the filamentous fungal flora of Konya mold-ripened Tulum cheese by molecular methods. To do this, 26 cheese samples were obtained from various bazaars and markets from Konya. The samples (10 g) were homogenized with 90 ml of 2% sodium citrate buffer and dilutions were prepared in ringer solution. A total of 54 filamentous fungi grown on potato dextrose agar (PDA) were purified by streaking and subjected to DNA isolation. Sequencing of the ITS region of the fungi showed that 53 of the molds isolated were *Penicillium roqueforti* and one of them was *Cladosporium cladosporioides*. Yeasts that grow extensively on PDA were also isolated and identified as *Pichia membranifaciens* (3 isolates), *Candida zeylanoides* (2 isolates), *Debaryomyces hansenii* (1 isolate), *Geotrichum candidum* (1 isolate). The morphology of the *P. roqueforti* isolates were examined using four different media, PDA, YES, malt extract agar (MEA) and oatmeal agar (OA), by three-point inolculations. Morphological analysis resulted in three different morphotypes of *P. roqueforti*. Future studies will include differentiation of morphotypes by molecular means such as rep-PCR (GTG5) and the effect of these morphotypes on cheese flavor. To our knowledge, this is the first study determining the Konya mold-ripened Tulum cheese mycoflora molecularly.

The Presence Of Allergens In Meat Products And A General Look On Current And New Detection Techniques

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The usage of vegetable or animal originated proteins in meat processing industry has been a common practice for economical or technological purposes. The main product type in this context is considered as emulsion type sausages. Decreasing the cost of product and processing low quality meats constitute the economic benefits, while enhancing water binding capacity and textural properties of the products constitute the technological benefits. The primary protein rich vegetables such as soy, pea and legumes are commonly used for this purpose and milk, egg white, whey proteins are the main animal-originated protein sources which have important place in meat processing industry. However, addition of these proteins into the products is not always a conscious action, but also there might be a cross contamination during process and/or the usage of contaminated spice mixtures and other additives may cause meat products to include allergenic proteins. Even quiet low concentrations (ppm level) of these proteins may cause serious allergic reactions and threath the health of sensitive consumers. On the other hand, meat adulteration consitutes another magnitude since different animal proteins such as porcine serum albümin (PSA) has a significant allergic property found in pork meat which is also undesirable due to religious reasons in Islamic countries. There has been a growing need and effort to develop more specific and sensitive detection techniques for allergens in meat products including chromatographic, mass spectrometric and new biosensor technologies in addition to current methods based on ELISA (enzyme linked immunosorbent assay) and PCR (polymerase chain reaction). Therefore, it is aimed to examine the present and new allergen detection techniques in the frame of controlling food safety.

Keywords: Allergens, Detection techniques, Food safety, Meat products

1.Introduction

Food safety as a huge world public health threat has attracted more and more attentions and any hazardous substances, including allergenic materials in food can cause a huge threat to human health and lead to huge economic losses in food industry around the world (Zhang et al., 2019). Those allergens may be derived from animal or vegetable originated foods and meat products may include the allergens from both of these sources. As is known, meat is processed with several production technologies and a wide variety of products are obtained. Cooked emulsified sausages, cooked pieces, dry-cured hams, fermented sausages and canned meats take place in the well known product categories. But sometimes, meat proteins are substituted by non-meat proteins for different reasons (Dolch et al., 2019). For instance, emulsion-type sausages can contain soy, casein, whey and egg white proteins, gelatine, collagen hydrolysates and blood plasma which generally enhance emulsion & water binding properties and emulsion stability. In addition, cooking yield and texture can also be improved while the cost of production is decreased. Nutritional & pro-health properties and lowering energy values by using vegetable or whey preparations are possible too (Montowska et al., 2019). However, it was clearly shown by statistical data in developed countries that up to 20% of people suffer from a type of food sensitivity. Moreover, a consumer protection study for providing an overview of the analysis of meat products from retail shops for the presence of soybean and gluten showed that in 29.6% cases the presence of these allergens was identified in meat products without a declaration on the label (Jankovic et al., 2015), which necessitates systematic controls while control processes also need to be simplified.

2.Allergen Detection Techniques

2.1.PCR & ELISA Based Methods

There have been many kinds of allergen detection techniques that, Enzyme-linked İmmunosorbent assays (ELISAs) and immunochromatographic lateral flow devices are taking place in the most common ones. These methods provide high sensitivity (ppm range), rapid results and ease of use, while there exist important disadvantages to be considered that, processed proteins can not be effectively detected. Especially during thermal processing, proteins are denatured, their conformation is altered, solubility is decreased and

some epitopes are destroyed. Cross-reactivity, processing method and food matrix may also affect the results. PCR (Polymerase Chain Reaction) is also sensitive to thermal processing and the results may be affected by the size of the amplified DNA fragment, since detection is not based on allergenic proteins, but DNA. Hence, negative results do not always mean the absence of allergenic protein. In addition, DNA is not tissue specific; for instance, egg & chicken meat can not be distinguished. Neverthless, a proper sample preparation and DNA extraction can enable very specific and highly sensitive results (Montowska and Fornal, 2018). Thus, Dolch et al. (2019) developed and validated two triplex real time PCR systems for the simultaneous detection of six ceral species (barley, oat, rye, maize, rice, and wheat) in processed meat products which enables to obtain a very low LOD (5 ppm of plant protein), while it should be considered that DNA detectability is negatively influnced by heat treatment. Figure 1 shows the schematic overview of the applied method.

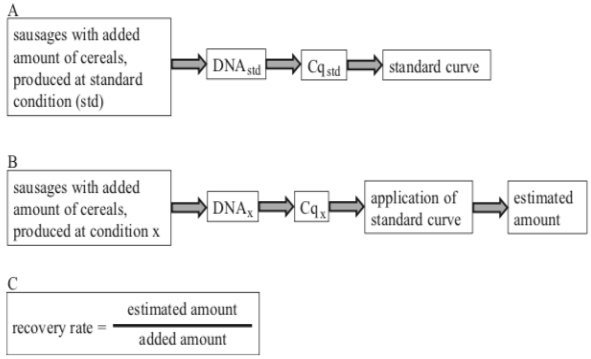

Figure 1: Sausages were produced with known amounts of cereals (0.0005–0.1% plant protein per sausage filling) at different production conditions (standard and x). Afterwards, DNA was isolated and real-time PCR assays were conducted. With the corresponding Cq values either standard curves were generated (A) or the estimated amount was gained by applying the standard curve (B). The recovery rate is the ratio of the estimated amount to the added amount of cereal flour to the sausage (C) (Dolch et al., 2019).

On the other hand, a novel thought has been emerging to construct ELISA based on aptamers which can detect allergens and several other substances such as surfage antigens and food contaminants. A good example of nano-ELISA had succesfully identified glycinin, soy bean allergen by a lateral flow immunoassay design with the Au-NPs labeled antibody with a high sensitivity of 0.69 mg/kg for glycinin detection within 10 min (Wu et al., 2019). There seems to be an increase in number of new researches in this field with a significant progress.

2.2.MS (Mass Spectrometry) Based Methods

It was mentioned in the previous sections that, PCR is only an indirect method and ELISA methods are, in most cases, only applicable for a single allergen-detection. However, MS-based methods have key advantages, such as detection and identification of many proteins in a single run. Proteins and proteotypic peptides of a unique protein can be differentiated simultaneously from complex food matrices, when derived from the same species or tissue, even in highly processed products (Montowska and Fornal, 2018). A group of researchers have developed a sensitive screening method for the simultaneous detection of lupine (*Lupinus angustifolius*), pea (*Pisum sativum*), and soy (*Glycine maxima*) in meat products applying HPLC-MS/MS. 3 to 4 marker peptides for each plant species were measured following protein extraction and tryptic digestion by using emulsion-type sausages which had prevously been produced for this purpose. The limits of detection (LODs) of the method were about 5 mg/kg meat product for pea protein, 4 mg/kg meat product for soy protein, and 2 mg/kg meat product for lupine protein. No false-positive or false-negative results were recorded. It was concluded that the method was applicaple for analyzing commercial meat products with and without added legume proteins (Hoffmann et al., 2017). Experimental workflow of the method is shown on Figure 2.

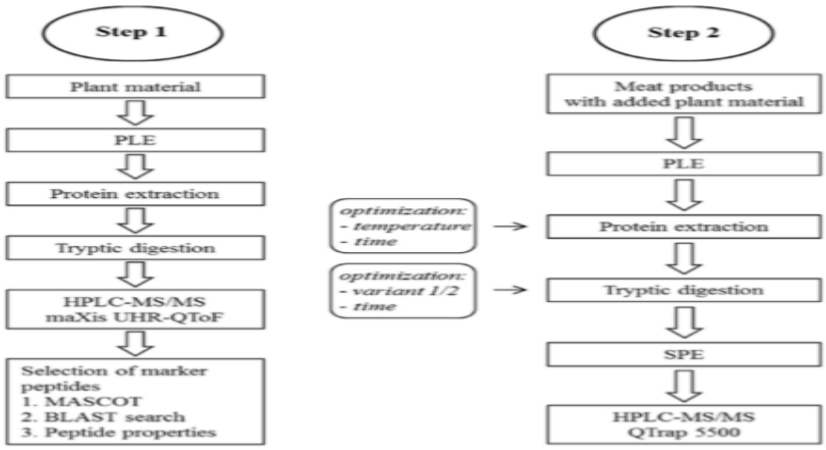

Figure 2. Experimental workflow for the selection of marker peptides for lupine, pea, and soy in legume protein isolates/legume flour (maXis UHR-QToF; step 1) and subsequent optimization of the method for the detection of these peptides in meat products (QTrap 5500; step 2) (Hoffmann et al., 2017).

In another research, which was carried out for the simultaneous detection of barley, maize, oats, rice, rye and wheat proteins in meat products by HPLC-MS/MS, values of LOD were ≤5 or ≤10 mg grain protein/kg meat product for each grain species and no false- positive or -negative results were obtained. Process effects had also been investigated and it was reported that the detectability of the marker peptides only slightly decreased after storage and grilling of sausages, whereas the influence of the canning process was noticeably higher (Jira and Münch, 2019). Thus, MS based methods can conveniently be considered as promising techniques in specific and sensitive detection of allergens in meat products.

2.3.Biosensor Based Methods

Biosensor is briefly defined as a device that can detect physiologic or biochemical changes by incorporating biological and physiochemical components (*Asal et al., 2018) and biosensor technology has recently become more prevalent in any stage of controlling and monitoring food safety. There have been different categories of biosensors, most of which are generally electrochemical biosensors (according to transducion mode) designed for food allergen detection with several advantages such as easy miniaturization, lower cost, and the potential to incorporating additional settings like wireless monitoring. Since a few food allergy biosensors are available for industrial use (but not for individuals), commercially-available biosensors that are both sensitive and accurate are expected to become available for use in the food industry within the next couple of years (Neethirajan et al., 2018). Neverthless, there occur a lot of multi-purpose allergen detection studies with biosensors that, a sensitive detection could be performed by a label free electrochemical immunosensor for porcine serum albumin as a marker for pork adulteration in raw meat. As is known, pork is a potential adulterant due to being cheaper than mutton and beef, not aceptable in Islamic and Jewish laws which is also considered as an allergen causing pork-cat syndrome revealed by a pork allergy study in cross-reactivity work carried out in 1996. Hence, the importance of detecting pork serum albümin (PSA) with a sensitive and reliable way has become more important, and very low limit of detection (LOD) could be achieved as 0,5 pg/ml in buffer solute with a linear range from 0,5 to 500 pg/ml. However, the device was unable to efficiently sense PSA in cooked and/or chemically processed meat products which contain preservatives due to denaturation and/or decomposition of albumins (Lim and Ahmed, 2016). So, this method may be appropriate for mild-processed products and/or minced meat mixtures. Figure 3 shows method performance indicating antibody-antigen reaction time and current change via concentration.

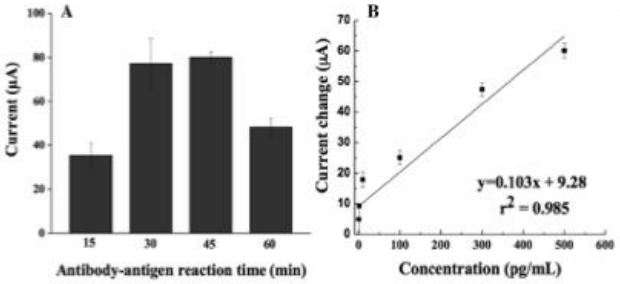

Figure 3. (A) Graph of antigen–antibody reaction response time at room temperature of 100 pg/mL porcine serum albumin based on the difference of the SWV area current. Measurements were taken in 5 mM $Fe(CN)^{3}6/Fe(CN)^{4}6$ in 10 mM PBS solution (pH 7.4). (B) Calibration plot of SWV (square wave voltmetry) area current change of concentration from 0.5 pg/mL to 500 pg/mL. Measurements were taken in 5 mM $Fe(CN)^{3}6/Fe(CN)^{4}6$ in 10 mM PBS solution (pH 7.4) (Lim and Ahmed, 2016).

Biosensors, especially immunosensors which have a working principle on the basis of antigen-antibody interactions are commonly used in many fields such as environmental applications, clinical analysis and diagnostics and food safety (**Asal et al., 2018-2) while several methodological disadvantages such as relatively longer time of analysis, cost and challenges in commercializing seem to be eliminated by progressive studies in this field.

3.CONCLUSION

Meat products sometimes contain non-meat ingredients or additives for several technological, economical, nutritional and other purposes which threath the health of sensitive consumers due to allergenic reactions that may even result in death. Therefore, analysis of allergens can be considered as important as declaration of their presence on the product label. Thus, a wide variety of allergen detection techniques have been improved and they are generally based on chromatographic analysis, PCR, ELISA or biosensor technologies. Each technology has got individual advantages and disadvantages such as possibility of multiple allergen detection by chromatographic techniques while other methods generally allow single allergen detection but require less labor with more sensitive results (lower LOD values, higer recoveries, etc.). However, process needs depending on the product type such as preservative addition and/or heat treatment (cooking, etc.) may affect the results since allergenic proteins are damaged by theese applications and can not be detected while several other methods still give correct results. Hence, future trends may focus on combining all advantages of various methods in one method and minimizing potential disadvantages. So, developing a sensitive, selective, cost-effective, fast & practicle and applicable method for any kind of product whether cooked and/or incorporated with additives, which can also allow multiple detection will be aimed.

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The Effects of Chocolate with Different Rheological Properties on Quality Characteristics of Chocolate Coated Wafer

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Chocolate is a special oil-based product consumed by consumers of all age groups and its consumption is increasing day by day. Chocolate which has many forms such as couverture, flakes, pralines, tablets and chocolate coated products must have different rheological properties in terms of production process for all these products. Chocolate coated wafer products are different from other chocolate products because it gives chance to taste different flavor together to the consumer. The rheological properties of chocolate are important in terms of end product quality properties and coating process. In this study, sunflower lecithin (0-0.8%) was used to modify the rheological properties of chocolate and the physical, chemical and sensory properties of the wafers coated with chocolate samples were examined. Wafer samples produced as standard were coated with tempered chocolates having different lecithin content by immersion method and kept for 10 minutes in a cooling tunnel at 10 ºC. After this process, the coating ratios of the samples were examined firstly and it was observed that there was 16.5% difference between chocolate coated wafer containing 0% lecithin and chocolate coated wafer containing 0.4% lecithin. The chocolate coating ratio decreased as the lecithin ratio increased up to that concentration. When samples including lecithin between 0.5% lecithin and 0.8% , it was observed that as the lecithin ratio increased, the coating ratio increased again and the coating ratio increased to 12.6%. As a result, it was determined that the rheological properties of the chocolate directly changed the coating rates and the sensory properties in terms of sensory properties like average score, appearance, taste, melting of chocolate in the mouth and crunchiness of wafer.

Key Words: Chocolate Coating Wafer, Rheology, Emulsifier

The Effect of Cocoa Masses with Different Geographical Origin on Bitter Chocolate Quality

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Cocoa (*Theobroma cacao)* is an agricultural product that grows mainly in tropical climatic regions such as South America and Ivory Coast. The composition profile of the cocoa bean is the major factor influencing the taste and aroma of the cocoa products, depends on the cocoa variety and geographical origin and directly affects the properties of the dark chocolate.

In this study, the effects of cocoa masses of different geographical origin (Colombia, Venezuela, Madagascar, Ecuador and Tanzania) on the quality of dark chocolate (sensory properties, rheological values, moisture, water activity, pH, total fat values and color (brightness) properties) were investigated. For this aim, five different chocolate samples were subjected to sensory analysis (9 points descriptive analysis). Rheological values of the samples are measured by viscometer and bitter chocolates of Colombian and Equator origin have the highest viscosity, while dark chocolate of Madagascar origin has the lowest viscosity. While the sample with the highest yield stress is dark chocolate of Venezuela and then Equatorial origin, the sample with relatively low yield stress is dark chocolate of Tanzanian origin. According to the results of the analysis, moisture, water activity, total fat values and color (brightness) properties of the chocolates differ statistically depending on the origin of the cocoa beans.

As a result of the study, it is seen that the origin of cocoa bean has a significant effect on the quality of dark chocolate.

Key words: origin chocolate, bitter chocolate

Functional Gummy with Containing Vitamin D and Calcium

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According to the research, the interest and demand for functional foods is increasing Turkey and in the World. Vitamin-mineral complexes, components with high antioxidant content, supplemented foods containing active ingredients such as collagen, omega are the most popular ones. These products are generally in the form of capsules and compressed tablets, which must be taken with water. Recently, supplementary foods in the form of fun gummy, which can be easily consumed by children and adults, have started to take place in the market.

Vitamin D is involved in bone development, prevention of skin diseases, balance of the nervous system and absorption of calcium. Calcium is a valuable compound in terms of bone and dental health, functioning of muscle and nerve tissues, communication between brain and other parts of the body. In the Communique on Supplementary Foods in the Turkish Food Codex recommended is daily intake D vitamin 5 µg, calcium 800 mg.

Gummy product is a type of deposit confectionery produced using sugar, water, maltose syrup, gelatin, aroma, coloring and acidity regulators. With the inclusion of active ingredients in this standard gummy process, a new category of functional gummy products has emerged.

Vitamin D is a fat-soluble vitamin. Calcium is an active substance insoluble in water because it is a mineral. In this study, the most suitable forms of calcium and vitamin D sources were selected for gummy application. Formulation and process optimization were made to reach the targeted calcium-D content in 2 soft candy products.

In this study, 2 gummy candies provide 28% of daily calcium and 180% of vitamin D requirement according to daily reference consumption.

Considerations and Applied Methods of Preserving the Viability of Probiotics during Food Processing and Storage

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Probiotics are defined as living microorganisms that have beneficial effects on the gastro-intestinal microbiota when taken in sufficient amounts. Today, the most common application for the introduction of probiotics into the body is through food.

"Probiotic Food" is defined as the product containing at least 106 CFU / mL probiotic microorganism during its shelf life and preserving it. Probiotic bacteria should maintain their 127iability to have a positive effect on health but, various studies indicate that bacteria lose their viability at certain levels during processing and shelf life.

In this review, information about alternative methods developed for probiotic microorganism preservation during probiotic food processing and storage and studies about the subject are summarized. In the light of the information collected from the methods that can be used to maintain the viability of probiotics can be listed as; selection of suitable microorganism species or strains with probiotic properties, the use of species with synergistic effects in the environment, determination of sufficient amount and percentage of inoculation, avoiding high temperature applications, preferring processes carried out under vacuum, not to be used in low pH foods, application of rapid freezing processes, use of freeze drying, fluidized bed drying, radiant heater drying systems, preferring environments containing glucose and mannose during drying, no use of food additives, use of glucose, minerals, various protein sources (whey), and antioxidants, use of materials with low oxygen and moisture permeability in packaging, prevention of temperature fluctuations during storage and the application of microencapsulation technique that ensures the viability of the microorganism.

Edible Film Production from Low Level Esterification Beet Pulp Pectin and Its Applications in Food Material

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In parallel with the rapid development in the packaging industry, in recent years, in addition to classical packaging techniques which have limited impact due to its barrier property, new packaging materials and technologies that provide additional advantages are also being developed. Edible films and coatings, which are among these technologies, are used in the packaging of foodstuffs which can be consumed together with food in order to prevent loss of quality and also extend its shelf life. This study was carried out to investigate whether or not beet pulp pectin which is a vegetable origin waste may be suitable as an alternative natural, cheap and easy applicability to edible coating materials. Bananas and strawberries selected as materials of the study were coated with immersion and spraying methods by using chitosan, pectin, calcium pectate and modified pectin solutions and the values of weight loss, dry matter, brix, pH, titration acidity and color were periodically monitored. As a results of the quality values obtained from the analysis, the minimum weight loss for the coated banana samples compared to the control sample were found in chitosan which indicates the best film material followed by modified pectin, Ca-pectate and pectin. In aspects of the values of color, in chitosan and Ca-pectate film coatings gave the best results due to the minimum changes observed as compare to the control sample. The best results determined in titratable acidity in comparison to the control samples was seen in modified pectin followed by Ca-pectate whiles the worse results were found in chitosan and pectin. For strawberry values, Ca-pectate gave the best result in terms of weight loss compared to the control samples, while in the evaluation for color, again Ca-pectate gave the best result with minimal change.

Keyword: Edible Film, Pectin, Ca-Pectate, Chitosan, Shelf Life

Using Egg as a Fat Substituent in the Production of Diet Block Type Melting Cheese

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In this study, possibility of decreasing fat content in block type melting cheese by addition of whole egg was investigated to meet the demands arising for dietary foods. Non-fat block type melting cheese was produced by addition of whole chicken egg into the curd prepared from skim-milk instead of fat-substitutes. In order to achieve melting and roping in the cheese, the lean (non-egg) mix and the mix samples incorporated with whole egg at the ratio 5%, 7.5% or 10% were pasteurized at 75 °C in a Stephan type steam jacket melting machine afterthe pH of the curd was adjusted to 5.30. The cheese doughs obtained were put into molds and removed again after one night of conditioning. Following the vacuum packaging of all the cheese samples, they were stored at 4 °C and analyzed for their several physicochemical, textural and sensory properties at 0th, 30th and 60th days. The findings showed that use of whole chicken egg increased total dry matter and titration acidity values of the non-fat block type melting cheeses significantly ($p<0.05$) and caused decrease in their pH levels. The changes in color values (L* and b*) of the samples were not statistically significant ($p>0.05$). Considering the texture analysis results, the cheese sample having the highest hardness score was with the plain melting cheese while the egg usage did not cause any significant decrease ($p>0.05$) in the hardness values of the cheese samples. According to sensory evaluation findings, the samples containing 7.5 % of egg had the highest general acceptability score, and in general, using whole egg positively affected both the appearance and taste of the samples. In conclusion, it was understood that incorporation of7.5 % of whole-chicken egg improved taste and appearance of the product, and it gives a fatty sense and increased eating quality of the cheese.

The Importance Given To Food Safety in Tourism

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In our country, food production is obtained from various sources and prepared in both fresh and processed forms and so takes place in our consumption. If proper food safety conditions are not provided from harvest to consumption, these foods which are included in our daily diet for our consumption, can reach the level that may threaten our health or cause bigger cases. Our country's strategic position and the business volume stemming from the other opportunities it provides are developing very rapidly in some sectors. One of these sectors is tourism and hospitality sector. Tourism and hospitality sector is one of the fastest developing sectors in the world with its business volume and foreign currency-earning feature.

Also food safety is great importance together with the business volume in these sectors. In this respect, the food provided to the customers in touristic facilities must be provided, stored, prepared, cooked and presented without harm to health. The fact that customers know that the food they consume is prepared under hygienic conditions and that they do not pose a risk to health is an important factor in choosing the facility to be accommodated. When wrong practices are performed in food preparation and service operations cause foodborne diseases. Therefore, food safety requires special attention in facilities. In this working, international visitors mass addressing the group of hotel business of food safety perspective and they give importance to the growth strategy of how it affects our operations, examining food safety perspective and approach to the resorts operating in Turkey were evaluated and strategies in this field were analyzed by qualitative research method.

Determination of the bacterial profile during the production process of pastırma

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Pastırma is a traditional dry-cured meat product of Turkey, produced from whole beef or muscles of water buffalo. In this study, it was aimed to determine the microbial profile during the manufacturing process at four different time points, after salination (stage 1), after cold-pressing (stage 2), before çemen coating (stage 3) and the final product (stage 4). In addition to the microbial analyses, water activity and pH were measured for each sample. During the production, pH showed a slight increase from 5,6 to 5,8; while the water activity decreased from 0,92 to 0,86 until stage 3, and then increased to 0,89 after çemen addition. Total mesophilic aerobic bacteria counted on PCA was 4,9-7,2 log kob/g. MRS agar results indicated lactic acid bacteria counts of 4,2-6,8 log kob/g, while M17 counts were between 4,6 and 7,3 log kob/g. Enterobactericeae members were only detected in Stage 1 by VRBD agar. Among the bacteria enumerated, 89 from MRS agar and 80 from M17 agar and 30 Enterobactericeae were purified and subjected to DNA isolation. After grouping by Rep-PCR (GTG5), 16S rDNA sequencing was performed on 62 MRS, 48 M17 and 23 Enterobacteriaceae isolates. Identification of MRS isolates indicated that for all stages, the most dominant species is *Lactobacillus sakei* with a relative abundance of 52%-81% and the second mostly observed species is *Weissella viridescens* with a relative abundance of 17%-30% for the first three stages. Other species identified include *Weissella confusa*, *W. halotolerans*, *W. cibaria*, *W. helenica*, *Lactobacillus curvatus* and *Leuconostoc citreum*. M17 isolates identified harbor *Brochotrix thermospacta* as the most dominant species in stage 1 and *Staphylococcus saprophyticus* as the most predominant one in the following stages. Other species identified by M17 include *Psychrobacter faecalis*, *Bacillus amyloliquefaciens*, *Carnobacterium divergens*, *Staphylococcus equorum*, *Kocuria salsicia*, *L. sakei*, *L. citreum*, and *Weissella jogaejeotgali*. The results give information on the bacterial diversity of pastirma during the manufacturing process.

Development of Pan Release Oil for High Sugar Cake Dough, and Quality & Performance Measurement of These Oils

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Abstract

Pan release oils are used in the industry to help oiling the pans/moulds for high sugar cake dough that are baked at very high temperatures. These oils prevents cakes to stick the molds and keeps the productivity in optimum. Pan realease oils should be non-polimerized, non-carbonized at high oven temperatures during several times usage.

Pan release oils having high oxidative stability are produced using highly refined oils and special additives. In terms of end product quality and performance, the initial quality of the pan release oil is very important. For this reason, in our project, canola oil is selected to develope the pan release oil, and is deodorized under optimized conditions by using RSM technique for superior quality and stability, Then an exprimental design with additives at various kinds and ratios is prepared. So, developed pan release oils having various quality and performance properties are examined using different quality parameters and performance tests.

With RSM technique, deodorization experiment pattern was formed with 4 most efficient factors (time, temperature, vacuum, % direct steam), deodorization experiments were performed according to 30 different conditions and all oil samples were analyzed. Analysis results were evaluated using ANOVA statistical programme; FFA, Rancimat and the ratios of C-18:3cis / C-16:0 values were determined to be significant and a model containing optimum conditions was formed. Developed in high quality and performance pan release oils with high quality and oxidative stability canola oil were deodorized under optimum conditions. Pan release oils were tested and compared using acid value (AV), density, viscosity, peroxide value (PV), free fatty acid (FFA), and the various quality and performance tests. After all results were examined and evaluated, the ones with the best features were identified in our project.

All these studies were carried out in Tübitak Teydeb 1501 project in Besler R&D Center Pilot Plant Facilities and Laboratories.

Introduction

Pan release oils are used at the very high temperatures for multiple times and thus, the oil used, even without the additives, is also an important main item. It must be able to withstand the oxidation, and have hiqh quality and a high shelf-life. Low peroxide and FFA values are preferable since the oils with higher values can give the product an off-odor or off-flavor by increasing its rancidity.

The release agents form an hydrophobic layer inside the mould to make the removal of the cakes from the mould easier. This process reduces the significant amount of product loss which is due to the adhered pieces to the mould. Pan release oils, though, should not transfer into the food, they just adhere on the walls of the mould. While they are doing this, they do not react with the food so that no carbonization or resinification occurs. Because of these properties, the fatty acids in the oil play a big role in terms of tendency to polymerization and oxidative stability. Hydrogenated oils almost find no application to be used in the pan release oils and also, nowadays, the animal fats are avoided as well. As another parameter, it is also crucial to have the oil applied on the inner surface of the mould easily. The release agents must be easy to spray and they should develop only low amounts of fog.

According to these properties needed, one of the most used pan release oils are soybean, sunflower, canola oils, etc. In our project, canola oil was chosen and the RSM had been applied to determine the deodorization conditions of the pan release oils in the most optimized way. The selected factors for this methodology were temperature, pressure, time and direct steam amount. The significant variables were determined by applying ANOVA and they were rancimat, FFA and C-18:3cis/C-16:0 values. They were obtained to give the best

stability conditions. Various additives in different ratios are added into these oils and stability tests in room temperature (20-25°C) and cold environment (5°C) were performed. Then, the the pan release oils that exhibit best quality and stability, were used in cake baking experiments to test the compliance of them.

Materials and Methods

First of all, the pan release oil should have high oxidative stability and low tendency to polymerization. Due to this properties and the availability, canola oil was chosen. The procedures below were applied:

1) Appropriate oil selection (Canola)
2) To make a high oxidative stability pan release oil, optimization of refination (mostly deodorization) conditions by RSM
3) Appropriate ingredient selection, formulation trials
   - Different fatty acid compositions
   - Different type and ratios of ingredients
4) The most suitable formulations obtained by room temperature and cold stability tests
5) Cake cooking performance tests.

Below are the analyses performed and their methods during the project:

- Appearance (Clear/Cloudy): Visual
- Peroxide Value: AOCS Cd 8b-90
- Free Fatty Acid (FFA): AOCS Ca 5a-40
- Fatty Acid Composition: (GC)- AOCS Ce 1-62
- Iodine Value: AOCS Cd 1-25 7.NMR
- Solid Fat Content (SFC): IUPAC 2.150a
- Viscosity: AOCS Metodu Ja 10-87
- Oxidative Stability (Rancimat):
- Cycle Test : Internal Method
- Total Oxidation Amount (Totox)
- Total Polar Material (TPM)
- Stability at Room Temperature (20-25°C)
- Cold Stability Test(4°C)

Results

The suitable oil was selected as canola oil, mostly because it has low tendency to polymerization. By using RSM technique, optimum conditions for refination, mostly deodorization, conditions were obtained and according to them, various trials were performed. During this method, temperature, pressure (vacuum), time and direct steam amount were selected as independent variables and the deodorized oil samples were analyzed by ANOVA statistically and free fatty acid (FFA) value, rancimat value and fatty acid ratio (cis-C18:3/C-16:0) were found significant. The mathematical model for letting FFA be minimized, fatty acid ratio (cis-C18:3/C-16:0) and rancimat values be maximized was obtained.

Figure 1. The samples prepared with different types of waxes and lecithins according to experimental design.

Figure 2. Cake cooking trials using pan release agents.

Figure 3. Spraying of pan release oil onto the pans.

Figure 4. Cake cooking trials using different types of pan release oils.

Figure 5. Cake samples cooked with the developed pan release oil.

By using the oil with the most oxidative stability, the high performance pan release oil that forms a thin layer onto moulds and pans, helps remove the product, are non-polimerizing and non-carbonizing for high sugar cake was developed.

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Synthesis of Neohesperidine Analogies, Investigation of Their Texture and Biochemical Properties

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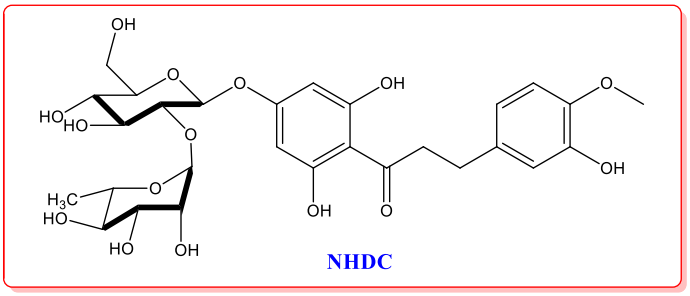
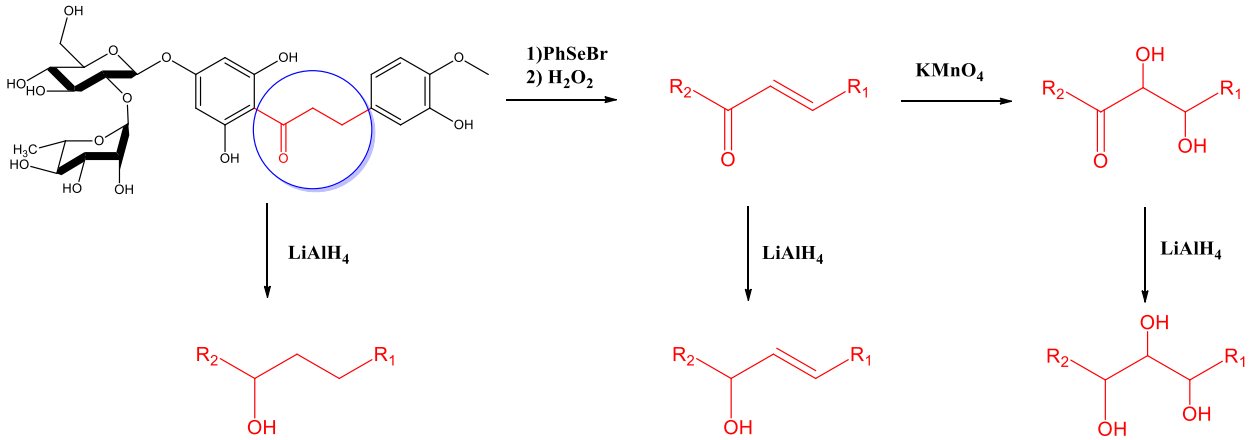
The neohesperidine is a strong bitter flavoured glycoside found in citrus fruits. This flavonoid found in orange, mandarin and lemon, is the most important component of citrus species. By simple hydrogenation reaction, the neohesperidine can be converted to the neohesperidin dihydrochalcone (NHDC) structure which is commonly used as a sweetener. Scientific studies, have shown that flavonoids in citrus have a variety of pharmacological effects, including activities such as anti-inflammation, anti-cancer and cardiovascular protection.



Reactive oxygen species (ROS) play a role in the adipogenic differentiation of human adipose-derived stem cells (hASCs). A low ROS level is important to block or delay adipogenic differentiation of hASCs. Lowering the ROS level is important to block or delay adipogenic differentiation of hASCs. Nuclear factor erythroid 2-related factor 2 (Nrf2); is a transcription factor that mediates various antioxidant enzymes and regulates cellular ROS levels. In 2018, Lee et al. Showed that Neohesperidine dihydrochalcone (NHDC), which is commonly used as a sweetener, has significant free radical scavenging activity.



In this study, oxidation and reduction reactions of neohesperidine dihydrochalcone compound will be carried out to form hydroxyl groups on the molecule. Among the flavonoid analogs formed due to the increased hydroxyl structures on the molecule, will be obtained sweeter and more antioxidant / antimicrobial active derivatives than NHDC structure.

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Use of Carob Powder as Cocoa Alternative in Compound Chocolate Formulation

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Chocolate; is a semi-solid product formed in the continuous fat phase of sugar, cocoa, milk components depending on the formulation. Compound chocolate, cocolin, differs from chocolate due to the vegetable-based oils present in the formulation instead of cocoa butter. Chocolate is a product consumed by people from all ages, in the world. Consumption rate increases every year. Nowadays, discussions about the sustainability of cocoa production have led to an increase in the tendency about finding of cocoa with required quantity. Therefore different alternative substances are investigated. For this aims, in this study, carob powder was substitutued with cocoa powder at different concentrations (100%, %80, %60, %40, %20, %0) and cocolin samples were produced. After production process, to determine the quality characteristics of the obtained products, some analyzes were performed. The hardness values of cocolin samples ranged from 4.41 to 8.23 N, depending on the increase in the rate of carob powder use hardness value also increased. It has been observed that increasing ratio of carob powder causes prolongation of melting time. Particle size showed variability 22.4 μm to 33.4 μm depending on the use of carob powder. Rheological analyses were conducted at 40°C. All samples showed shear thinning behavior. Casson model well described the flow behavior of the samples with R2 values 0.985-0.993 close to unity. Yield stress and plastic viscosity of the samples varied between 0.95-1.80 Pa and 1.08-1.57 Pa.s, respectively. According to the results of sensory analysis, the sample including 60% carob powder and 40% cacao powder had the acceptable scores considering hardness, color, aroma, smell, and general acceptability parameters. This work was funded by the Scientific and Technological Research Council of Turkey (TUBITAK), Project No: 1139B411802256.

Geranium (*Pelargonium graveolens*) Flavored Boza

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Abstract

Fermentation technology is one of the oldest and most economical methods of food production and preservation. Fermented foods are widely produced and consumed worldwide because of their beneficial effects on human health. These effects are known to result from the functional components of the foods in question and their high absorption. Boza, which is obtained from various cereals such as millet, maize, rice, wheat, is a traditional fermented beverage. It has a characteristic sweet-sour taste, light yellow color and acidic-alcoholic odor. Depending on the raw material used in production and the fermentation method applied, the quality characteristics of the boza may also differ from. Boza has an important place among traditional fermented beverages due to its taste, flavor and nutritional value. The aim of this study is offered a different and new flavor to the market which is available as an alternative to boza. In this context, two kinds of boza were obtained by adding the geranium (*Pelargonium graveolens*) plant before and after fermentation. The geranium plant which will be used in the production of geranium flavored boza is supplied as ready from the market. Geranium plant was added to the boza at a rate of 1.33 %. In the literature review, it has been seen that the geranium used in our study has many functional properties such as tranquillizer, removing stomach and intestinal gases and reducing parasites. Sensory evaluation analysis was carried out by comparing the different characteristics of the two types of boza with simple boza. 25 % of the participants who participated in sensory evaluation preferred simple boza, 33 % followed by post-fermentation boza and 42 % followed by pre-fermentation boza. When the sensory properties of the geranium flavored boza were evaluated as a whole, it was seen that the boza sample which was added geranium before fermentation was sensory acceptable.

Keywords: Boza, geranium (*Pelargonium graveolens*), rose geranium, fermented beverage.

1. Introduction

1.1. Purpose

In the production process of geranium (Pelargonium graveolens) flavored boza product, geranium plant was added as well as raw materials of boza unlike existing production process. Being different taste and flavor is one of the new features of the product. Within the scope of this study, two types of boza were obtained as "Boza production by normal production technique by adding geranium to boza raw materials" and "Adding geranium to boza produced by normal production". It is aimed to achieve a different flavour by changing the formulation of the market available boza.

1.2. Boza Definition and Properties

According to Turkish Standards Institution (TS 9778), boza is defined as “A product which is made by adding drinkable water to cereals such as millet, maize, wheat, and rice. The sugar is then added to allow alcohol and lactic acid fermentation. Boza can be classified as sweet or sour boza depending on its acid content” [1].

The most important factors influencing the physicochemical properties of boza are the types and amounts of cereals and cereal products as a raw material used in boza production, fermentation time and temperature. Particularly, extended fermentation time results in higher amounts of total acidity and lower pH [2].

During the fermentation, two different kinds of fermentation happen simultaneous: Alcohol fermentation and lactic acid fermentation [3]. Microorganisms liable for alcohol fermentation in boza are yeasts (*S. cerevisiae*, *S. carlsbergensis*, *C. tropicalis*, *C. pararugosa*, *C. diversa*, *C. boidinii*, *C. lactiscondes*, *C. lambica*, *C. norvegica*, *C. inconspicua*, *Pi. fermentans*, *Pi. norvegensis*, *R. mucilaginosa*, *R. araucariae* and T. *delbrueckii*) and lactic acid bacteria, LAB, (*Lb. confusus*, *Lb. fermentum*, *Lb. plantarum*, *Lb. cryniformis*, *Lb.*

sanfrancisco, Lb. coprophilus, Lb. paracasei subsp. paracasei, Lb. brevis, Lb. acidophilus, Lb. rhamnosus, Leu. mesenteroides, Leu.oenos, Leu. raffinolactis, Lc. lactis, P. pentosaceus or *Weissella (W.) confusa*) [4,5].

With the fermentation process increases the free acidity value in boza, decreases the pH value and the product gains a characteristic flavor be allied to with metabolite products generated by lactic acid bacteria. While the pH value in non-fermented boza is in the range of 4.1-6.7, it decreases to 4.0 or more below by fermentation [6].

According to the Turkish Boza Standard (TS 9778), total dry matter and total sugar (as saccharose) content should be minimum 20 and 10 %, respectively, and ethyl alcohol content should not exceed 2 % by volume in both sour and sweet boza. Total titratable acidity by means of lactic acid should be 0.2-0.5 % in sweet boza and 0.5-1.0 % in sour boza. On the other hand, volatile acidity by means of acetic acid is allowed up to 0.1 % in sweet boza and 0.2 % in sour boza [1].

Within 100 milliliters of boza; 240 kilocalories energy, 57.5 grams carbohydrates, 3.5 grams protein, 0.5 grams fat, 29 milligrams calcium, 1.3 milligrams iron, 97 milligrams phosphorus, 1 milligram zinc, 0.09 milligrams thiamine (vitamins B_1), 0.05 milligrams riboflavin (vitamins B_2), 1.16 milligrams niacin are comprised [7].

Boza is generally consumed in winter. Although there is no formal history, the season of boza as cultural begins in mid-September and ends in mid-May. Due to its rich content of carbohydrates, proteins, vitamins A and E, vitamins B_1 and B_2, phosphorus, zinc, iron and niacin, boza is a good energy source for young people, pregnant women, nursing women, athletes and those who want to gain weight. Boza is a beverage rich in calorie content. For this reason, attention should be paid to the quantity when consuming. Boza, which is known for its effects on diseases which come in the winter season such as flu or cold, also increases the human breast milk. Thanks to the yeast that boza contains, its benefits such probiotic effect, supporting the health of the digestive system, preventing the formation of carcinogenic materials in the body, mind opening and relieving fatigue, calming stress and good for coughing can be seen [8].

The cooling impact of lactic acid enables boza to be consumed in the summer months; in addition to this, the high temperatures during that season result in rapid growth of present microflora, and as a result, in dramatic changes in sensorial attributes. Thus, boza is a suitable beverage for winter [9]. The shelf life of the boza is quite short, up to 15 days. At every stage of the fermentation; boza can be consumed until the pH drops to about 3.5 [10]. Caputo ve ark. [11], the shelf life of the boza when stored at +4 °C is between one or two weeks. One or two weeks later, they stated that the acidity of the product increased and could not be consumed. The shelf life of the boza produced using probiotic starter culture has been reported as 12 days at 4 °C [6,11].

1.3. Geranium (*Pelargonium graveolens*)

Geranium (*Pelargonium graveolens*) belongs to the Geraniaceae family. Geranium is an erect, much-branched bush, that can reach a height of up to 1.3 meters and a sprawl of 1 meters. Round-shaped, green-colored and abundant hairy bodies become woody in time. When the deepl recessed, ornate leaves are crushed, they release other scents such as fruit and mint. Light or dark, pink or white colourful fragrant flowers bloom from summertime to autumn. Geranium species grow in all kinds of soil provided that it is abundant sunny. Pelargonium graveolens, commonly known as rose geranium is one of more than 250 species within the Pelargonium genus and that are endemic to the southern parts of Africa. In Turkey, various pelargonium species are very common in the Aegean and Mediterranean regions as ornamental plants. The known composition of the geranium plant involves bitter substances such as tannin, volatile etheric oils and ceranine. Geranium plant has benefits such as relieving indigestion, facilitating digestion, removing excess gases in the stomach and intestinal and preventing diarrhea. It is objectionable to use in the first 3 months of pregnancy. Therefore, it is suggested that pregnant women should not use geranium flavored boza, but it is suitable for nursing mothers [12].
The volatile oils of black pepper, clove, geranium, nutmeg, oregano and thyme are evaluated for antibacterial activity against 25 different genera of bacteria. These included animal and plant pathogens, food poisoning and deterioration bacteria. The volatile oils exhibited important inhibitory effects against all the organisms under test while their major components demonstrated various degrees of growth inhibition [13].

Geranium (*Pelargonium graveolens*) is used for its antimicrobial activity in the food industry. Geranium is demonstrated potential in many different studies for its abundance of positive benefits. These benefits are found antibacterial, antifungal and antioxidant activity, and others [14].

2. Materials and Methods

Raw cereal materials; rice, maize, millet and wheat, as indicated in Turkish Standard TS 9778, and sugar are achieved from local markets.

Boza is a fermented cereal based beverage; millet, maize, rice, rye, oats and wheat grains such as is grinded and is cooked by adding water. It is then produced by fermenting lactic acid with yeast by adding sugar. The boza has a intense consistency, a light yellow color, a sweet-sour taste and an acidic-alcoholic odor.

The geranium (*Pelargonium graveolens*) plant which will be used in the production of geranium flavored boza is supplied as ready from the market.

2.1. Boza Production Technology

Preparation of Raw Materials: From the raw materials is used in the production of boza selected millet is cleaned of foreign materials, broken into semolina size pieces, and is sifted to remove hull and bran at grading screen.

Boiling: Water is first putted into the an open or steam jacketed stainless steel boiler and boiled. Then, The semolina obtained is added to the drinkable water and mixed continuously to prohibit agglomeration. Millet, maize and wheat can be putted together in the boiling process. Millet, maize and wheat mixture should be putted into the boiler and boiled at the same time. Only bulgur can be used as raw material. After the raw materials is putted into the boiler, they slowly take up water and swelling, intumescency and begin to get viscosity increment (pasting). The boiling boiler is continuously mixed. Boiling water is added again instead of the water lost during boiling. The boiling process takes 2-8 hours.

Cooling: Cooling time changes between 2-12 hours.

Straining: The raw boza that is obtained after boiling the raw material filtered with brass sieves. Liquid that is passed from wood barrel at sieve is called as unsweetened raw boza. Undrained solid part is used for animal feed.

Sugar Addition: According to Turkish Food Regulations, boza should involve a minimum of 15 % of granulated sugar (saccharose). In this way, for an efficient fermentation, up to 20 % sugar is added to raw boza.

Fermentation: The sweetened raw boza is putted into wood barrels. Boza (2-3 %) from a previous batch as yeast should be used as the starting culture. The mixture is left to ferment in wood barrels. Inoculated mixture is incubated at 15-25 °C for approximate 24 hour before it is prepared for use. Two different types of fermentation happen synchronically during boza fermentation. The first; alcohol fermentation that generates carbon dioxide bubbles and increases the volume. The second; lactic acid fermentation that generates lactic acid and gives the acidic character to boza. Due to the increase in volume during fermentation, the wood barrels should not be filled completely. Alcohol fermentation yeasts are *Saccharomyces carlsbergensis*, *Hansen* and *Saccharomyces cerevisiae* yeasts. If alcohol fermentation occurs more than 24 hours, the amount of alcohol increases. Lactic acid fermentation bacteria are *Streptococcus sp.*, *Micrococcus varians migula*, *Lactobacillus sp. bacteria*. The pH value of raw boza is 4.1-6.7 and the pH value of ripe boza is 3.9-4.0.

Dilution: The purpose of the dilution is to bring the indense and viscous boza after fermentation to a consistency which appropriate for the consumer's desire. 20 grams of geranium plant leafs are boiled in 500 milimeters of water. Boiled water is added to the boza obtained by adding the geranium plant leafs after fermentation. Boza is diluted with boiled water added.

Storage: After the fermentation, boza is cooled to refrigerator temperature and should be consumed within 3-5 days.

Within the scope of this project, two kinds of boza are obtained by adding the geranium (*Pelargonium graveolens*) plant before and after fermentation.

In case the geranium plant leafs are added before fermentation; geranium plant leafs are added into the boiler at the boiling process. Essence of geranium plant leafs is provided to pass into the sugarless raw boza. At the end of the boiling process, essence of geranium plant leafs is taken out from the boiling vessel.

In case the geranium plant leafs are added after fermentation; at the end of fermentation the geranium plant leafs are boiled in water. Essence of geranium plant leafs are provided to pass into water. The obtained water from essence of geranium plant leafs are added to the boza. Thus, the acquired intense consistency is provided to be diluted.

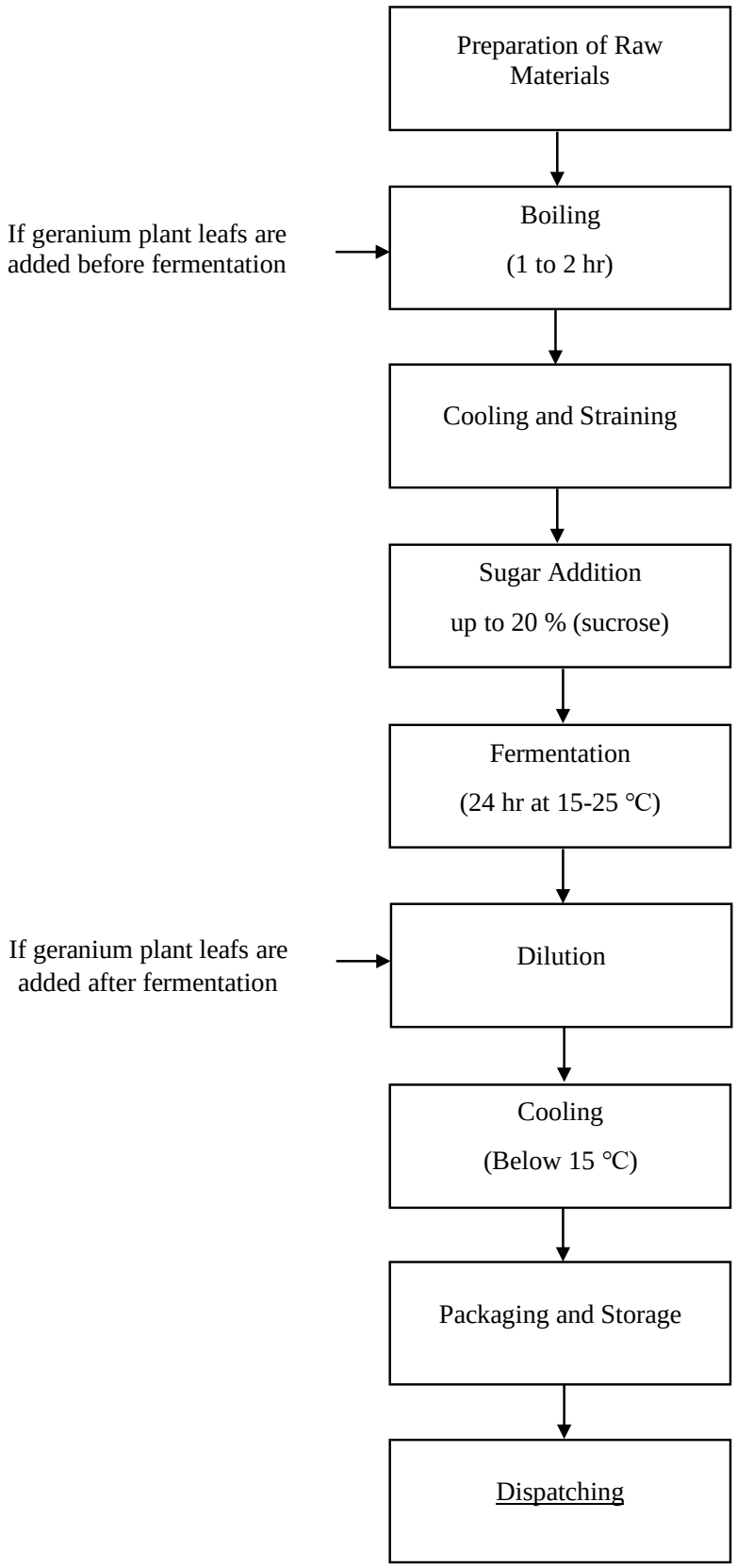

Figure 3. Geranium (*Pelargonium graveolens*) Flavored Boza Production Flow Chart

3. Results and Discussion

Within the scope of this study, two types of boza were obtained as "Boza production by normal production technique by adding geranium (*Pelargonium graveolens*) plant to boza raw materials" and "Adding geranium plant to boza produced by normal production". In addition, the simple boza sample was obtained. The formulation of the geranium flavored boza product was obtained as 16.67 % bulgur, 16.67 % sugar, 3.33 % rice, 1.33 % geranium plant and 62 % water. 25 % of the participants who participated in sensory evaluation preferred simple boza, 33 % followed by post-fermentation boza and 42 % followed by pre-fermentation boza. When the sensory properties of the geranium flavored boza were evaluated as a whole, it was seen that the boza sample which was added geranium before fermentation was sensory acceptable.

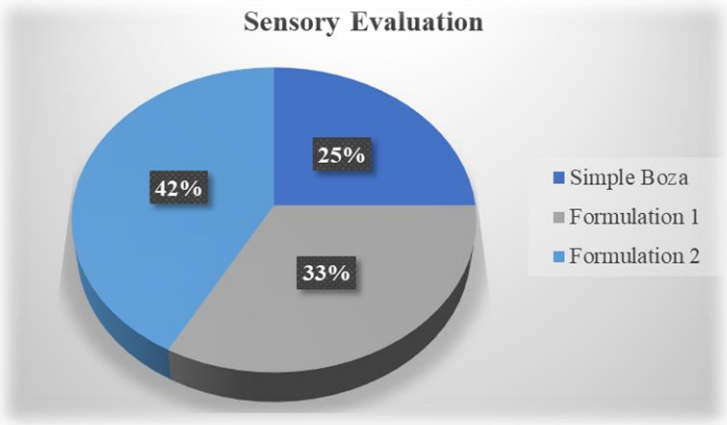

Figure 4. Sensory Evaluation Analysis Result

4. Conclusion

In this study; with the addition of geranium plant into the boza that is a traditional beverage, geranium (*Pelargonium graveolens*) flavored boza aroma that is like in market not lower than standard product quality, showing antimicrobial effect, will benefit human health and has flavor, odor, color, aroma that does not disturb the consumer was obtained.
Within the scope of the project, two different formulations were had a go at by adding the geranium plant to the boza before and after fermentation. As a result of the sensory evaluation analyzes, it were observed that the color, consistency and appearance of the product was similar to the products sold in the market and had a new flavor and aroma.

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Quality Changes in Sous-Vide Cooked Meat

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Meat and meat products are valuable sources and essential for diet because of comprising substantial nutrient components. However, some quality variations take place depending on various cooking parameters such as temperature, time and vacuum application. Sous-vide process is a cooking method that can minimize these variations and for vacuumed products which are placed in a water bath or steam oven at controllable low temperatures and specific long times. Some of the important advantages of this method are increasing the shelf life by eliminating the risk of contamination, reducing aerobic bacteria growth, limiting the formation of oxidized flavor due to lipid oxidation through vacuum application and having positive effects on nutritive value and sensory properties by means of low temperature-long time application. Furthermore, being used in meat and meat products that are sensitive to cold storage, having practical application conditions and facilitating to the production of standard quality product make sous-vide cooking method possible to be used in restaurants, factories, ready-to-eat sectors, schools, hospitals, military services and in the houses. In this review, it is aimed to inform about the effects of sous-vide cooking method on oxidative changes in various meat sources and alteration of texture, color, flavor, juiciness and cooking losses, which are effective in determining the quality of meat. Besides, the effects of sous-vide cooking method on quality parameters, different effects of sous-vide and traditional cooking methods on quality parameters were deeply discussed.

Fishbone as a Source of Food Ingredient and Supplement

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20-50% of the seafood used as human food is considered as edible while remainder is released as waste. Waste products generated during the processing of aquaculture worldwide reach 20 million tons. However, they can not be evaluated appropriately. Fishbone, an important by-product of fish fillet production, is reported to be rich in calcium, phosphorus and other minerals. Fish bone is composed of 51-75% ash, 6-20% fat, 15-31% protein, 20-24% calcium and 10-12% phosphorus. It is stated that by-products of fish processing are potential ingredients for food and supplement with high added value. Moreover, fish bone is used for the production of fish bone powder with a low economic value. Fish bone powder has been shown to be used as raw material in the production of various foods such as biscuits, crisp rice and as edible powder for calcium supplements. Researchers report that the use of fishbone in foods or as supplements can meet the recommended daily allowance of calcium and phosphorus. In order to contribute waste management of fishery industry and achieve environmental sustainability, higher amount of fish bone should be transformed into high value added products. In addition, products used in pharmaceutical and biomedical applications are extracted from fish by-products. Due to high protein, fat and mineral matter content, fish industry by-products have been used frequently in recent years. In particular, the isolation of collagen and gelatin from fish skin, fish bone and fins is an indication that the importance of by-product processing technology increases.

The Usage of Exopolysaccharides in Food Industry

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Exopolysaccharides (EPS) are produced by microorganisms, mainly lactic acid bacteria. Microorganisms synthesized exopolysaccharides out of the cell. Synthesized exopolysaccharides hold on to cell wall are called as capsular exopolysaccharides, if they are free in extracellular environment they are called as mucosa exopolysaccharides. Synthesis of exopolysaccharides takes place at fermentation steps of fermented products, such as yoghurt, cheese, kefir, fermented sucuk, fermented Polyporus umbellatus.

In food industry they are used as gelling agent, emulsifier, stabilizer, thickener, viscosity increasing agent, hydrocolloid of instead of commercial ones. Also, they can used for improve loaf volume, shelf-life, staling rate of gluten free cereal products. While exopolysaccharides enhance technological and textural properties, at the same time they protect bacteria against phage attacks, toxic compounds, osmotic stress and drying. Furthermore, they have positive effect on health because of digestive, anti-tumor, anti-ulcer, cholesterol lowering property and probiotic characteristic. Also, they have generally recognized as safe (GRAS) property, for this reason the use of exopolysaccharides in the food industry has become popular in recent years.

In literature many studies available about enhance quality properties of yoghurt, types of cheeses, butter, cake, gluten free cereal products, tarhana and bread with the usage of exopolysaccharides. The aim of this presentation is giving information about properties of exopolysaccharides and share some of studies about their usage in food industry.

Key words: Exopolysaccharide, food industry, quality properties.

Application of Probiotic in Dairy Products: Potential Health Benefits

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Abstract

Probiotic dairy products are a fast growing area of functional food, as found to be strongly accepted by the consumers. The application of probiotics in dairy products is already common Probiotics show considerable promise for the expansion of the dairy industry, especially in such specific sectors as yogurts, cheeses, beverages, ice creams, and other desserts. However, the dairy industry is seeking to produce different varieties of probiotic dairy products with potential health benefits. The success of new probiotic dairy products depends on the ability of probiotics to provide sufficient numbers of viable cells that beneficially modify the gut microflora of the host. It is highly desirable that the viable counts of probiotics in the final product to be at least 10^6–10^7cfu/ml to offering health benefits to the consumers. Probiotic foods should contain specific probiotic strains and maintain a suitable level of viable cells during the product's shelf life. Therefore, the objective of this study is to review the applications of selected probiotics and their health benefit in dairy products. Most probiotics fall into the group of organisms' known as lactic acid-producing bacteria and are normally consumed in the form of yogurt, fermented milks or other fermented foods.

Introduction

In recent years, the use of food as a vehicle of probiotic microorganisms has been developed in numerous food applications for dairy products, such as yogurts, kefir, cheese, cultured drinks, ice creams and many others. The development of foods with adequate doses of probiotics at the time of consumption is a challenge, because several factors during processing and storage such as pH, temperature, oxygen, presence of antagonistic microorganisms, can affect the viability of probiotic microorganism. In this context, dairy products have good potentiality for deliver probiotic microorganisms into the human intestine; mostly cheeses have a number of advantages over yogurt and fermented milks because they generally have higher pH and buffering capacity, a solid and consistent matrix and relatively higher fat content. Different commercial probiotic cultures must be selected on the basis of growth ability, acidifying activity and resistance to high temperatures. The objective of this study is to review the applications of selected probiotics and their health benefit in dairy products.

Development of Potential Health Benefit of Probiotic Dairy Products

Probiotics are defined as viable microorganisms (bacteria or yeasts) that, when ingested in an appropriate concentration, exert various beneficial effects on the host. Among the known probiotic microorganisms, species of lactic acid bacteria (e.g., *Lactococcus*, *Lactobacillus*, *Streptococcus*, and *Enterococcus*) and *Bifidobacterium* have a long history of safe use (Doron and Snydman, 2015; Prado *et al*., 2015; Soccol *et al*., 2015).

The selection of probiotic microorganisms requires a systematic approach using some characterizations such as stress tolerance, adhesion ability, antipathogenic activity, safety assessment and clinical trials. The strains that present the highest number of functional properties and, concomitantly, without any negative traits, are selected.

Probiotic stress tolerance ability must have acid and bile tolerance or exclusion mechanisms to survive in the gut. pH ranging from 2 to 5 and bile salt concentrations from 0.3 to 2% are considered critical for the selection of probiotic microorganisms (Ogunremi *et al*., 2015; Psani and Kotzekidou, 2006). These resistance properties can be tested by cultivating the strain of interest at a different pH with the presence of enzymes, such as pepsin, lysozyme and amylase, phenol, NaCl, Oxgall, porcine gastric juice, pancreatic, and taurodeoxycholic acid. Resistance to these compounds is measured by the colony count or absorbance at different time intervals (Divya *et al*., 2012; Lin *et al*., 2007; Maragkoudakis *et al*., 2006). The potential probiotic candidates can colonize the GIT epithelial cells through adhesion ability. Adhesion of microbes to epithelial cells is related to both the autoaggregation capacity and hydrophobic properties of the cell surface.

Anti-pathogenic activity happened when probiotic adhered to the gut. Probiotics produce extracellular antimicrobial components through the conversion of carbohydrates, proteins, and other minor compounds into important substances that can kill pathogenic bacteria, such as organic acids, enzymes, hydrogen peroxide, bacteriocins, and low-molecular-mass peptides. Other mechanisms of probiotic antagonism include competition for nutrients, coaggregating with pathogens, and immune system stimulation (Lebeer *et al*., 2008). The risk of infection when introducing live microbes to the diet should be assessed, and the conclusion that "probiotics are safe" must not be fully considered (Culligan *et al*., 2009). Some initiatives by the European community (The European Union Novel Food regulation, QPS, and PROSAFE), United States (FDA and WHO), and Canada (Health Canada: NHPR) have been dedicated to establishing criteria for the safety assessment of probiotics for human use. Common recommendations include records of isolation history, taxonomic identification, and absence of virulence, infectivity, toxicity and transferable antibiotic resistance genes (Sanders *et al*., 2010).

There are different host-associated functional criteria selection for probiotic bacteria such as anti-cancer activity. Several health benefits associated with the consumption of probiotics can be included to select improved strains. Probiotic strains can exert anticarcinogenic effects by multiple mechanisms, including production of compounds with anticarcinogenic activity, the binding and degradation of potential mutagens, the reduction of the activity of enzymes involved in carcinogen formation, the reduction of genotoxic immunosuppressive and nephrotoxic mycotoxins, the inhibition of tumor cell proliferation, and the induction of the apoptosis in cancer cells (Commane *et al*., 2005; Ewaschuk *et al*., 2006; Kumar *et al*., 2013). Probiotic strains can also be screened by the ability to synthesize compounds with direct anticarcinogenic activity, including short-chain fatty acids and conjugated linoleic acid. The other one is anti-cholesterol activity. Recent discoveries have linked probiotics with the prevention of heart disease by lowering the cholesterol serum levels (Ooi and Liong, 2010). Probiotics act to decrease the solubility of cholesterol and, consequently, reduce its uptake from the gut (Nguyen *et al*., 2007). Also anti-depression and anti-anxiety. Probiotic administration has been associated with the reversal of symptoms of depression and anxiety. The first evidence for this hypothesis was postulated by Tannock and Savage (1974), who showed that stressed mice drastically reduce their populations of *Lactobacilli*. Thereafter, several studies have been devoted to elucidate the function of probiotics in brain function (Dinan and Cryan, 2013). Another one is anti-obesity and anti-diabetic activities. Probiotics can suppress body weight gain and insulin resistance by modulating gut flora composition and stimulating the formation of gut hormones, such as glucagon-like peptide-1 and gastric inhibitory polypeptide (Kerry *et al*., 2018; Zhang *et al*., 2016). The extraction of energy from the diet is another convincing strategy (Erejuwa *et al*., 2014). Also immunostimulatory activity. Immunostimulatory effects of probiotic occur by enhancing secretory immunoglobulins, phagocytosis of pathogens and/or cytokine production (Rocha-Ramírez *et al*., 2017; Wold, 2001). Finally, functional molecule secretion. Probiotics have cell components and secrete functional molecules, including antioxidants, enzymes, short-chain fatty acids, peptides, essential vitamins, and minerals, which confer a health benefit on the host. The antioxidant compounds produced by probiotics include superoxide dismutase, glutathione dismutase, ascorbic acid, melatonin, and glutathione. These molecules protect the human body against high levels of oxygen radicals that cause damage to lipids, proteins, and DNA (Schieber and Chandel, 2014).

Industrial requirements and technological properties for the selected probiotic should not have adverse effects on the taste or aroma of the product or increase the acidity over the shelf life (Champagne *et al*., 2005; Goodarzi, 2016; Senaka Ranadheera *et al*., 2012). Additionally, the probiotic must survive food-processing stressors, such as fermentation, harvesting, freeze-drying, and variations in temperature, pH, and oxidative and osmotic stress during storage. Finally, from a safety perspective, it is crucial that probiotic cells are genetically stable to avoid developing pathogenicity or the loss of productivity.

For probiotic effectiveness, populations of 10^6 to 10^8 cfu/g by the time of consumption are required (Minelli and Benini, 2008). The population ratio can be affected by bacteriophages, which infect probiotic cells, thus causing cellular lysis (Garneau and Moineau, 2011; Leroy and De Vuyst, 2004). The selection of bacteriophage-resistant probiotic strains can be performed via classic methods, such as plaque assays or acidification monitoring, or via more sophisticated tools, such as qPCR, biosensors, and flow cytometry (Garneau and Moineau, 2011; Lucchini *et al*., 2000). In addition, some products can show modifications during their shelf lives, such as postacidification, thus resulting in the loss of probiotic viability. The presence of oxygen during some processes and storage can also affect cells' viability (Antunes *et al*., 2005; Pereira *et al*., 2016).

Yogurt, fermented milks (both drinkable and spoonable) and, to a much lesser extent, cheese have long been used as probiotic carrier dairy foods (Granato *et al*., 2010; Özer & Kirmaci, 2011). Yogurt has long been associated with longevity and wellbeing of the people (Aryana & Olson, 2017). Up until now, many efforts have been made to give conventional yogurt additional beneficial properties by adding value added ingredients such as probiotics, prebiotics and various plant extracts (Champagne, da Cruz, & Daga, 2018; Fazilah, *et al*. 2018). Among such value-added fermented products, probiotic yogurt has reached a great market success during the last two decades or more. Although solid texture, high fat content and pH values of cheese offer better protection of probiotic cells against undesirable environmental conditions, probiotic cheese market is far below its market potential (Özer & Kirmaci, 2011).

Whey is no longer a waste of cheese-making but a raw material for high value-added products including probiotic beverages. It contains many nutritional compounds such as soluble milk proteins, minerals and milk sugar, and offers a suitable food matrix for the growth and viability of probiotic microorganisms (Buriti, Freitas, Egito, & dos Santos, 2014; Castro, Cruz, Bisinotto, *et al*., 2013; Pescuma, Hébert, Mozzi, & de Valdez, 2010). Whey can be used in the production of probiotic beverages in various forms. It may be used directly or may be supplemented with dairy based powders or added to beverage formulations at varying ratios. The probiotic buttermilk based beverage contained lower level of diacetyl which is a characteristic feature of the product than the control beverage due possible to the metabolic activity of probiotic strains on the diacetyl. The promoted growth and viability of *B. animalis* subsp. *lactis* in flavored probiotic buttermilk beverage was reported by Antunes *et al*. (2007). Rodas, Angulo, de la Cruz, and Garcia (2002) recommends to add probiotic adjunct culture (i.e. *Lb. reuteri*) to buttermilk prior to fermentation with major starter culture.

Conclusion

International competition within the dairy market and increasing public awareness about the importance of functional food consumption are providing new challenges for innovation in the probiotic sector. Fermented and non-fermented milk-based functional products including probiotics have a well-established market success. Safety assessment of probiotics can greatly be improved using mechanistic omics tools. Safety-related genes, including antibiotic resistance and harmful metabolites production. The use of some bacteria strains with claimed probiotic properties in foods is promising and may increase the food industry's possibilities for developing probiotic products aiming at impacting on consumer's health.

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Factors Affecting Fermentable Sugar Extraction of Household Tea Wastes

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Abstract. An estimated 40000 tonnes of tea waste are generated each year from factories in the Black Sea region. An annual production of 5 billion tons of household tea wastes produced in Turkey. Generating value-added products from the household tea wastes can enhance both economic and environmental benefits for producers and consumers. Tea wastes are a potential source of fermentable sugars such as pentose and hexose sugars. These sugar monomers after recovered by pretreatments can be used as substrates for biotechnological and chemical processes such as bioethanol and enzyme production. This study, thus, aimed to
determine the effect of dilute acid (H_2SO_4) concentration, solid/liquid ratio and pretreatment time on fermentable sugar extraction from household tea waste.

Experimental design was carried out using acid concentration of 1 to 3% (w/v) and solid/liquid ratio 1 to 3% (w/v) for a pretreatment time of 15 to 45 min at 121 o C. The fermentable sugar extraction from household tea waste samples ranged at 1.13-8.01 g/L. The optimal fermentable sugar extraction was estimated at 8.01±0.59 g/L under 3% H_2SO_4 and 3% solid/liquid ratio for 30 min. ANOVA results indicated that solid/liquid ratio and pretreatment time had significant effect on fermentable sugar extraction ($P<0.05$), whereas acid concentration had no significant effect on fermentable sugar extraction ($P>0.05$). For comprehensive understanding of interactions between each factor and for complete optimization further studies are needed to optimize fermentable sugar extraction. Thus, this study showed that dilute acid hydrolysis is a promising pretreatment for household tea wastes.

Keywords: household tea waste, acid pretreatment, fermentable sugar extraction

Investigation of the Effect of Microwave-Vacuum Drying on the Quality Characteristics of Rosehips

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Nowadays, the conventional hot air drying method is still widely used to preserve products that do not have a long shelf life such as fruit and vegetables. However, considering the quality losses of dried end products and long drying times with this method, alternative new drying techniques have now gained importance. Rosehips (*Rosa canina* L.) has a rich nutrient content due to its high antioxidant and phenolic compound content, especially vitamin C. Therefore, in this study, it was aimed to investigate the effect of microwave-vacuum drying technique on drying time and some quality characteristics of rosehips. It is also intended to compare with hot air and freze-dried samples.

Rosehips were dehydrated by using both microwave-vacuum and hot air drying techniques until reaching below 10% moisture content on wet basis. Drying process with microwave-vacuum technique was carried out under three different microwave power (50, 100 and 150 W) and three different system pressure (40, 75 and 110 mbar) parameters. The hot air drying was carried out in a tray dryer at 60 °C. Drying curves of microwave-vacuum dried rosehips were extracted. The dried samples were subjected to physical (moisture content, water activity, color, rehydration rate, microstructure) and chemical (Vitamin C, total phenolic compound content, total antioxidant activity) analyses.

The drying times by microwave-vacuum method were between 75-195 minutes. In all chemical analysis results, the values of hot air dried samples were found to be the lowest. The total phenolic content was higher in all microwave-vacuum dried samples. The amount of vitamin C of the dried rosehips by the microwave-vacuum method was close to the freeze-dried rosehips and higher than the dried rosehips by hot air. Unlike hot air dried sample, microwave-vacuum and freeze-dried samples had similar colors, and redness (a*) values were found to increase compared to the fresh samples. While the microstructures of the microwave-vacuum and freeze-dried sample were observed to be open and porous, the samples dried with hot air were completely closed and had a non-porous structure.

Key words: Rosehips, Drying, Microwave, Vacuum, Hot air, Color, Vitamin C.

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Impact of Surface Type on the Resistance of *Candida albicans, Staphylococcus aureus* and *Listeria monocytogenes* Biofilms to UV-C

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The objective of this study was to evaluate inactivation efficiency of short wave ultraviolet (UV-C) light at 254 nm on *C. albicans*, *S. aureus* and *L. monocytogenes* on stainless steel and polystyrene surfaces. Mid stationary phase of cells were allowed to adhere onto the surfaces (4 h) inside a biosafety cabinet prior to UV-C treatment. Biofilms formed on the surfaces were exposed to UV-C radiation between 0-4 kj/m^2 in an enclosed chamber at room temperature with radiation doses using varying exposure times and the UV-C light intensity of radiation as measured by a portable digital radiometer at the surfaces. Biofilms were irradiated at a distance of 8 cm to obtain specific doses and then survivor populations were enumerated by using swab-vortex method. The UV-C treated surfaces were swabbed twice with two separate sterile cotton tips wet with sterile distilled water. Each swab was dipped into 10 ml peptone water (0.1 %) and vortexed for 1 min. To enumerate the surviving population, the suspension was then subjected to tenfold serial dilution prior to surface plating on TSA and NA plates and incubation at 37C for 24 h. Colonies grown were enumerated and expressed in terms of log CFU/cm^2. Experiments were repeated three times. To determine the inactivation kinetic parameters of the test organisms, the decimal reduction time (D value) of the test organism on each surface was calculated from the inactivation curve. Experimental results demonstrated a log linear inactivation phase on both test surfaces. The results obtained showed the potential of the UV-C treatment as alternative to commonly used surface disinfectant or chemical sanitation protocols.

Keywords: Biofilm, UV-C, inactivation, *C. albicans*, *S. aureus*, *L. monocytogenes*, stainless steel, polystyrene

UV-C Irradiation for Inactivation of Escherichia coli O157:H7, Listeria monocytogenes and Staphylococcus aureus on Strawberries and Redberries

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This study evaluated inactivation efficiency of short wave ultraviolet (UV-C) light at 254 nm on *E. coli* O157:H7, *L. monocytogenes* and *S. aureus* inoculated on the surface of strawberries (*Fragaria* × *ananassa*) and redberries (*Ribes rubrum*). Berries inoculated with each bacteria were exposed to UV-C radiation treatments between 0-4 kj/m^2 in an enclosed chamber at room temperature with radiation doses using varying exposure times and the UV-C light intensity of radiation as measured by a portable digital radiometer at the fruit surface. Fresh strawberries and redberries were purchased from local supermarket the day before each experiment and stored at +4°C until use. 10 g of blueberries (approx. 7-9) or 25 g (approx. 3-4 g) of strawberries were surface spot inoculated with strains of bacteria and then placed in sterile empty petri plates and placed under germicidal UV lamp. Fruits were irradiated at a distance of 8 cm to obtain specific doses. Experiments were repeated three times. After UV-C treatment samples were transferred into a 90 ml of buffered peptone water and then homogenized samples were serially diluted. Each dilution of the samples was surface plated on VRB agar, Agar *Listeria* and *Staph* express count plate for *E. coli*, *L. monocytogenes* and *S. aureus* counts, respectively. Changes in the color of fruit samples depending on the surface density of the UV-C radiation dose were quantified by Hunter (*L**, *a**, *b**) system. Results showed that *E. coli*, *L. monocytogenes* and *S. aureus* counts decreased with increasing UV-C dose and also, the reductions in the number of bacterial species were different due to UV-C treatment. Significant reductions ($p<0.05$) were observed in all three bacterial populations for the range of UV-C doses applied. After UV-C treatment with1.16 kJ/cm^2 (16 s), ≤1.5 log cfu/g reductions of *E. coli*, *L. monocytogenes* and *S. aureus* counts were detected, respectively. No significant ($p>0.05$) differences in total anthocyanins and total phenolics were observed between UV-C treated and untreated berries immediately after treatment.

Buffalo Milk and Products Manufactured From Buffalo Milk

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Milk is a part of essential diet for human nutrition. One of them is buffalo milk that contains higher amount of dry matter, cholesterol, lactose, milk cream than the other types of milk. What makes it special is taste, textural properties, nutritional value and flavor. Due to its remarkable chemical features (compared with other types of milk) it can be processed into drinking milk as well without undergoing significant changes. Consumed alone or mixed with other types of milk, buffalo milk, is available in liquid forms or converted into various items. Its production comes second in milk industry after cow milk. Many goods are made from buffalo milk. These are; yogurt, butter, ice cream, cream, cheese and delight. Mozzarella cheese, which is one of the most famous cheese varieties in Italy, is used in evaluation studies of buffalo milk manufacturing. The fact, that it preserves its characteristics, can be approved by easily distinguishing tests even after processed into yogurt. Undeniably rich consistency and finest sensory attributes lead buffalo yogurt to take its unique place in traditional Anatolia cuisine. Its butter is three times more efficient than the butter produced from cow's milk. Buffalo milk cream can be consumed fresh, or might be used in confectionery products. The outstanding one is Afyon Cream.

This review was prepared by examining literature about buffalo milk composition and other characteristics, products and steps of production, considering the impacts on human health.

Key Words: Buffalo milk, Mozzarella cheese, Afyon Cream, Texture

Donkey Milk as an Alternative Functional Product

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The presence of high levels of polyunsaturated fatty acids, vitamins A, B, C in donkey milk, low cholesterol content and high lysozyme content compared to cattle, horse and breast milk provides to the donkey milk different biological functional properties. It is preferred as an alternative source of nutrition for individuals with cow's milk protein allergy along with their nutritive and functional qualities. At the same time, donkey milk is close to breast milk has shown that it can be a good alternative for babies who cannot consume breast milk. However, it has been reported that protein and fat content are low and also lactose-rich compared to breast milk. The antimicrobial properties of donkey milk allow it to be used as a natural food preservative.

In this review, it has been given information about the functional properties of donkey milk which has attracted great attention recently.

Key Words: Donkey milk, Functional properties, Health effects

Probiotics and Their Areas of Utilization in Milk Industry

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Probiotics are being described as the living microorganisms which effect the host's health positively if they have been consumed sufficiently. In order for probiotic microorganisms to have a positive effect, the product must stay living throughout it's shelf life and it needs to pass to the intestines without being effected by the digestive system. Fermented milk products like kefir, yoghurt or non-fermented milk products which contains same amount of living probiotic microorganisms that artifically added as the aforementioned products; are most popular food products which are being used as the carrier of probiotic bacterial culture. Within the products which are being manufactured bacteria by the milk industry; strains of *Lactobacillu*s and *Bifidobacterium* are being used. Milk and milk products which contain probiotics increase the bio-availability of some vitamins and minerals, balance the serum lipid level and blood pressure and by regulating the intestine motility and permeability; their positive effects have been observed against many disorders like cancer types starting with colon cancer, osteoporoz, coronery heart disease and food alergy. In order to attain these positive effects, the products which contain probiotics must be consumed daily and regularly for continuation of their effect.

This review has been developed for providing information about the probiotic microorganisms and their features, their effect mechanisms, their effects on health, their future and the products that contains probiotics.

Key Words: Probiotic, Microorganism, Probiotic products

Functional Food Products Produced Using Kefir and Kefir Cultures

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As a result of increasing interest in healthy and reliable foods by consumers in today's world, demand for functional foods has increased and new consumption and production habits have occurred. Kefir, one of them, is a fermented dairy product that has been widely used as a source of natural probiotics and has proven to be of great benefit to health in studies.

In this review, kefir and its effects on human health and the properties of kefir are mentioned. Furthermore, information has given about the functional foods which are produced by using kefir and kefir cultures.

Key Words: Functional food, Kefir, Milk and milk products

Rheological Behavior of a New Analogue Cheese Obtained From Peanut

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In this work, we focused on a crosslinked peanut suspension in which starch is added. The mixture is composed of water, lipids, starch, and proteins. The process consists into blending together the different constituents. By changing the shearing time, we adapt the texture of the mixture to reach the properties compatible for the production of a new analogue cheese. Thus, the shearing step duration has been tested between 0 and 10 minutes. We measured the rheological properties by determining the viscosity and by using indentation methods. The physical parameters such as color, dry extract, oil droplet size have been also determined. Finally, the matrix behavior after centrifugation step has been studied to determine the oil retention capacity of the matrix as an indicator of the emulsion's stability. Among the different parameters investigated, a maximum of firmness (0.441 N) appeared when modifying the shear stress duration to 1 minute. This suggests structural changes that are involved in the rheological behavior of this analogue cheese. To get a rheological impact of the shearing time on the peanut-based analogue cheese, we provided evidences that a shear stress superior at 4 minutes tend to destabilize the matrix. This complex matrix could be interpreted like an Interpenetrating Polymer Network (IPN): a retrograded starch network interpenetrated by a crosslinked protein network in which oil droplets have been dispersed.

Ohmic Heating Assisted Extraction of Natural Coloring Matters From Foodstuffs

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Nowadays, studies on novel extraction methods are increasing to eliminate some disadvantages of traditional extraction methods. The novel extraction methods supported by electric current provide advantages such as high extraction efficiency, minimizing solvent consumption, short processing time and high energy efficiency compared to traditional methods. Ohmic heating, which is one of the electrical methods, can be used to assist the extraction process as a heating source due to its high energy efficiency and probable electrical effects increasing the yield of valuable materials. Its other advantages compared to conventional heating also include the more uniform and faster heating and higher conservation of the nutritional value of food products. The ohmic heating applied at low frequency and high voltage gradient causes pore formation on the cell membrane and increases both the heating rate and the permeability due to the electrical effect of ohmic heating, and hence this phenomenon is called electroporation. Furthermore, the extraction method supported by ohmic heating can extract valuable components quickly and efficiently from the food wastes. Thus, it is thought to be beneficial in terms of the efficient utilization of waste foods in sustainable food processing. In this study, electrically assisted extraction mechanism and effective electrical parameters such as voltage gradient, frequency, pulsing, etc. are summarized, its application to get natural coloring matters from food materials are compared with traditional extraction methods, and the future prospects are recommended by reviewing novel studies on this subjects in the open literature.

Acknowlegment: This study is a part of the Master Thesis project conducted in Ege University Graduate School of Natural and Applied Sciences, Turkey.

The Potential of Using Olive Oil Biophenols against to Cancer Stem Cell

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The Mediterranean Diet contains fruits, vegetables, nuts, whole grains, fish and virgin olive oil (VOO) as a key component. It is well established as having a large number of positive health effects. It was accepted that the leading compound in VOO was oleic acid. However, the latter researches were figured out that VOO including high oleic acid percentage and additionally rich in natural phenolics have multifaceted influence on major diseases including cancer, diabetes, cardiovascular diseases, neurodegenerative disease, and metabolic disorders. Moreover, recent developments and medical studies proved that oleocanthal and oleacein, characteristic bioactive biophenol-secoiridoids in VOO, success in the anti-inflammatory and in the antioxidant properties, respectively. Chronic inflammation is the underlying cause of many of today's diseases such as Alzheimer's, Parkinson's, Type II Diabetes, rheumatoid arthritis. Oleocanthal helps reduce inflammation in the body. On the other hand oleocanthal kills cancer cells (CCs). Researchers found that the cells of all cancer forms got wiped out within 30-60 minutes due to oleocanthal's ability on destroying the CCs' waste centres. Another study's results showed that VOO with a high oleocanthal and oleacein content (700mg/kg) resulted in a decrease in cancerous white blood cells and an increase in the death of CCs in nine of ten patients. A new study suggests that HT may be useful as an alternative therapy for the limitation of breast cancer preventing the reappearance of tumour metastasis. The findings of that research showed that HT reduces breast cancer cells both in number and aggressiveness, and inhibits CCs multiplying.

Hippocrates has been referred that early harvests VOOs have the best medicinal quality. There are many researches and growing evidence about the many health benefits of adding high phenol EVOO in our daily diet. For best effect, high biophenol source should be taken daily (morning and evening) and on an empty stomach if you have not any disorder of nutrition.

Keywords: cancer stem cell, breast cancer, leukemia, early harvest virgin olive oil, oleocanthal, oleacein

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Drying of Quince Puree with Maltodextrin by Different Drying Methods: Some Physical Properties

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Abstract: Quince (*Cydonia oblonga* Miller) is considered as a rich source of antioxidants and phenolic compounds, dietary fibers, and pectin and it is mostly used in a processed form as jam, marmalade or in bakery product. This study aims to determine the effect of the addition of maltodextrin (MD) to quince puree for two different drying methods (hot air drying and freeze drying) to observe the drying behaviors and some physical properties of the obtained quince puree powders. Quince puree was obtained by a home type blender and 10% (w/w) of MD was added to the puree. As a result of preliminary studies, it was found that drying of quince puree was possible when MD was added in an amount of 10%. Samples of 5 mm thickness were frozen overnight at -24°C. Hot air drying (at air temperature of 70°C and air velocities of 0.5, 1 and 1.5 m/s for 340, 300 and 200 minutes, respectively) and freeze drying (at an absolute pressure of 13.33 Pa and at a condenser temperature of -48°C for 540 minutes) were performed. Some physical properties of the dried powders such as moisture content, water activity, total color change (ΔE), and hygroscopicity were determined.

Depending on the results, the moisture content of quince powders varies between 2.11% and 5.77% in hot air drying method and 7.71% in freeze drying method. The water activity values of quince powders obtained by hot air drying method increase from 0.369 to 0.407 depending on air velocities while the water activity value of freeze drying method was found to be 0.303. The total color change was calculated as 12.41 on average for hot air drying and 18.39 for freeze drying method. Hygroscopicity values of quince powders obtained by hot air drying method were between 14.84% to 15.87% and 18.83% for freeze drying method. As a result, the effects of different drying conditions on quince puree powders were observed and freeze drying was determined as the more effective drying method.

Keywords: quince, hot air drying, freeze drying, powder properties

Drying of quince puree with maltodextrin by different drying methods: some physical properties

1.Introduction

Quince has been consumed for a long time and is a delicious fruit. Its homeland, Iran, passes through the northern part of the Caucasus, the Caspian Sea and northern Anatolia. Due to the ecological suitability of quince can be grown in almost every region in Turkey (Kaya et al. 2007; Şirikçi and Gül 2017). The world quince production of approximately 340000 tons was expressed by Wojdyło et al. (2014) and as the largest producing countries are listed as Turkey, China, Iran and Morocco.

Quince (*Cydonia oblonga* Miller) is a multi-seeded (5-20) soft-core fruit of the *Rosaceae* family. Fruits are large (10-12 cm in diameter), variable in size and have an asymmetrical structure. Quince emits a characteristic fragrance (Silva et al. 2008). The bitter and acrid taste is due to the high amount of tannin content of the quince. This feature has a negative effect in terms of fresh consumption. While it is not preferred in other countries, it is preferred in our country (Şahin and Mısırlı 2016).

Drying is one of the processes that ensure the preservation of the nutritional properties as much as possible and increase the consumable time in the period until the time of consumption of fruits and vegetables (Özgen 2014). The drying was first started with sun drying, but industrial drying methods such as hot air drying and freeze drying have been developed due to long processing times and the use of standard products. In hot air dryers, samples are placed on the platform with trays which will remain in a fixed position during drying. The hot air required for the process enters the side walls of the cabinet and passes through the trays (Cemeroğlu, 2004). In the freeze drying process, the texture and shape of the product is less damaged than other drying methods by removing the water in the product structure with the help of vacuum in the solid phase. In this way, losses of valuable components such as minerals, vitamins and aromas in the structure of the product are minimized (George and Datta 2002; Ratti 2001).

This study aims to determine the drying behavior of quince puree in hot air drying and freeze drying processes and to observe the effects of these drying methods on quince powders. In addition, the physical and powder properties of the quince puree powders obtained were determined.

2.Materials and Methods

2.1. Material

The fresh quince fruits used in the study were obtained from a local convenience store in Izmir, Turkey. Maltodextrin (MD) with Dextrose Equivalence (DE) value of 17-19.9 (Kimbiotek Kimyevi Maddeler Sanayi ve Ticaret A.Ş., Turkey) was used as a drying aid by directly adding to the puree.

2.2. Methods

2.2.1 Preparation of Quince Puree

The fresh quince fruits were washed, peeled and seeds were removed. The puree as prepared by a home type blender (Tefal Smart, MB450141, Turkey). Maltodextrin was added to the quince puree in a ratio of 10% (weight: weight) and mixed with a home type blender for 1 minute to ensure homogeneity. The quince puree was transferred to a glass tray with a depth of 5 mm to be plate-shaped and stored in the freezer (-24 ° C) until drying (see Figure 1).

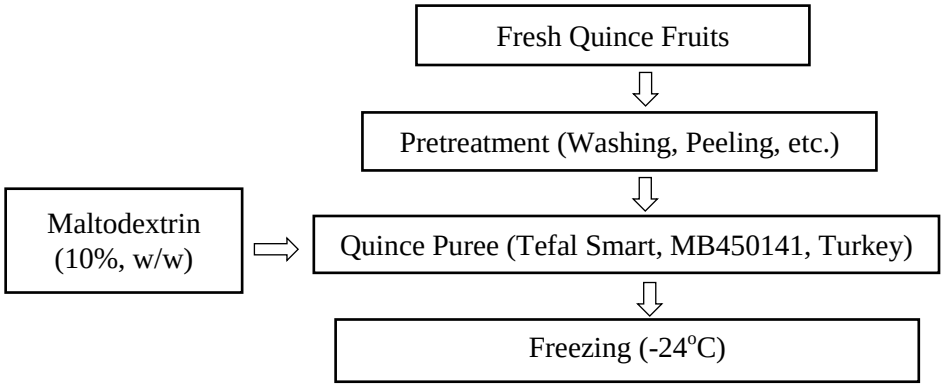

Fig. 1 Preparation of quince puree samples for drying

2.2.2 Hot Air Drying

Experiments were performed in a pilot-scale hot air dryer (see Figure 2a) at air temperature of 70°C and air velocities of 0.5, 1 and 1.5 m/s (Armfield Lim., Ringwood, Hampshire, UK). The obtained powders were stored in desiccator at room temperature in ALPE (aluminum polyethylene) packaging material.

2.2.3 Freeze Drying

Experiments were performed in a pilot-scale freeze dryer (see Figure 2b) at an absolute pressure of 13.33 Pa and at a condenser temperature of -48°C (Armfield, FT 33 Vacuum Freeze Drier, UK). The obtained powders were stored in desiccator at room temperature in ALPE (aluminum polyethylene) packaging material.

Fig. 2 Pilot-scale hot air dryer (a), pilot-scale freeze dryer (b)

2.2.4 Analysis applied to quince puree and powders

The moisture content of the quince puree and obtained quince powders were carried out by gravimetric method in an oven at 105 °C for 4 hours and were calculated with Equation 1. The water activity values of quince powders were determined using a water activity measuring device with a sensitivity of ± 0.001 (Testo AG 400, Germany). The color values of quince puree and powders were measured using a color meter (Konica Minolta Chroma Meter CR-400, Japan). In the sample; L* (brightness), a* (+ red, - green), b* (+ yellow, - blue) color values were measured. In addition, Total Color Change (ΔE), Chroma (C*), and Browning Index (BI) values were calculated using the following equations (Equations 2-5) (Demirhan and Özbek 2011). The hygroscopicity values were determined according to Cai and Corke 2000.

$$Moisture\ (\%) = \frac{(W_1 - W_2)}{W_1} * 100 \qquad (1)$$

W_1: Weight of sample before oven (g)

W_2: Weight of sample after treatment (g)

$$\Delta E = \sqrt{\Delta L^{*2} + \Delta a^{*2} + \Delta b^{*2}} \qquad (2)$$

$$Chroma = (a^{*2} + b^{*2})^{1/2} \qquad (3)$$

$$BI = \frac{[100(x - 0.31)]}{0.17} \qquad (4)$$

$$x = \frac{(a^* + 1.75L^*)}{(5.645L^* + a^* - 3.01b^*)} \qquad (5)$$

1.Results and Discussions

The data obtained during the drying operations are presented in Figure 3 where, the drying curves of the hot air drying (HAD) and freeze drying (FD) methods with time versus moisture content are given. The drying properties of the quince puree samples during drying were determined from the mass loss of the samples at the known initial moisture content (75.12 ± 0.68, wet basis). As expected in hot air drying, high amounts of moisture were removed in the first parts of curves. Due to the higher moisture diffusion, the drying stages and subsequent dehumidification gradually decreased. In a study conducted by Türkoğlu et al. (2018), it was observed that there were similar results regarding hot air drying. As expected, the drying time of the samples decreased with increasing drying air velocity. In freeze drying, the decreasing speed region appears to be twice.

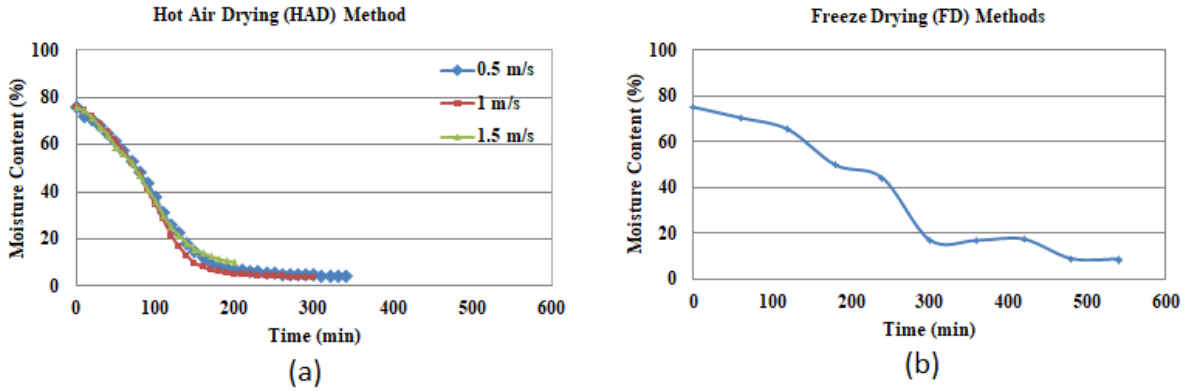

Fig. 3 The moisture content % versus time data for hot air drying (a) and freeze drying (b) methods

The total drying times of samples measured when constant weight was observed, moisture content of dried quince puree powders and water activity values are given in Table 1.

Table 1. The drying time, moisture content, and water activity values of the quince powders

Samples	Drying Time (min)	Moisture Content (%)	Water Activity
HAD 0.5 m/s	340	4.84±0.11	0.369±0.00
HAD 1 m/s	300	2.11±0.05	0.374±0.00
HAD 1.5 m/s	200	5.77±0.09	0.407±0.00
FD	540	7.71±0.34	0.303±0.07

It is seen in the Table 1 that the drying time decreased due to the increase in air speed in the hot air drying method and the sample dries in 9 hours in the freeze drying method. The moisture content of quince powders varies between 2.11% and 5.77% in hot air drying method. The moisture content value in freeze drying method is 7.71%. Dry foods (with 0.20-0.40 water activity) have been considered stable for browning, microbial growth and enzymatic reactions (Marques et al. 2007). According to Table 1, the water activity (aw) values of the powders are very close or slightly higher than the upper limit.

The results of the color measurement analysis for fresh and dried quince puree samples are shown in Table 2.

Table 2. Effect of dryer methods on fruit and powder color

Samples	**L***	**a***	**b***	**ΔE**	**C***	**x**	**BI**
Fresh fruit	56.54±0.94	3.35±0.17	23.73±0.32	-	23.97±0.33	0.41±0.00	56.67±2.10
HAD 0.5 m/s	49.72±0.02	13.45±0.03	26.26±0.02	12.47±0.68	29.51±0.02	0.47±0.00	91.34±0.06
HAD 1 m/s	50.43±0.07	13.19±0.02	26.98±0.03	12.06±0.67	30.03±0.04	0.47±0.00	92.00±0.03
HAD 1.5 m/s	51.60±0.09	14.09±0.05	28.25±0.05	12.69±0.57	31.57±0.06	0.47±0.00	95.20±0.05
FD	74.48±0.69	7.06±0.23	22.33±0.14	18.39±1.44	23.42±0.20	0.38±0.00	41.48±0.90

The brightness values (L *) of the samples ranged from 49.72 to 74.48, while the minimum brightness value was found in the samples dried in a hot air dryer with an air velocity of 0.5 m/s. This difference is thought to occur by Maillard reactions in quince puree under the influence of hot air. Similar to literature (Orak et al. 2012), when the brightness value of hot air freeze-dried samples is compared, it is seen that freeze-dried samples are higher in brightness value compared to hot air dried samples and even the fresh sample. In freeze dried samples, the increase in brightness (L*) led to an increase in the total color change (ΔE). In the samples dried in tray dryer; although the redness (+a*) and yellowness (+b*) values were higher than the fresh samples, the total color change was lower than the freeze-dried samples. It is thought that browning (Çakmak et al. 2016) which occurs due to Maillard reactions on the surface of quince puree by the effect of hot air leads to decrease of brightness value and increase of redness value in hot air dryer. The browning index (BI) represents the purity of the brown color and is considered an important parameter for browning, particularly in conventional drying (Çalışkan and Dirim, 2017). The browning index values were given in Table 2 that hot air drying leads to more brown compounds as expected. The chroma value observes the degree of saturation of color and is proportional the strength of the color (Türkoğlu et al. 2018). As shown in Table 2, the browning index (BI) and Chroma (C*) values are the lowest freeze-dried samples. Que et al. (2008) reported that freeze drying significantly reduced browning.

Unbound water is present mainly in the cavities in the solid, and bound water containing agents are known as hygroscopic agents. Whether the powder products are hygroscopic or not varies depending on the structural properties (organic acid in the structure, moisture content of the product, etc.) of the product (Denge 2011; Dirim and Talih 2018). Hygroscopicity values of quince powders obtained by drying in hot air decreases with increasing air velocity 15.87, 15.05, and 14.84%, respectively. The hygroscopicity value for the freeze drying method was calculated to be 18.83%.

1.Conclusion

In this study, some physical properties of quince powders dried by hot air and freeze drying methods were determined. It was observed that the moisture content decreased from 80% to 2.11-5.77% in hot air drying method and it decreased to 7.71% in freeze drying method. Although the freeze drying takes longer drying times, as expected with this method the color values are better indicating their preservation. As a result of the color measurement, a decrease in L* value was observed as the air velocity decreased in hot air drying. The total color change (ΔE) value was the highest in the freeze dried samples, while the browning index (BI) value was the lowest. This shows us that freeze drying is the best method for color protection. The higher hygroscopicity values were generally obtained from the samples which have higher moisture contents.

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Determination of Chemical, Biochemical, Microbiological, Color and Sensorial Characteristics of Tulum Cheeses Sold in Bolu Markets

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Abstract

This study was aimed to determine some important properties of Tulum cheese samples obtained from Bolu retail markets. Totally 10 Tulum cheese samples coming from different regions to the markets were collected and analyzed for chemical, biochemical, microbiological, color and sensorial properties. It was found that dry matter content of the samples ranged between 47.93-63.64 %, fat content between 1.00-36.00 %, salt amount between 2.63-9.73 %, acidity as lactic acid (%) between 0.56 - 1.34 and pH between 4.62 – 6.32. The ripening parameters as water soluble nitrogen (WSN), thrichloroacetic acid soluble nitrogen (TCA-SN) and phosphotungstic acid soluble nitrogen (PTA-SN) were found between 0.090 – 1.332, 0.021 – 0.400 and 0.000 – 0.151, respectively. Lipolysis as acid degree value (ADV) was obtained between 0.875 and 5.950 %. The counts of total aerobic mesophilic microorganisms, coliforms and yeasts and molds were found between 5.53-10.46, 0.00-7.80 and 5.13-7.88 log cfu/g, respectively. Color value L* of the samples ranged between 77.68 - 91.56, a* values between -6.88- (-) 1.91 and b* values between 14.27-35.36. According to sensory analysis, the appearance of some samples was found whiter while some were more yellow. Only some cheese samples had original skin smell and Tulum cheese taste while the others not. In addition, the color and sensory analyses revealed some doubts that there were imitated Tulum cheeses in the retail markets and unfortunately they have been still sold under name of Tulum cheese. Advanced studies should be done to determine imitated cheese availability in the markets.

Introduction

In Turkey, we have over 190 kinds of cheeses (Akpınar et al., 2016). Among these cheeses, Tulum cheese production has been coming in third order after Kashar and White cheeses (Adıgüzel et al., 2009). The cheese is called together with the name of Tulum and additionally takes the names of provinces or regions in Turkey like 'Erzincan Tulum cheese' and consumed in all over the country. Erzincan, Afyon, Divle, Ilgaz, Kargı are some of the regions (Hayaloğlu et al., 2007). The name of Tulum cheese is originated from "Tulum" meaning animal skin which are usually goat or sheep skin (Akpınar et al., 2016). The main characteristics of Tulum cheese are in color of white or cream, semi hard, disperse in mouth easily, with sharp and buttery taste and being crumpled (Hayaloğlu et al., 2007). Sheep, goat and cow milk are used in making Tulum cheese. In traditional production, after coagulation of milk with rennet, the curd is cut and the whey is removed. The rest of curd is then pressed. After pressing, the curd is broken into small pieces (in size of hazelnut) and dry salted. Then, the salted curd is filled firmly into the skin so that no air remains inside. After that the skins (Tulums) with cheese are ripened in caves in many regions or in cold rooms in Turkey and ready to consume in 3 or 6 months.

Different raw material as milk, production methods, packaging materials and ripening conditions make the cheese different from each other. However, with traditional production still the characteristics of the cheese are distinctive (Sert and Akın, 2008; Demirtaş and Coşkun, 2018).

Kurt et al. (1991) analyzed Tulum cheeses obtained from the region Şavak in Erzican and reported that the cheeses had average dry matter as 53.21 %, fat as 28.20 %, protein as 18.51 %, salt as 3.44 % and acidity as 1.83 %. Dığrak et al. (1994) described microbiological properties of Şavak tulum cheeses and reported that the counts of coliforms between 240 and ≥2400, total microorganisms as $1.8x10^9$ cfu/g, *Staphylococcus aureus* as $3.5x10^4$ cfu/g, yeasts and molds as $3.6x10^6$ cfu/g. Tulum cheeses produced in Divle of Karaman province is one of popular among the others and these cheeses are ripened in underground caves. Morul and İşleyici (2012) reported contents of dry matter, protein, fat, salt, acidity and pH between 56.27 %, 25.90 %, 23.46 %, 3.99 %, 1.074 % and 5.42 respectively for Divle Tulum cheeses. They also studied microbiological properties of Divle tulum cheeses and found that total bacteria as 6.78 cfu/g, coliforms as 3.04 cfu/g, *S. aureus* as 5.04 cfu/g, yeasts and molds as 6.36 cfu/g. Koçak et al. (2005) analyzed Tulum cheese samples collected from Ankara markets and reported the values of water soluble nitrogen (WSN), thrichloroacetic acid soluble nitrogen (TCA-SN) and phosphotungstic acid soluble nitrogen (PTA-SN) as average 0.598 %, 0.444 % and 0.239 %, respectively.

As seen from the studies above, properties of Tulum cheeses vary. However, nowadays some Tulum cheeses with more varying properties have been sold in markets. Actually they differ from each other in terms of price, color, texture and taste. This study was aimed to determine some chemical, biochemical, microbiological, color and sensory properties of the cheeses sold under name of Tulum cheese in Bolu markets.

Materials And Methods

Tulum cheese samples were purchased from different markets in Bolu in 2018. The samples were brought to the laboratories of Food Engineering Department of Bolu Abant İzzet Baysal University in an icebox and analyzed. Samples were coded from 1 through 10 and totally 10 samples were analyzed during study.

The contents of dry matter, fat, salt, acidity and pH of the samples were analyzed according to the methods given by Kurt et al. (1996). Water soluble nitrogen (WSN), thrichloroacetic acid soluble nitrogen (TCA-SN) and phosphotungstic acid soluble nitrogen (PTA-SN) amounts were determined as described by Butikofer et al. (1993) and the nitrogen amounts of the extracts was determined with Kjeldahl method (Kurt et al., 1996). Acid degree value (ADV) as lipolysis was analyzed with the method of Salji and Kroger (1981) and Case et al. (1985).

Total bacteria were counted on Plant Count AGAR (PCA) (Messer et al., 1985), coliforms were counted on Violed Red Bile Agar (VRBA) and yeasts and molds were enumerated on Potato Dextrose Agar (PDA) (Frank et al., 1985). The color of the samples as values CIE L*, a* and b* were measured with a color meter (Konica Minolta CR400, Japonya). Sensory analyses were done according to Metin (1977).

Results And Discussion

Chemical, biochemical, microbiological and color properties of Tulum cheese samples obtained from Bolu retail markets are presented in Table 1. As seen from the table, the highest dry matter content was obtained from the sample 3 while the lowest one was obtained from the sample 4. Average value of dry matter was close to the value reported by Morul and İşleyici (2012). The lowest fat value was found from the sample 9 as 1 % while the highest value from the sample 5 as 36 %. As seen, the range in amount of fat was so wide. Amount of salt of all samples ranged between 2.63-9.73 %. Mean value of salt was higher than those given by Kurt et al. (1991). Filtration process in analyzing of salt content took long time in samples 3 and 8, which were from the same region. In addition, these samples were more yellow than the others and they were sticky. Sample 3 had the lowest acidity value among the others. On the other hand, pH value of the sample 10 was the highest and it followed by sample 3 and the values were quite high for the cheeses.

In the study, WSN, TCA-SN and PTA-SN values were measured to get information about proteolysis level in the cheese samples. Results showed that the sample 10 had the highest while sample 1 had the lowest WSN values. On the other hand, the sample 5 had the highest TCA-SN and PTA-SN values. When mean values of WSN, TCA-SN and PTA-SN were taken into consideration, they were lower than those reported by Koçak et al. (2005). Lipolysis level as ADV was also determined in cheese samples and found that the highest (5.95) value was obtained for the sample 1, giving distinct rancidity taste to the cheese.

Table 1. Chemical, biochemical, microbiological and color properties of Tulum cheese samples obtained from Bolu retail markets.

Properties	Tulum cheese samples												
	1	2	3	4	5	6	7	8	9	10	**Min**	**Max**	**Mean**
Dry matter (%)	56,18	59,61	63,64	47,93	60,72	51,75	54,04	51,57	59,64	51,54	**47,93**	**63,64**	**55,66**
Fat (%)	27,00	33,75	31,50	8,00	36,00	12,50	11,50	5,03	1,00	12,03	**1,00**	**36,00**	**17,83**
Salt (%)	2,63	3,04	2,89	9,73	6,02	5,10	4,97	3,43	4,53	5,56	**2,63**	**9,73**	**4,79**
Acidity (%)	1,04	1,31	0,56	1,34	1,15	0,90	0,96	0,68	1,03	0,74	**0,56**	**1,34**	**0,97**
pH	4,83	4,82	5,94	4,63	4,78	4,80	5,23	5,00	4,60	6,32	**4,60**	**6,32**	**5,10**
WSN	0,090	0,100	0,200	0,230	0,495	0,129	0,274	0,295	0,291	1,332	**0,090**	**1,332**	**0,344**
TCA-SN	0,040	0,060	0,035	0,169	0,400	0,119	0,087	0,181	0,067	0,021	**0,021**	**0,400**	**0,118**
PTA-SN	0,000	0,030	0,005	0,078	0,151	0,025	0,019	0,029	0,015	0,030	**0,000**	**0,151**	**0,038**
ADV (%)	5,950	3,120	0,875	1,850	2,580	2,440	1,810	1,100	4,170	1,300	**0,875**	**5,950**	**2,520**
TAMB (cfu/g)	6,25	7,37	7,34	5,96	8,20	7,37	8,05	10,46	5,53	8,56	**5,53**	**10,46**	**7,51**
Coliforms (cfu/g)	0,00	0,00	0,00	0,00	2,38	3,48	4,43	7,80	5,06	7,70	**0,00**	**7,80**	**3,09**
Yeasts and molds (cfu/g)	6,16	5,69	7,57	7,62	6,79	7,26	7,88	6,81	5,13	7,12	**5,13**	**7,88**	**6,80**
Color L*	89,03	91,56	90,19	77,68	79,10	87,86	83,17	83,93	80,49	88,02	**77,68**	**91,56**	**85,10**
a*	-3,19	-3,36	-5,92	-1,91	-2,02	-4,23	-4,10	-4,42	-4,61	-6,88	**-6,88**	**-1,91**	**-4,06**
b*	18,38	14,27	25,97	18,74	20,13	24,34	24,44	19,90	20,14	35,36	**14,27**	**35,36**	**22,17**

Min: minimum, Max: maximum, WSN: water soluble nitrogen, TCA-SN: thrichloroacetic acid soluble nitrogen, PTA-SN: phosphotungstic acid soluble nitrogen, ADV: acid degree value as lipolysis, TAMB: total aerobic mesophilic bacteria. L*: lightness, 0-black, 100-white; a*: redness, - green, + red; b*: yellowness, - blue, + yellow

Samples 5, 7, 8 and 10 had total aerobic mesophilic bacteria count over 8 log cfu/g, which were higher than those reported by Morul and İşleyici (2012). Cheese samples 1, 2, 3 and 4 had no coliform microorganism on the plates in all inoculated dilutions while the highest coliform count was monitored in the sample 8 (7.80 log cfu/g). Yeasts and molds of the samples had an average value of 6.80 log cfu/g.

In terms of color analysis, the sample 2 was the whitest (L* value 91.56) than the others. Values a* of all samples were in green area and the sample 10 had the lowest value meaning more green. On the other hand, all samples had the values b* in yellow area and the most yellow sample was the sample 10.

As a result of sensory analyses, some cheese samples were determined being in color of porcelain, some were white and some others were more yellow. All cheese samples were crumbly. Some of the cheeses have a normal smell, while others were found to have a heat-precipitated yogurt odor and some had a sour smell. In terms of taste, some samples were like the taste of normal Tulum cheese, some other samples had a prosaic taste while some of them gave a creamy feeling in the mouth and sticks to teeth when chewed and also left rancidity in throat.

In conclusion; the chemical, biochemical, microbiological, color and sensory properties of 10 Tulum cheese samples obtained retail markets in Bolu were determined. When taking samples, it was seen that there was no content label on the package of the cheeses. Therefore, to compare the results with content label was not possible. Turkish Food Codex Communiqué on Cheese indicates that Tulum cheese must have moisture content not more than 45 %. However, it was seen that samples 4, 6, 8 and 10 had a water ratio over 45 %. The cheese samples had wide range of fat content from 1 % up to 36 %, but since it was not seen the content

label on the package of the cheese, they could not be classified in terms of fat. The same was true for salt content. In addition, colors of some cheeses were more yellow than the others and their taste distinctly differ from each other. During the study, it was thought that some cheeses were imitated. Therefore, more detailed studies should be made in order to determine the availability of imitated Tulum cheese in markets.

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Dilactone Limonene Level of Orange Concentrate Produced In Turkey and Brazil

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Dilactone Limonene is known as the main bitter component which can strongly affect the organoleptic properties and determine the consumer's acceptance of orange juices. Limonene is the principal bitter constituent of orange juice. The bitterness in juice due to limonene gradually develops after extraction from oranges. The intact fruit barely contains limonene; however a nonbitter precursor limonoat A-ring lactone is present. This nonbitter precursor originally present in the insoluble fruit sections passes into juices after its preparation and is converted to limonene under acidic conditions. Bitterness due to limonene (delayed bitterness) in citrus juices especially orange juices has become an increasingly important economic problem. Delayed bitterness has become a serious problem to the citrus industry and attempts are being made to solve the problem by processes such as prevention of limonene formation by choice of rootstock, exposure of the fruit to ethylene, treatment of the juice by enzyme and recently absorption of the limonene already formed on cellulose acetate. The objective of this study was to compare the Dilactone Limonene level of Brazil orange concentrate and Turkish orange concentrate. For this purpose, the changes in the Limonene contents of orange concentrate were determined by using an HPLC-UV method. In this study, the selective removal of limonin bitterness from orange concentrate which is produced ın Turkey and Brazıl by HPLC-UV method was investigated As a result obtained for the D-Limonene concentrate were found average 7,9 ppm for Turkish orange concentrate, 3,5 ppm for Brazil orange concentrate.

Research on the Effects of Vegetable Fibers on Veal Burger and Meatball Products

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Vegetable fibers are extracted from vegatable's root, seed, leaf and fruits etc.. They have been used lately as ingredients in popular meat products in order to increase its nutritional value and yield, gain cost savings, developed its texture, water and liquid retention, fat reduction and decrase the rate of shrinkage after cooking. The objective of this study was the physical-chemical characterization of 9 vegetable fibers and fiber combinations in order to apply them in veal meatball formulation. At this study, 10 g fiber, 20 g vegetable oil, 70 g water which has 15-20 °C were stirred. The mixtures were left at the room condition for resting at 2 hours and 30 min. The blends were remove from the beakers and examined by hand to understand structure differences; calculated the weight loss for see fat and water retention capability. According to the results, fibers were applied in same percentage at a meatball recipe, one by one. Meatball doughs were left in a refrigerator for a night. The doughs were taken shaped by hand and cooked to compare their texture, shrinkage, weight loss, taste, color differences etc. As a result; oat, wheat and cellulose fibers has lower; potato – citrus fiber mix., carrot, citrus and vegetable mix. fibers has higher water and fat retention capability. Usage rate of fibers are important; product's texture and taste are affected negatively at higher percentage usage. With fibers having high water retention capacity, it is possible to get cost saving without affecting the final product quality.

Keywords : Vegetable fiber, Meat products, Cost Save, Texture

Preparation and Characterisation of Chickpea Flour-based Biodegradable Films Reinforced with Rice Starch Nanoparticles

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The use of sustainable biomaterials as food packaging provides many advantages such as being economical, biodegradable, easy to use and accessible. Physicochemical properties of the biodegradable films can be enhanced by cross-linking, forming composite films using different biopolymers together or blending with nanoparticles. In this study, chickpea flour-based films were prepared using different glycerol (2% and 4%) and nanoparticles concentrations (0, 10 and 25 % (w/w) of chickpea flour) by casting method. The main reason for choosing chickpea flour as main gel network is its higher starch and protein content. Starch nanoparticles were obtained by using starch acid hydrolysis method. Rice starch nano-particles were used since the particle size of rice starch is smaller than other starch sources. Mechanical, optical and barrier properties of chickpea flour-based films filled with rice starch nano-particles were examined. While opacity values weren't affected by increasing nanoparticle and glycerol concentrations, water solubilities of films were changed depending on the glycerol concentration. The increased nanoparticle concentration decreased the Young's modulus value in films containing 4% glycerol, while it increased the elasticity values of the films containing 2% glycerol. Rice starch nanoparticle addition should be used with low glycerol concentration to develop mechanical properties of chickpea flour-based biodegradable films.

Keywords: Biodegradable film, chickpea flour, rice starch nanoparticle, glycerol, mechanical properties

The Effect of Microfluidization Process on Morphology of Legume Flours based Nanofibers Produced by Electrospinning Method

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Electrospinning is a process that produces continuous nanofibers through the action of an electric field imposed on a polymer solution. Microfluidization is one of advanced homogenization methods. In this study, it was aimed to produce legume flour based homogeneous nanofibers by electrospinning. The effects of flour concentration and poly(ethylene) oxide (PEO) concentration on nanofiber morphology were discussed. The effect of microfluidization process on apparent viscosity, electrical conductivity and nanofiber morphology was evaluated. Solutions were prepared at alkali pH value of 10 with 0.5% (w/v) hydroxypropyl methylcellulose (HPMC) and with different legume flour concentrations (1%, 2%, 3%, 3.5% 4%, 5%, 6%, 7.5% w/v) and different PEO concentrations (0.5%, 1%, 1.5%, 2%, 2.5%, 3%, 3.5% w/v). Fiber morphology was affected by both legume and PEO concentration. For both legume flour solutions, SEM images confirmed that homogenous nanofiber formation (HNF) was obtained from the solutions with PEO concentrations equal or greater than 2.5%. Also, fibers become smoother as PEO concentration increased. Microfluidization process was applied on solutions with 3.5% PEO and 5.25% flour concentration and with 2.5% PEO and 7.5% flour concentration. Microfluidization process increased consistency coefficients (k) of both legume flour solutions while decreased electrical conductivity of solutions. Therefore, microfluidization process did not have a positive effect on obtaining homogeneous nanofibers and resulted in fibers with beads.

Keywords: electrospinning, nanofiber, microfluidization, pea flour, lentil flour, poly(ethylene) oxide

Kinetics of Drying, Transport Properties and Hardness of Pear Coated with Chitosan

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The present work aimed to evaluate the impacts of chitosan as an edible coating in drying kinetics, transport properties and hardness of dried pears. Pears from Santa Maria variety were peeled, cut into circular shape and coated with the chitosan solution (2%, w/v). The coated pears were dried with air at 80, 100 and 120°C with a constant velocity of 1 m/s. All drying were done in the falling rate period, which demonstrated that diffusion was the main mechanism affected the drying process. Also, Fick's second law of diffusion and Arrhenius equations were applied for the determination of diffusions coefficients and activation energy which varied from 0.901×10^{-9} to 2.69×10^{-9} (m^2/s) and 101.08 to 118.73 kJ/kg.mol with the R^2 from 0.9422 to 0.9644. Furthermore, the firiction drag forces, thermal conductivities, specific heats, heat and mass transfer coefficients ranged from 0.880 to 0.885×10^{-6} (N), 0.548 to 0.572 (W/m.K), 3666.86 to 3815.60 (J/kg.K), 31.29 to 31.35 (W/m^2 K) and 0.02581 to 0.02613 (m/s), respectively. However, hardness of the samples varied from 2.379 to 12.354 (N). The results reveal that chitosan has the moisture barrier property which produces a longer drying time and decreases the internal moisture transport while leading to more uniform drying. The presence of a chitosan coating significantly increases the hardness of the fruit tissue. Chitosan allowed a reduction of water loss and hardness maintenance which presents potential for application as edible coating before drying.

Keywords: Pear, Chitosan, Drying kinetics, Heat and mass transfer coefficients, hardness

Effect of Different Sugar Replacers on No Sugar Added High Protein Ice Cream Physical Properties

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The dairy industry are studies on no added sugar and high protein products to meet the demands on healthy food consumption. A high protein and low sugar ice cream product with good sensory and technologically sustainable production is a research subject that should be studied in detail. In this study 4 different no added sugar high protein cocoa ice cream samples were produced by using consistent amount of stevial glycoside and different ratio of xylitol and erythritol in ice cream mix formulation. The production made to meet the requirements of the half fat dairy ice cream category in the Turkish Food Codex Ice Cream Legislation and protein amount is 7,9 g/per 100 g product. The product is prescribed to be 3% milk fat, total solid amount is 35%. Ice cream formulations of 1, 2, 3, 4 differentiated only with their xylitol and erythritol ratios vary in each of the 4 recipes 100% xylitol, 60% xylitol & 40% erythritol, %40 xylitol & 60% erythritol, 100% erythritol, respectively. Physical properties of ice cream samples were evaluated such overrun, total solid, pH, meltdown rate, texture. Overrun of ice cream samples were so similar 50% value which is the maximum capability of the laboratory scale freezer, the calculation of overrun was done by measuring the comparing weight mix and ice cream in known volume container. All ice cream texture analyzed by texture analyzer in terms of firmness, all samples were better compared with the similar industrial products. 18,9±2,2 kg force obtained result for the best firmness properties for sample 2. Also, differentiation of the recipes was not effective to pH analysis results. The better melting analysis result were obtained in recipe 2 that has higher xylitol than erythritol. Based on the study results ratio of erythritol and xylitol has significantly affected the melting and texture properties. Sample 2's ratio has better results in terms of texture and melting properties which are the most critical qualifications for ice cream industry. This study will help to create new ice cream product development for rising healthy food trends.

Keywords*:* Ice cream, high protein, no sugar added, xylitol, erythritol

Effect of Edible Coating Formulated with Gelatin, Chitosan and Rosemary Extract on the Quality of Pearl Mullet Fillets during Cold Storage at +4°C

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In this study, gelatin and chitosan based edible coatings incorporated with rosemary extract and rosemary oil were investigated for extension of shelf life of pearl mullet fillets during cold storage at +4°C for 15 days. Four different coating formulations were used for treatment samples stored along with the control with no coating. During storage, some chemical, physical and microbiological quality parameters were periodically analyzed. In addition, fatty acid profile of pearl mullet oil and antioxidant activity of coating formulations were determined. According to the results, peroxide formation was limited in samples with coatings formulated with rosemary extract and rosemary oil. There were significant differences among the samples in terms of the contents of free fatty acids, conjugated diens and triens, but not primarily associated with the coatings. In the early days of storage, limiting effects of coatings were observed on the count of total mesophilic bacteria and the formation of volatile basic nitrogen, but later on this effect was diminished. Visible differences were seen in the color of coated samples and these differences were sustained during the whole storage period. Regarding the microbiological quality, total mesophilic and psychrophilic bacteria counts were lower especially for the first half of the storage period in coated samples in comparison with the control. This study revealed the positive effect of coatings formulated with chitosan, rosemary extract and rosemary oil on fish preservation beside with necessity of further studies to investigate which active ingredients should be used in formulations with which carrier polymers and at what concentrations. Therefore, each specific food product, where applicable, needs suitably optimized coating formulation.

Keywords: Edible coating, chitosan, gelatin, pearl mullet, rosemary, fish quality.

Effect of Frying On Viscosity of Hazelnut Oil

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In this study, hazelnut oil obtained from a local market was fried 4 times a day for 3 days and for a total of 12 times. As antioxidants; propolis, quinoa and uskun extracts in addition to BHT were added at a level of 1000 ppm except for BHT, which was at 200 ppm. Effect of antioxidants added was comparatively evaluated in terms of viscosity of hazelnut oil. Viscometer used for this analysis was set to 24°C for all measurements and 50 data points were obtained for each sample at 95 rpm. Results were averaged and statistically compared for any significant difference. Viscosity of all samples increased in parallel with the repeat of frying. In terms of antioxidants used, the viscosity change was acquired respectively by BHT, propolis, quinoa, and uskun extracts in ascending order. Viscosity of hazelnut oil with no antioxidant added (control) was 17.64 mPa s while it was determined to be 83.99 mPa s after 12 times of frying. Viscosity of BHT added sample was initially 34.62 mPa s and 59.80 mPa s after 12 times of frying. Viscosity of propolis added sample was 26.07 mPa s initially and determined to be 72.81 mPa s after 12 times of frying treatment. Above mentioned values for quinoa and uskun added samples were 28.33 and 81.03 mPa s, and 15.40 and 80.17 mPa s, respectively. Effect of multiple frying treatment on viscosity of hazelnut oil in the presence of different antioxidants was significantly affected by the antioxidant used ($P<0.05$).

Keywords: Hazelnut oil, antioxidants, frying, viscosity, BHT, propolis, quinoa, uskun.

Effect of Different Extraction Methods on Fatty Acid Composition of Black Cumin and Linseed Oils

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Vegetable oils have a large amount of polyunsaturated fatty acids such as linoleic and linolenic acids. The major fatty acids in black cumin and linseed oils are linoleic and linolenic acids, respectively. In this study, the effects of solvent extraction at room temperature, cold press and soxhlet methods on fatty acid compositions of black cumin and linseed oils have been investigated in samples stored at 60°C for 28 days. Black cumin oil showed considerable amount of linoleic acid (56.22-56.43%) followed by oleic, palmitic, stearic and linolenic acids in descending order. Linolenic acid (51.93-52.60%) was the most abundant fatty acid in linseed oil followed by oleic, linoleic, palmitic and stearic acids. The linoleic acid content of black cumin oil extracted by solvent extraction, cold press and soxhlet methods were varied from 56.22 56.34, and 56.43% to 55.85, 56.24 and 55.97%, respectively. The decrease in linolenic acid ratios of linseed oil extracted by the same methods were 1.14, 0.61 and 1.16%, respectively, after 28 days storage at 60°C. The results showed that different extraction methods slightly reduced the linoleic and linolenic acid content of black cumin and linseed oils after storage at 60°C for 28 days. In addition, oil samples obtained by cold press showed lower decrease in linoleic (0.1%) and linolenic acids (0.61%) content in black cumin and linseed oils. It is concluded that the method of extraction may lead to slight differences in fatty acid composition of oils.

Keywords: Black cumin oil, Linseed oil, Extraction, Cold press, Fatty acids.

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Use of Solid State Fermentation Technique in Natural Color Pigment Production

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Color and flavor are among the key characteristic properties of food materials which play a significant role in the consumer preference. The recent spread of food colorants and the adverse health effects of the synthetic colorants have led to prohibition of their use. This provides an opportunity for the usage of natural pigments as a food colorant. One of these natural pigments is *Monascus* pigment, which is commonly used in the industry. *Monascus* species produce natural color pigments as secondary metabolites. Pigments synthesized by *Monascus* species are used in Asia for a long time with the aim of coloring food and food safety in some food products like alcoholic beverages, red soybean curd and meat. Furthermore, *Monascus* pigments which consist of antioxidant and antimicrobial properties, have high stability in terms of pH and temperature, and these features are promising alternatives to synthetic colorants. *Monascus* pigments can be produced with both submerged fermentation and solid-state fermentation techniques. Nowadays, industrial-scale pigment production is not economical because of the high cost of technology used. For this reason, low-cost processes are needed to be improved. In general, industrial-scale pigment production is done by submerged fermentation. However, solid-state fermentation technique has a lot of promises due to its low cost of capital and energy, low water consumption, and low waste water generation. In solid state fermentation technique, there are no foam formation; hence complex process equipment is not needed and the system provides high effieciency. This review aims to give information about solid-state fermentation, discuss its advantages, and analyze the studies on *Monascus* pigment production by using solid-state fermentation technique.

Some Instrumental Characteristics of Chicken Skin Gelatin in Comparison with Commercial Gelatins from Different Sources

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In this study, chicken skin, as one of the wastes from poultry processing industry, was used in gelatin extraction. Gelatin extraction was carried out under predetermined conditions and resultant gelatin were compared with commercially available gelatins from different sources in terms of some instrumental properties. For this purpose, gelatin films and solutions prepared by bovine hides, fish and porcine skin gelatins were used for analyses of scanning electron microscopy, Fourier transform infrared electron spectroscopy, polyacrylamide gel electrophoresis, amino acid compositions and ultraviolet absorbance spectrum. According to the results obtained, chicken skin gelatin was found to have similar binding positions and average molecular weight with other gelatins studied. In addition, SEM images of gels prepared from chicken skin gelatin presented some air gaps, possibly due to impurities resulted in hydrophobic forces, in the contrary of commercial samples. Considering amino acid compositions, proline content was lower in chicken skin gelatin while hydroxyproline levels were similar among the samples, leading to a bit lower amount of total imino acids. Results obtained revealed that high quality gelatin might be produced from chicken skin by appropriate bio-separation methods for removal of lipid and water fractions and after a suitable isolation procedure for obtaining collagen.

Keywords: Gelatin, chicken skin, amino acid profile, SEM, FTIR, SDS-PAGE

Examination of the Texture Properties of Bakery Product

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The desired textural level of any product is one of the best reasons for its selection. The primary factors in determining the suitability of dough products are flavor and texture. Evaluation of product quality by texture analysis is an important tool for the development and production of dough products.

In this study, the terms and analysis methods used in the texture analysis of the intermediate (dough) and the final baked product were examined. For the final baked product, the texture, freshness, volume and appearance of the crust and crumb structure are all important criteria for which the product is evaluated. In addition, eating quality, chewability, stickiness, firmness, brittleness and portion quality of the product were analyzed. The tests and tools used in these analyzes are explained. The quality of bakery products made from different types of flour will also be compared and the effects of different types of flour on bakery products will be examined by making experiments in semi-finished pizza, flour and puff pastry doughs. The effects of parameters such as temperature, kneading method, kneading time, fermentation temperature and time on the tissue were evaluated and optimum conditions were determined during the analyzes.

Thus, standardization has been achieved in all end products by obtaining the desired quality products from the semi-product stage.

Keywords: Bakery products, texture, dough, flour,

The Usage of Bacteriophages in Food Preservation

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Food safety is still a challenge because of food market globalization and spread of antibiotic-resistant microorganisms. Many efforts have been made to search for new effective, safe, and sustainable antimicrobial agents to improve food safety. Bacteriophages (phages) have emerged as a promising natural and green technology for food preservation and safety. Bacteriophages are viruses that specifically infect bacteria and multiply in the bacterial cell. Therefore, phages are bacterial parasites they are harmless to humans, animals, and plants. Phages are very common in nature and can be found in high numbers in seawater, sewage, thermal waters, soil, plants, animals and human intestines, feces, foods, and food businesses. Bacteriophages have two types of life, lytic (virulent) and lysogenic (mild). Phages that infect and lyse host bacterial cells are called virulent phages. Virulent phages are considered as attractive candidates of antimicrobial agents in the food industry because of their exponentially multiply capability in the presence of susceptible bacteria and eliminate target bacteria regardless of their antimicrobial resistance. In recent years, the number of studies on the use of bacteriophages as biocontrol agents in the food industry has increased significantly. The use of bacteriophages to control the growth of diverse pathogens has been reported in various food commodities including, fish, chicken, pigskin, cooked and raw beef, milk, cheese varieties, vegetables and fruits, etc. In conclusion, it can be said that further researches are required to struggle more phage/host food product combinations and procure more characterized phages show biocontrol potential for food application.

Comparison the Quality Characteristics of Herby Cheeses Produced in Traditional and Industrial Conditions

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Herby cheese is produced in the Eastern Anatolia Region and is mostly called as "Van Otlu cheese". In this study, in order to reveal the similarity of two type cheeses, 30 cheese samples provided from dairy plant/dairy factory and 30 samples from traditional cheese producers. Some chemical, biochemical, physical and electrophoretic characteristics and free fatty acid contents of these two type cheeses were compared. Dry matter, fat, ash, salt, acidity, water soluble nitrogen, non - protein nitrogen, amino nitrogen and lipolysis (ADV) values were significantly higher ($p<0.01$) in traditional Herby cheeses than those of Industrial counterparts;, however in terms of protein contents there was no significant difference statistically. pH values were lower in traditional Herby cheeses ($p<0.01$) as expected. It has been determined that the hardness values of the Herby cheeses produced by traditional methods are higher than those of commercial cheeses by three times. Urea-PAGE images show that in the production of all of the traditional Village type Herby cheeses mainly sheep's milk was used, in the cheeses produced by dairy plant/factory 2 of them were made entirely from goat milk, the remaining cheeses produced from cow milk. The concentration of free fatty acids of Village Herby cheeses is 2 times higher than that of commercial cheese.

Key words: Herby cheese, Chemical composition, Biochemical and electrophoretic properties

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Microbial Profile of the Traditional Beverage Shalgam during the Fermentation Period

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Shalgam is a fermented beverage produced using black carrot, bulghur flour, turnip (shalgam), water, baker's yeast or sour dough, salt and water. In shalgam production, generally, sour dough is used as the main microorganism source for fermentation. In this study, it was aimed to determine the microbial profile of shalgam during its fermentation period. To do this, shalgam was produced following the two-stage production method, first dough fermentation and then carrot fermentation. In the first stage, bread dough was incubated for 6 hours at 30°C and then mixed with bulghur flour and salt and further incubated at room temperature (23°C -25°C) for five days. After this first stage, the resulting dough was extracted with water. Black carrot, shalgam and salt were added to the extract and the second carrot fermentation stage was conducted at room temperature for ten days. Samples were taken at five different time-points: at the end of dough fermentation, at days 3, 5, 7, and 10 of the carrot fermentation. The pH showed a gradual decrease from 4,0 in the dough to 3,3 at day 10 of the carrot fermentation. Microbiological analyses were performed on the samples, which involve total mesophilic aerobic bacteria, coliforms, lactic acid bacteria (LAB) and mold-yeast counts. Seventy six bacterial srains (40 from MRS and 36 from M17) and 30 yeast strains were isolated and purified. After DNA extraction, the isolates were grouped by Rep-PCR and one from each group was selected for molecular identification. MRS isolates were found to be *Lactobacillus plantarum* and *Lactobacillus brevis*. M17 isolates were more diversified; in addition to *L. plantarum* and *L. brevis*, *Leuconostoc mesenteroides*, *Lactococcus lactis*, *Micrococcus yunnanensis*, *Bacillus circulans*, *Paenibacillus cucumis*, *Pantoea agglomerans* and *Staphylococcus pasteuri* were observed. Among yeasts, only *Pichia kudriavzevii* was detected other than *Saccharomyces cerevisiae*. While the dominant lactic acid bacterium was *L. plantarum*, the dominant yeast was *S. cerevisiae* during the fermentation period.

Parameters Affecting Stability of Cold Coffee

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The coffee brew is one of the most frequently consumed beverages in the world.

Consumers traditionally drink hot coffee, in recent times, the consumption of cold coffee has increased in northern European countries, the USA and Japan. Cold brew method, indicates a coffee produced by cold extraction, and should not be confused with cold coffee, which is usually produced by a hot system and left to cool down.

According to the coffee consumption trends, ice coffee is a hot market topic. Global market values reached to 6.895 MT in 2017. Especially in summer, consumers prefer ice coffee due to its taste, aroma and stimulating properties. The most preferred ice coffee flavours are plain, caramel, vanilla, chocolate, cacao and hazelnut.

For providing best ice coffee experience to consumers, products should have stable taste and structure until the end of shelf life. An iced coffee recipe includes coffee base, stabiliser, pH-agent, sugar, milk and water basically.

After the determination of optimum recipe ingredients and dosage for sensorical side, stability tests are applied at 5 different aging conditions based on different timelines, different light effects and different temperatures.

According to analytical analysis and sensorical evaluations, it’s observed that iced coffee product is directly affected by temperature at the end of the stability tests. Regarding to this result, type of pH-agent and dosage of stabiliser are changed and stable product recipe are achieved.

In conclusion temperature, storage condition, stabiliser type and dosage and type of pH-agent are important parameters and effects stability of iced coffee products.

The Effects of Liquid Smoke Flavouring on the Sensory and Chemical Characteristic of Dried Red Pepper

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Pepper (Capsicum annuum L.) is in the Solanaceae family as potato, tomato, tobacco and petunia. Peppers are used as whole or sliced, fresh, dried, cooked and canned in food industry. The pepper is a highly nutritional food due to vitamin A, B and C, pigments, flavonoid and antioxidant compounds. The peppers have an important role in human nutrition especially due to rich content of vitamin C and carotenoids, high fiber and unsaturated fat.

Smoking method mostly imparts a desirable flavour and inhibits the growth of microorganisms. Using of the liquid smoke is a method that becoming popular nowadays. Liquid smoke has some advantages such as; it is easily applied, the concentration of liquid smoke can be controlled, it is resulted uniform products and it has less toxic effect on human and environment. Additionally, in related to consumer preferences, it is indicated that they do not like consuming the same kind of products all the time. The objective of this research was to determine the effects of liquid smoke flavouring on the sensory and chemical characteristic of dried red pepper.

Smoking conditions were optimized by using response surface method according to Box-Behnken experimental design. Drying temperature (60°C, 70°C and 80°C), concentration of liquid smoke (0.5%, 1.5% and 2.5%) and dipping time to the liquid smoke solution (1, 3 and 5 min) were chosen as independent variables and treatment was optimized to maximize total phenolic content and sensory score. Accordingly, the results indicate that the optimum concentration of liquid smoke is 2.5%, optimum dipping time to the liquid smoke is 1 min and the optimum drying temperature is 80°C.

Effects of Fruit Juice Clarification on Anthocyanin Stability

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Colour may be considered one of the most impressive and delightful attributes of foodstuffs, which directly influences preference, selection and eating desires of the consumers.

Food manufacturing processes may cause degradation or loss of the natural pigments in the raw food and production of many processed foods requires the addition of colour.

Natural food colourants have been demanded and become increasingly popular among worldwide consumers.

The global natural food colours market is expected to grow at a CAGR of 8.8% to reach $2,537.3 million by 2024 from $1,662.4 million in 2019.

Anthocyanins are the most widely studied natural food colourants, being obtained from flowers, fruits, leaves and even whole plants. Commercial anthocyanins, namely cyanidin 3- glucoside, pelargonidin 3-glucoside and peonidin 3-glucoside have been also used, and their effectiveness has been increasingly assessed.

Bentonite, gelatin and kieselsol are mainly preferred as clarifying agents in hot clarification method of fruit juice industry.

As clarifying agents, 0.2 g/L bentonite, 0.05 g/L gelatin and 0.8 mL/L kieselsol were used for the clarification of pomegranate juice and 0.2 mL/L enzyme and 0.4 g/L bentonite for the clarification of strawberry juice. Hot clarification resulted in 21 and 13% losses in anthocyanin content of pomegranate and strawberry juices, respectively. Consequently, anthocyanin content of pomegranate juice after hot clarification (188 mg/L) was found higher than those after cold clarification (170 mg/L). This finding was very surprising due to high sensitivity of anthocyanins to heat.

Migration of Acetaldehyde from Polyethylene Teraphthalate (PET) Food Packaging

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Acetaldehyde is a compound that can be formed by lactic acid fermentation in foods such as cheese, yoghurt, and alcohol fermentation in wine and can be found naturally in foods such as fruits and vegetables. However, even trace amounts of acetaldehyde formed in polyethylene teraphthalate (PET) packages change the taste and smell of beverages. Therefore, acetaldehyde migration is becoming an important issue for PET bottles used in carbon dioxide beverage industry. Particularly, the high temperatures applied during the processing of the material and the temperature parameters in the drying process applied to remove moisture cause an increase in acetaldehyde formation. Acetaldehyde migration is examined in terms of health; The US National Toxicology Program's 10-year report on carcinogenic substances and the report of the USEPA-IRIS Department of the US Environmental Protection Agency include assessments of acetaldehyde. Although animal studies have shown adequate results, but not enough data on humans, acetaldehyde appears to be among the compounds likely to have a carcinogenic effect for human health. 10/2011 In accordance with the EU, the specific migration limit for acetaldehyde is 6 mg / kg in the Turkish Food Codex Communiqué on Plastic Materials and Articles for Contact with Food (Communiqué No: 2013/34). In this study, the amount of acetaldehyde detected in different PET samples used in food packaging in Headspace-GC-MS device was evaluated. The amount of acetaldehyde in 10 different PET food packages was determined within the range of 0.51-2.15 mg / kg and was found to be below the limit in the legislation.

Thermal and Rheological Characteristics of Kuwaiti Honeys

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Honey is one of the earliest natural sweeteners, and traditionally used as food and medicine by mankind. The honey is a sweet, aromatic liquid with a high nutritional profile. Because of the difference of botanical origin, honey differs in appearance, physicochemical and sensory characteristics. Kuwait has recently given the stress on the production of the local honey. The quality of the honey produced in Kuwaiti requires characterization and a comparison with the honey produced by other countries. Rheology is one of the best quality attributes of honey as it predicts the flow behavior and also provide information for the equipment design.

In this present work, the rheological and thermal properties of Kuwait produce honey samples were evaluated to find their suitability in the industry. Oscillatory rheology and thermal properties of six Kuwaiti honeys were evaluated. The mean values of glucose and fructose are 33.3 and 39.8%, respectively. The dynamic rheological measurements show that the G″ was much higher than the G′, confirming the viscous nature of honey. The rheograms of honey samples at different temperatures (10–40 °C) show the Newtonian behavior of all the samples. The glass transition temperatures (T_g) of the honey samples, as measured with a differential scanning calorimeter (DSC), showed a wide variation ranging from -42 to -23 °C. The observed values while compared with honey produced in the developed countries indicated a significant difference.

Nutritional Content of Whole Wheat Flour and the Importance of the Use of Foods Containing Whole Wheat Flour

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In this study, the nutritional content of whole wheat flour was determined and it was aimed to highlight the nutritional differences of whole wheat flour by comparing with white wheat flour. Two different wheat varieties, low protein, medium protein and high protein were selected. White wheat (without any bran) and whole wheat flour were obtained from these wheats. Wheat flour moisture, ash, protein, total dietary fiber and total fat values were investigated. Flour that contains no bran; moisture was found to be 13.3(%), ash(%); 0.27, protein(%); 8.34, total dietary fiber(%); 3.22, total fat(%); 0.77. The nutrient content of whole wheat flours; moisture(%); 12.83, ash(%), 1.42, protein(%); 11.32, total dietary fiber(%); 13.32, total fat(%) 1.97. In the scientific researches, the use of whole wheat flour in various bakery products is intense. In these studies, it was concluded that instead of refined wheat flour, tambod flour which has proven nutritional superiority should be preferred. Many epidemiological and clinical studies, suggests an inverse relation between whole grain consumption and the risk of chronic diseases such as obesity cardiovascular disease, cancer and type II diabetes. During the grinding of whole wheat, separation of the bran and wheat germ from the grain leads to significant loss of many valuable nutrients. In this regard, consumption of whole wheat flour or whole grain products rather than white flour must be encouraged by raising the awareness in the community.

Key words: whole wheat flour, dietary fiber, protein, healthy nutrition

Zein-Based Electrospun Fibres/Capsules for Food Applications

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Currently the world population has been more conscious about natural and healthy food products in order to prevent diseases and improve diets. Regarding this fact, electrospinning technique has been focus of interest in the scientific community and in the nutraceutical and functional food industries, aiming to improve the food matrices with structural and functional benefits. In fact, this novel method is promising to fabricate vehicles for encapsulation of bioactive ingredients, protecting them from degradation during food processing and digestion, while enhancing their bioavailability, stability and controlled release. At the same time, there is an improvement of the product's shelf life.

In order to develop the functional food matrices, zein was the polymer proposed in this study. The concept is to develop and optimize zein electrospun fibres and capsules, and guarantee suitable physical and chemical characteristics to encapsulate and immobilize bioactive ingredients. The effect of solvent, zein concentration, environmental conditions and electrospinning parameters on the fibres and capsules morphology were investigated by scanning electron microscopy. Optimized conditions for zein fibres with a diameter of about 400 nm, as well as for zein capsules with diameter of 2 μm were developed. These optimized formulations show a high potential to incorporate active and natural compounds for food application.

Evaluation of Food Wastes in Color Pigment Production

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Food wastes increase every day with the acceleration of production. The assessment of food waste is important for meeting the needs of the growing population and for an environmentally friendly waste management strategy. Natural colorants can be produced by chemical, enzymatic and biotechnological methods by using food wastes as raw materials.

Natural and artificial food colorants have been used for various purposes in foods as food additives for many years. As consumers become aware of the impact of food on health, the demand for natural products has increased rather than products containing additives and artificial dyes. Artificial colorants used in the food industry are tartrazine, sunset yellow, ponceau 4R, indigotin, azorubin, patent blue 5, erythrosin, etc. There are studies that artificial colorants can cause health problems such as cancer, attention deficit and hyperactivity or increase existing symptoms. Natural color pigments can be used instead of artificial colorants; Chlorophyll, flavonoids, carotenoids, betalaines, caramel, carmine and carminic acid, paprika, turmeric, curcuma, crocetin, bixin (anatto excreta). Color pigments can be obtained from food waste by distillation, soxhelet, highlighted electric field, ultrasound, microwave assisted, supercritical liquid and chromatographic methods of extraction or fermentation techniques.

Food waste serves as a cost-effective substrate for the production of color pigments. Molasses, maize maceration liquid, bran, whey, waste edible oils, vegetable wastes, etc. are a potential source of carbon, nitrogen and minerals. There are studies on the production of color pigments from various agricultural industry residues such as. The production of color pigments from food waste serves as a sustainable and cost effective strategy.

In this review, it has been investigated that various food wastes can be evaluated in the production of different color pigments using modern and classical methods.

Aspects of Thermography Use on Evaluations of Novel Food Processing Technologies

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Thermography, also called thermal imaging (TI), is a field of science analyzing the distribution of temperature of various surface or regions of sample fast and accurately. Thermography is defined as "a large number of point temperatures are measured over an area and processed to form a thermal map or thermogram of the target surface". It is a method for measuring the temperature of the food surface without touching and damaging. This method can be useful for monitoring and analyzing the performance of any thermal process. In recent years, consumer expectations lead the food processing sector faster production rate, extended shelf life and improved product quality. The use of electromagnetic technologies in food processing (microwave, radiofrequency, pulse electric field, ohmic, ultrasound, etc.) for unit operations such as cooking, heating, pasteurization, sterilization and extraction, etc. have gained increased industrial interest. These methods offer high heating rates, however, resulting in the overheating or heterogeneous heating is not to be a desirable effect. During use of electromagnetic technologies, temperature measurement has some difficulties due to process principles. Using thermocouples lead to problems such as signal perturbations and electrical discharges inside electromagnetic process device. In current literature, there is a lack of information about the advantages or disadvantages of thermal imaging of novel food processing methods. Increasing demands for consistency and efficiency within the food industry, have necessitated more information about computer-based image processing techniques. In this study, the current literature on evaluation of attributes and the potential applications of TI on novel food processing technologies were reviewed. The fundamental principles, limitations and different approaches were summarized. In addition, the current trends and future aspects of using this technology in food processing were discussed.

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Vacuum-Atmospheric Drying Of Camel Milk

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Abstract

Drying of thermolabile materials in vacuum compare to drying at atmospheric pressure due to moderate temperature regimes allows to better preserve biochemical composition and sensory indicators. At the same time, atmospheric drying, unlike vacuum dehydration, is characterized by a shorter drying time and low energy consumption. In this regard, it is advisable to combine both methods of drying in a single process that would combine their advantages. To develop the process of vacuum-atmospheric drying of camel milk, it is necessary to combine separate processes of vacuum and atmospheric drying into a single process. Combining processes should be based on selection of modes of above methods of drying. It is necessary to use an indirect approach based on the comparison of intensities of both drying methods, i.e. the amount of removed moisture per unit surface for unit time. The task of developing a single process of vacuum-atmospheric drying of liquid-viscous materials is solved by studying and comparing kinetics of drying processes in a rarefied medium and at atmospheric pressure. The curves of vacuum drying at a certain mode, i.e. temperature and pressure of medium must coincide by nature of bending and duration of process with the curves of atmospheric drying at a certain air temperature. In a result of experimental research vacuum-atmospheric drying process for camel milk is developed. In the dryer, atmospheric drying is carried out in parallel with vacuum drying. Reduction of energy consumption and intensification of the drying process is achieved through the simultaneous use of high- and low-potential heat of refrigeration machine included in the drying plant according to the heat pump scheme in the processes of vacuum and atmospheric drying.

Camel milk is different by high content of fats, proteins, mineral substances and other valuable elements therefore it is considered as a high-nutritious food. Usually camel milk has pure white colour, flattish-sweet or sweetish-salty taste depending on camel feeding, dense consistency, at pouring-over it is strongly foamed. Mal G. and Pathak K.M.L. (2010) thoroughly described camel milk composition and products obtained from it in India. Grigor'yants (1954) compared chemical compositions of camel milk and Chal (Turkman analog of Shubat).

Camel milk possess by many medicinal properties. Camel milk exhibits hypoglycemic effect when given as an adjunctive therapy, which might be due to presence of insulin like protein in it (Agrawal et al. 2003) and possesses beneficial effect in the treatment of diabetic patients. Camel milk has been used for the treatment of food allergies (Shabo et al. 2005) and autism (Shabo and Yagil, 2005). Camel milk can be used for the treatment of different types of tuberculosis (Mal et al. 2000, 2001 and 2006). Camel milk possesses medicinal properties to treat different ailments such as multiple sclerosis, psoriasis, lupus, allergies-asthma (Wernery, 2006). Camel milk drinking has shown a good effect for treating crohn's disease (Shabo et al. 2008). Shubat promotes curing of tuberculosis and gastric ulcer, normalizes the activity of sweetbread, stomach, liver and enhances organism resistance to infectious diseases (Sharmanov, 1991).

Therefore processing of camel milk in order to obtain long-lived commodities keeping own native properties is a topical issue of Kazakhstan food industry. It is thought that drying till powder-like condition is the best preservation method. There are many Kazakhstani scientists have been investigating dairy drying. Their investigations are related to modernization of spraying and vacuum-sublimation drying methods.

Drying in vacuum of thermolabile materials by contrast with drying at atmospheric pressure due to moderate temperature regimes allows preserve better the biochemical composition of the material and reduce the caramelization of carbohydrates, and due to the almost absence of oxygen in the vacuum medium, it is better to preserve the color of the dried material. As a result, the finished product has good sensory indicators and rehydration properties. At the same time, atmospheric drying, unlike vacuum dehydration, is characterized by a shorter drying time and low energy consumption. In this regard, it is advisable to combine both methods of drying into a single process that would combine their advantages.

To develop the process of vacuum-atmospheric drying of camel milk, it is necessary to combine separate processes of vacuum and atmospheric drying into a single process. At the same time, the combination and

selection of optimal modes of vacuum and atmospheric drying should be carried out in such a way as to ensure the uniform nature of the drying process of the material, which would take place only with vacuum or only with atmospheric drying. In addition, the development of the process of vacuum-atmospheric drying is necessary to ensure maximum efficiency of the modules of vacuum and atmospheric drying in the dryer. This can be achieved if vacuum and atmospheric drying units are employed with equal time. Accordingly, after reaching the optimum moisture content of the material in vacuum camera process should be continued in atmospheric unit. To do this, it is necessary that the nature of the changes in the combined curves of the vacuum and atmospheric drying of the material is identical. This could be achieved by ensuring the same intensity of drying during the transition of the material from vacuum unit to atmospheric one.

Combining processes should be based on the selection of modes of those drying methods. Selection of operating parameters visually, i.e. by direct way is impossible, since vacuum drying is characterized by such parameters as medium pressure and temperature of heaters, and atmospheric drying – temperature and air velocity. In this case, it is necessary to use an indirect approach based on the comparison of the intensities of both methods of drying, i.e. the amount of moisture removed from the surface unit per unit time. In turn, the intensity of moisture removal is a derivative of the drying rate. Thus, the task of developing a united process of vacuum-atmospheric drying of dairy materials is solved by studying and comparing the kinetics of drying processes in a rarefied medium and at atmospheric pressure. The curves of vacuum drying at a certain mode, i.e. the temperature and pressure of the medium must coincide in the nature of the bending and the duration of the process with the curves of atmospheric drying at a certain air temperature.

Research of processes of vacuum and atmospheric drying for the purpose of their combination in united process of vacuum and atmospheric drying was carried out at the following modes [1]:

- vacuum drying - medium pressure – (6÷10) kPa, heating temperature (35÷45) ^{0}C;
- atmospheric drying - drying agent temperature – (36÷40)^{0}C, drying agent velocity - 0.35 m/s.

The results of experimental studies were processed in the form of drying curves, which are shown in figures 1-2. In figure 1, the atmospheric drying curves in the form of dotted lines are shown together with the vacuum drying curves in the form of solid lines – at a heating temperature of the medium 40 ^{0}C and medium pressures 6; 8 and 10 kPa. As can be seen from figure 1, for camel milk, the curve of vacuum drying at 6 kPa and the curve of atmospheric drying at an air temperature of 40 ^{0}C are well matched. Both curves have a similar character of bending and the duration of drying is 7 hours. Also the curve of vacuum drying at 10 kPa by duration of the process coincides with the curve of atmospheric drying at a temperature of 36 ^{0}C. At the same time, there is great variance in the 2 hours between the curve of vacuum drying at 8 kPa and the curve of atmospheric drying at a temperature of 38 ^{0}C which precludes their combination in a single process.

However at comparison of curves of atmospheric drying at above mentioned temperatures of air with curves of vacuum drying at pressure of medium 8 kPa and temperatures of heating of medium 35; 40 and 45 ^{0}C which are shown in figure 2, it is revealed that curve of atmospheric drying at 38 ^{0}C harmonizes well with curve of vacuum drying at temperature of heating of medium 45 ^{0}C and pressure of medium 8 kPa by duration of process of dehydration. Though in first 4 hours there is a retard of vacuum drying from vacuum one. This time segment is 0.25 hours in average. But in the next 5 hours this interval is decreased till 0.1 hours.

From the above it should be concluded that for one material, regardless of the method of drying with equal intensity of the processes of vacuum and atmospheric drying, the nature of the curves is identical.

Thus, it is possible to develop a vacuum-atmospheric drying process for camel milk in the following modes:

- vacuum drying with pressure of medium 6кПа and heating temperature 40 ^{0}C and atmospheric drying when the air temperature is 40 ^{0}C;
- vacuum drying at pressure of medium 10 kPa and heating temperature 40 ^{0}C and atmospheric drying at air temperature 36 ^{0}C;
- vacuum drying at pressure of medium 8 kPa and heating temperature 45 ^{0}C and atmospheric drying at air temperature 38 ^{0}C.

In the dryer, atmospheric drying is carried out in parallel with vacuum drying. Vacuum drying is accompanied by drying of materials in device of atmospheric heat drying from the intermediate humidity of material to the final one. At the same time, the time spent on drying should be approximately the same.

Reduction of energy consumption and intensification of the drying process is achieved through the simultaneous use of high- and low-potential heat of refrigeration machine included in the drying plant according to the heat pump scheme in the processes of vacuum and atmospheric drying. Since atmospheric drying is carried out by using the heat of condensation of the refrigerant, a moderate temperature head is created, equivalent to the temperature head during vacuum drying.

Similarly, it is possible to develop modes of vacuum-atmospheric drying for other types of thermolabile materials.

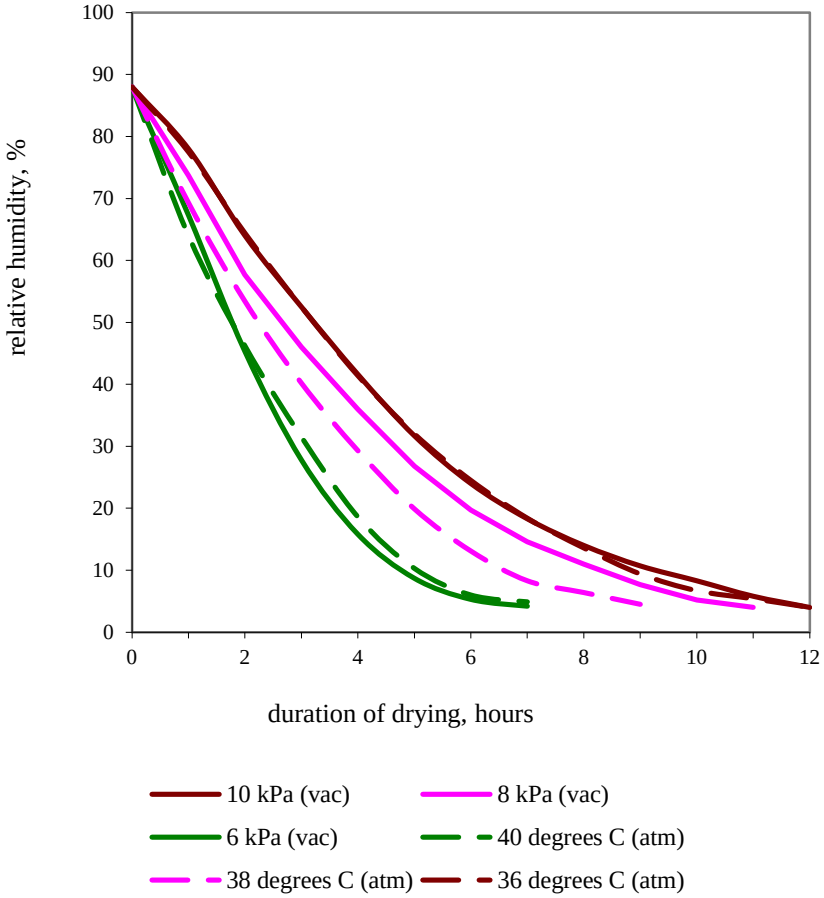

Figure 1. Curves of vacuum drying (solid lines) and atmospheric (dotted lines) drying of camel milk at a heating temperature in vacuum chamber 40^0C and air velocity in device for atmospheric drying 0,35 m/s.

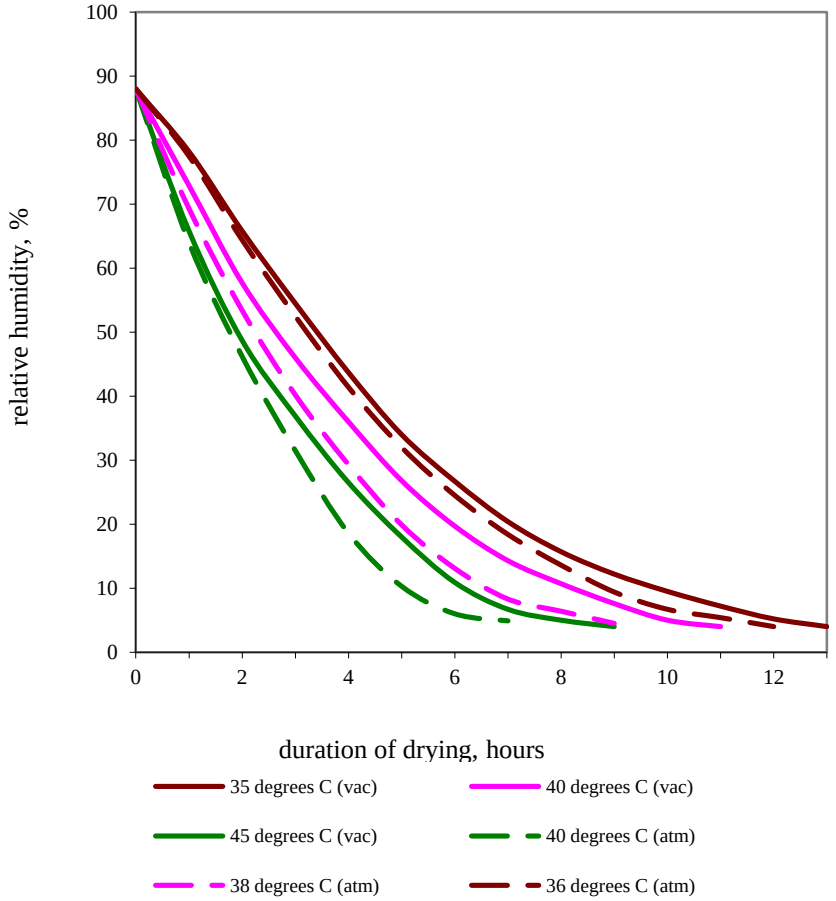

Figure 2. Curves of vacuum drying (solid lines) and atmospheric drying (dotted lines) of camel milk at pressure of medium in vacuum chamber 8 kPa and air velocity in device for atmospheric drying 0.35 m/s.

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Study of the Influence of Flour from Non-Traditional Raw Materials on Cooked Sausages

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Abstract

Over the past few years, industry experts have been developing recipes for cooked sausages, consumption of which can somewhat reduce deficiency of functional ingredients by combining prescription components and introducing biologically active additives of plant origin. However, the use of these additives in production is limited. This is due, in particular, to the lack of basic research on effect of such additives on product quality, primarily organoleptic, physico-chemical, rheological and other properties.

This paper shows the possibility of using flour from non-traditional raw materials (hawthorn) in the production of cooked sausages. The optimal amount of flour from non-traditional raw materials contributes to compaction of structure, allows to increase water- and fat-binding ability.

Comparison of the mineral composition shows that in cooked sausage using flour from non-traditional raw materials, the content of macroelements increases: calcium - by 21%, potassium - by 6%, phosphorus - by 6% and magnesium - by 23% compared with cooked sausage obtained from traditional technology.

The article also proposed the formulation of meat-vegetable cooked sausages balanced in amino acid composition and improved the technology for producing meat- vegetable cooked sausages with functional additive from non-traditional raw flour. The expediency of using hawthorn flour in sausages is substantiated. The mineral composition, the functional and technological properties of the finished product are studied. This will expand the range of meat products, ensure the rational and economical use of raw materials.

Keywords: cooked sausage, meat, flour, vegetable raw materials, mineral composition.

Introduction

According to the Ministry of Health of the Republic of Kazakhstan, most of the country's population is deficient in vitamins, minerals and other biologically active substances. This factor is one of the reasons for reducing the body's immunity, accelerating the development of many diseases and reducing life expectancy. The modern progressive direction of the development of the meat industry is creation of new technologies based on use of various types of non-traditional raw materials. One of the tasks assigned to the technologists is development of new products not only with the aim of expanding range, but also improving nutritional value of products.

The meat industry is one of the largest sectors of the food industry. It is designed to provide the population by food products, which are the main source of protein.

Sausages are products prepared from minced meat (in or without casing) and cooked. The nutritional value of sausages is higher than the value of raw materials and most other meat products. This explained by the fact that during the production of sausages, the least valuable tissues are removed from raw materials. The high nutritional value of sausages is also due to the high content of protein and extractive substances in them. The addition of milk, butter and eggs not only increases the nutritional value, but also significantly improves the taste of sausages [1,2].

Sausages made from horse meat have a good presentation, pleasant specific smell and taste, retain nutritional value during storage and in great demand among the population. The increase in demand for horse meat products is due to the high biological value of this type of meat and in particular that they are used as dietary products, since horse meat is more easily absorbed by the human body, due to the characteristics of protein and fat. Horse meat proteins are characterized by balanced amino acid composition with sufficient amount of essential amino acids and their optimal ratio, for example, amount of tryptophan, tyrosine, phenylalanine, methionine, and histidine in horse meat is higher than in beef [3,4].

Over the past few years, industry experts have been developing recipes for cooked sausages, the consumption of which can somewhat reduce the deficiency of functional ingredients by combining prescription components and introducing biologically active additives of plant origin. However, the use of these additives in production is limited. This is due, in particular, lack of basic research on the effect of such additives on product quality, primarily organoleptic, physico-chemical, rheological and other properties. Promising improvers of meat products, in particular of sausage, can be fruit and berry products. The fruits and flowers of hawthorn species have a complex chemical composition and contain number of organic acids, sugar, carotene (provitamin A), pectin and tannins, sorbitol, choline, acetylcholine, quercetin, emigdalin, thiamine, riboflavin (vitamin B2), anthocyanins, microelements, number of potent alkaloids, proteins, catechins, flavonols and other organic substances. These biologically active substances, combining high physiological effectiveness with small amount of active principle, make it possible to use the flowers and fruits of hawthorn as medicinal raw material. They are used for functional disorders of cardiac activity, hypertension, angioneurosis, angina pectoris, tachycardia, atrial fibrillation, myosthenia, general atherosclerosis, climacteric neurosis and other diseases. The antispasmodic effect of hawthorn preparations is associated with presence of triterpene compounds and flavonoids in the plant. The fruits of many species are edible, have high palatability, sweet or sour-sweet in ripe condition. They are used in fresh and dried form, and also for the preparation of jelly, marmalade, jam and jelly [5].

The aim of the work is possibility of using hawthorn flour in the production of cooked sausages.

2. Materials and research methods

Materials: horse meat, flour from non-traditional raw materials (hawthorn), spices, salt and spices.

As the research methods were used: control and comparative analysis of the studied object, standard and physico-chemical methods, general scientific methods of system analysis, comprehensive description of the studied object and results obtained.

The experimental part of the work was carried out in laboratories of the department "Food Engineering", regional testing laboratory of engineering profile "Structural and Biochemical Materials" of M. Auezov South Kazakhstan State University.

3. Research results and discussion

The use of non-traditional raw materials in food production allows to solve the following problems: to reduce the consumption of expensive raw materials by replacing it with cheaper and less energy-intensive; to increase nutritional and biological value of products by introducing protein-containing and other additives with unique properties and on their basis the creation of original recipes of functional products; improve structural-mechanical and consumer properties of products, extend shelf life; expand the range of food products. As raw materials, flour from non-traditional raw materials was used as the main plasticizer of the extrudable mass obtained as result of processing of hawthorn fruit.

New types of combined products based on combination of meat with vegetable raw materials affect functional-technological and nutritional properties, the principles of combination of components, allows developing recipe and technology [6].

The main useful property of hawthorn flour is absence of gluten in its chemical composition. Flour from hawthorn contains a large amount of calcium, potassium, iron and magnesium. Of the trace elements present are copper, zinc and manganese. Also rich in vitamins C, E, K and provitamin A, carotene, sorbitol also prevails.

The use of dietary fiber in the diet ensures the normal functioning of organs and some body systems. The use of hawthorn flour in balanced diet makes up for the deficiency of dietary fiber, effectively regulates the physiological and biochemical processes in the digestive system, restores human cardiovascular activity, lowers cholesterol and bile acids, removes toxins and electrolytes, increases the absorption of nutrients during diet, inhibits the development of obesity. Physico-chemical characteristics of hawthorn flour are presented in table 1.

Table 1 - Physico-chemical characteristics of hawthorn flour

Indicator	Hawthorn flour
Humidity, %	10.2
Titratable acidity, %	0.22
Ash content, %	3.1
Mass fraction of fiber, %	1.7
Mass fraction of vitamin C, mg/100 ml	230

According to the tasting results of experimentally obtained cooked sausage, it can be concluded that it has high nutritional value and organoleptic properties, because boiled sausage enriched with hawthorn flour contains an increased amount of vitamins C, E, A, K.

Adding flour from hawthorn does not negatively affect the taste of sausages, on the contrary, the product is pleasant and juicy. The use of new, non-traditional vegetable additives, in particular, hawthorn flour, increases the optimal content of zinc and iron, and also has the property of prevention against carcinogens and anemia. The analysis of organoleptic indicators shows high organoleptic characteristics of cooked sausages.

The technological process for the preparation of cooked sausages consists of following operations: defrosting, stripping and cutting of half carcasses, deboning and trimming of meat, rough grinding (2-6 mm) of raw meat, fine grinding. The ingredients (crushed meat, hawthorn flour, salt, spices) are loaded into the cutter, and mix at temperature of + 12^0C, continue the process of chopping until homogeneous meat emulsion with pronounced viscoplastic properties is obtained. The sausages are stuffed into the casing, sediment at temperature of 0-4^0C for 2 hours, smoking (at temperature of 80-85^0C, within 100 min), cooking (at temperature of 80-85^0C, within 50-80 min) and cooling until the temperature inside the product reaches 8^0C (within 20 min), packaging. The amount of hawthorn flour used is 3-10% with respect to ground meat. Recipe cooked sausages are presented in table 2.

In order to expand assortment in the production of sausages for special purposes, use of hawthorn flour as vegetable additive has great prospects, because the study of the chemical composition, nutritional value of hawthorn flour and results of the obtained experimental data show the possibility of future use.

The optimal level of application as additives of flour from hawthorn to sausages is from 3 to 10%. The addition of plant components in large quantities can lead to deterioration in the appearance of product, taste and smell, which has an adverse effect on the consumer.

Table 2 - Recipe for cooked sausage

Name of raw materials	Output		
	Unsalted semi-finished products, kg / 100 kg		
	1-sample	2-sample	3-sample
Horse meat	94.0	89.0	87.0
Fat	3	3	3
Hawthorn flour	3	8	10
Spices, g/100 kg			
Salt	2000	2000	2000
Sugar	500	500	500
Nutmeg	50	50	50
Black pepper	50	50	50
Sodium nitrite	5	5	5

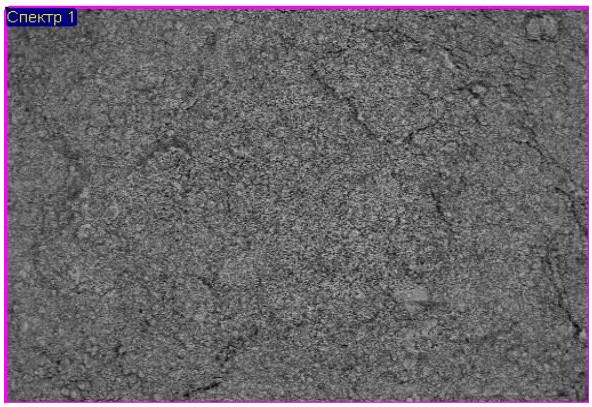
The effect of vegetable additives obtained from hawthorn flour on the properties of minced meat was studied. The number and types of food additives are scientifically based and proven experimentally. The lipid content decreases, and the amount of minerals increases.

The preventive properties in the finished product are determined by the presence of biologically active substances and vitamins. For the human body, vitamins play an essential role. The lack of vitamins in the human body leads to violation of physiological functions, leads to change in appearance and reduces endurance to various diseases. Changes in technological and functional-technological factors of the properties of hawthorn flour are investigated.

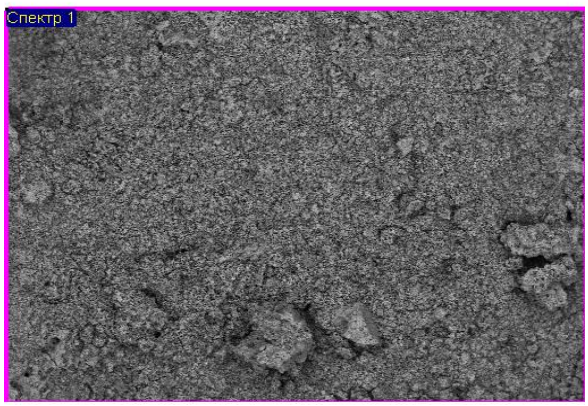
Based on the studies, recipe and technology for the production of cooked sausages was developed. The content of protein, fat, moisture in the finished product is mainly associated with the quality of semi-finished products. According to the results obtained, can be concluded that the samples are rich in minerals and vitamins by chemical composition.

The roentgenogram of the samples obtained by an electron microscope is shown in Figure 1.

An increase in minerals was found in cooked sausage enriched with hawthorn flour. The macro- and microelement composition of the finished product was investigated using an electron microscope. An electron microscope is device that allows to obtain an image of surface of sample with high accuracy. Using the ICP-MC mass spectrometer, high content of macro- and micronutrients was observed in sausages. The composition of chemical elements in the studied samples are presented in table 3.



a) Sausage with additives



b) Sausage without additives

Figure 1 - Roentgenogram of samples obtained through an electron microscope

Table 3 - Composition of chemical elements in the studied samples

Samples	Elemental composition, %									
	O	Na	Mg	P	Cl	Si	K	Ca	Fe	Zn
Sausages without additives	27.6	24.9	1.1	8.77	29.63	0.06	5.45	1.48	0.15	-
Sausages with additives	27.05	26.19	1.35	9.29	29.33	0.15	5.78	1.79	0.18	0.16

The fruits of hawthorn are rich in mineral composition. Of these, higher concentration of potassium, calcium, magnesium, phosphorus and selenium should be noted. If the magnesium content in the experimental sample on 23% higher than control, then the potassium content on 6%, calcium on 21%, phosphorus on 6% higher than the control sample. Magnesium and iron have antioxidant properties. This, in turn, has positive effect on the absorption of iron by the body. If iron is found together with magnesium, histidine and folic acid in foods, this contributes to the formation of hematopoietic iron.

The expediency of using hawthorn flour in sausages is substantiated. The mineral composition is studied, the functional-technological properties of the finished product are studied. This will expand the range of meat products, ensure the rational and economical use of raw materials. The content of protein, fat, moisture of finished products depends on the quality of semi-finished products using in the production of sausages. New food production is cost effective.

The study of plant materials containing a wide range of biologically active substances and which can be used as additives in the production of sausages is very promising. In the manufacture of sausages, all the requirements of the standards must be observed. Spices used in the manufacture of cooked sausages must be clean, dry and not affect the rheological properties of minced meat. Organoleptic and physico-chemical characteristics of cooked meat-vegetable sausages are shown in table 4.

Table 4 - Physico-chemical parameters of meat-vegetable cooked sausages

The name of indicators	Data	
	Control	Finished products with the addition of hawthorn flour 10%
Mass moisture content, %	64.5	61.3
pH of finished product	5.9	6.1
Mass protein, %	12.1	11.6
Fat content, %	13.4	12.50
Mass fraction of fiber, %	not found	1.1
Mass content of sodium chloride, %	2.0	2.0
Mass content of sodium nitrite, %	0.004	0.004

The presence of protein and fat in the control and experimental samples varies slightly. According to the results in table 4, it can be seen that that in the developed sample there is an increase in fiber content due to the fact that hawthorn is rich in fiber. The fiber content in the product as and dietary fiber helps to improve the moisture-binding properties of the meat product. In addition, enzymes of the gastrointestinal tract do not affect them, i.e. they bind toxins and processed products of our body, thereby cleaning the intestinal wall. The presence in the experimental sample of fiber has positive

effect on the structural and mechanical properties of the meat product and improves the digestive system of the body.

Conclusion

The effect of hawthorn flour, which were used in minced meat, was investigated. The qualitative indicators of enriched additives of cooked sausages are investigated. The indicators of the qualitative composition of hawthorn flour and sausages were determined. Enriched the composition of cooked sausages with new special additives. Qualitative indicators were determined and cooked sausages were analyzed. Improved the production technology of cooked sausages, developed a new recipe. In sausages, the initial content of chemical elements increased.

In contrast to the control sample, the amount of calcium, magnesium, sodium, silicon, phosphorus, and zinc increased in the experimental sample. Adding flour from hawthorn increases the yield of the finished product.

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A Novel Approach for Effective Alkaline Neutralization of Crude Oils: Ultrasound Assisted Neutralization

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The refining of vegetable crude oils is applied in order to remove the undesirable components in the oil or to reduce the amounts of these substances to an acceptable level. While the undesirable substances are removed from the oil during the refining process; bioactive compounds (tocopherols, phenolic substances, sterols, squalene, etc.) in the oil are lost quantitatively.

Intra-system, innovative refining steps, which can be carried out for short times at lower temperatures with the usage of less chemicals and consumption of less energy, need to be developed to reduce the loss of bioactive compounds. Since ultrasonic cavitation forces supply an important portion of the activation energy required for chemical reactions in liquids, with ultrasound application, reactions may occur faster; hence, processing time was shortened.

Chemical refining contains degumming, neutralization, bleaching and deodorization steps. In neutralization steps, free fatty acids in crude oil are neutralized with alkali solution and the soap-stock is removed from the neutral oil. Use of excessive and/or strong alkaline solutions in neutralization step cause significant loss of bioactive compounds from vegetable oils. It is hypothesized that the usage of alkaline solutions with weak and medium strength together with ultrasound application will decrease aforementioned loss of bioactive compounds while an efficient free fatty acid reduction is still maintained. Therefore, crude safflower oil was neutralized with conventional method and ultrasound assisted system using different alkaline solutions. Results showed that an efficient free fatty acid reduction was achieved while the loss in tocopherol and total polyphenol content was limited. Consequently, ultrasound assisted neutralization may be considered as a reliable and efficient novel method which is also highly compatible with the common refining systems.

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Neutralization and Bleaching Process for Minimizing Diglyceride Content Of Olive oil to Reduce 3-MCPD and Glycidyl Content

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3-chloropropane 1, 2-diol (3-MCPD) and glycidyl esters are the food-borne contaminants that have been accentuated in recent years. 3 monochloropropane-1,2-diol (3-MCPD) was first detected in products such as acid hydrolyzed vegetable proteins (HVP) and soy sauce. 3-MCPD was found in many foods containing oil phase as fatty acyl esters in foods. The main factors in the formation of 3-MCPD and glycidyl esters in vegetable oils are presence of free chlorine ion, glycerol, monoglycerides, diglycerides and high temperature. Therefore, refining operation of lampante olive oil is susceptible to formation of glycidyl esters and 3-MCPDE. The adverse effects of 3 monochloropropane-1,2-diol (3-MCPD), 2-monochloropropane-1,3-diol (2-MCPD) and glycidols and their esters on health were reported by many researchers. Together with the increasing awareness of these process contaminants, many mitigation studies have been developed simultaneously. These studies were generally focused on to create a solution to reduce the glycidyl ester and 3-MCPDE contents in refined oils. However, reduction of the precursors such as mono- and diglycerides may limit the formation of these contaminants. In this study, lampante olive oil was neutralized using three different alkaline (NaOH, MgO, Ca(OH)2) then neutralized oils were bleached using two different commercial adsorbents (Tonsil 210, Tonsil 258) in three different proportions (0,1-0,5-0,9) to reduce diglyceride content prior to steam distillation step where glycidyl esters and 3-MCPDE are mainly formed. Oil produced using best and worst process combinations with regard to diglyceride content were steam distilled to evaluate the effect of mitigation in diglyceride content on glycidyl ester and 3-MCPDE content of final product.

Use of High Oleic Refined Vegetable Oils in Chemical and Enzymatic Interesterification Method for Industrial and Pastry Oil Production

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Refined vegetable oils with high oleic acid content are oils such as hazelnut oil, canola oil, olive oil, pomace oil, sunflower oil and safflower oil with increased oleic acid content. In our country, high oleic acid oils such as hazelnut oil and olive oil are available for production. However, these oils have limited usage areas due to their structure. Different modification methods are used to expand the use of these oils in the industry. Interesterification, one of these methods, is widely used. Interesterification reactions can be carried out chemically or enzymatically according to the type of catalyst employed. Both methods are used for the interesterification of refined vegetable oils with high oleic acid content. Interesterified high oleic oils; has successful applications for confectionery, bakery, pastry, margarine and meat products industries. With these methods, cocoa butter alternatives, vegetable oils that can be used instead of animal oils, soft margarine, margarine stocks and shortenings can be obtained. Interesterified high oleic fats which are healthy because of their high unsaturated fat content, trans free fats can be used instead of high-cost fats such as cocoa butter and because of their successful applications in economic and industrial products. In this study, it is aimed to investigate the modified oils obtained by chemical and enzymatic interesterification using refined vegetable oils with high oleic acid content and their usage areas.

Hydroxymethyl Furfural Formation in Grape and Pomegranate Juices over Heating Treatments

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Abstract

Hydroxymethyl furfural (HMF) occurs as an intermediate product by breaking down sugars in acidic media or during the Maillard reaction. The formation of HMF is used as a chemical index to determine the storage time of food products and to determine if the heat treatment is performed properly to the food products such as fruit juices, milk, honey, cereal products and jams. In this study, it was investigated the formation of hydroxymethyl furfural due to heating process in white grape, red grape juice and pomegranate juices. The fruit juices were heated at 200 °C and HMF occurrence was analyzed over period for different raw materials. Temperature, pH value and Brix values of the samples were also measured. Heating was continued until 68 ˚Bx for white grape juice, 74 ˚Bx for red grape juice and 37.5 ˚Bx for pomegranate juice. The initial HMF content of white grapes, red grapes and pomegranate juices which are sold in the market were found as 21.44, 26.46 and 27.32 mg/kg, respectively. As a result of heating treatment at 200 °C, the Brix value was reached to 68 for white grape juice and 74 for red grape juice and the HMF content of white and red grape juices were increased to 3292.01 in 190 min and 2741.61 mg/kg in 220 minutes, respectively. For the same target Brix value of pomegranate juice was reached to 37.5 at 360 minutes and the HMF value were found 2867.79 mg/kg. Consequently, the HMF content of white grape, red grape and pomegranate juices was increased 153, 103 and 104 times higher than their initial content by long term heating process under atmospheric conditions.

Hydroxymethyl Furfural Formation in Grape and Pomegranate Juices Over Heating Treatments

1. Introduction

Food products are subjected to a number of processes to improve sensory or tissue properties to provide microbiological safety and to eliminate enzymatic activities. Physical, chemical and microbiological changes occur in foods during and after these processing steps. Reactions related to heat treatment are very important in producing sensory properties such as aroma, taste and color. Hydroxymethyl furfural (HMF) is a quality criterion due to storage of carbohydrate-rich foods at inappropriate temperatures and chemical reactions caused by heat treatment during production. Unfortunately, in addition to sugar matrices, there are also some other food components, including fats, mineral compounds and proteins. In this case, various mechanisms should be considered for the formation of HMF (Batu et al., 2014; Metin, 2014).

Maillard reaction, which plays an important role in HMF formation, is a series of reactions between aldehyde ketone and reducing sugar, amine, amino acid, peptide and protein. To begin the reaction, the carbonyl group and the amino group must be present in the system. The reaction is influenced by temperature, time, various sugar and protein, pH, acidity, phenolic substances, metal ions and water activity. Many by-products are formed as a result of Maillard reactions which are released as a result of heat treatments applied to fruit juices (Resnik and Chirife, 1979).

Demand for grape and pomegranate juices has increased rapidly due to its rich nutritive values and various benefits to human health. The composition of grape and pomegranate changes during the ripening of the fruit and varies from region to region according to soil, ground and climatic conditions. The quality of the fruit juice depends on the sugar, acid content and the number of flavoring agents such as methyl anthranilate and other volatile substances, organic acids and colored substances (Igual et al., 2010; Zuritz et al., 2005)

During the heating process of the fruit juices obtained from white grapes, red grapes and pomegranates selected within the scope of this study; temperature, Brix, pH, titration acidity, sugar and HMF values were measured. In addition, the effect of the heating process on HMF formation and the changes occurred during heating process was examined.

2. Materials and Methods

2.1. Materials

In this study, the raw materials that are white grapes, red grapes (*Vitis vinifera*) and pomegranates (*Punica granatum*) were purchased from a local market in Izmir. The stems of white and red grapes were first sorted out and washed, then dried and shredded with the help of blender. After this process, juices were filtered with the help of cheesecloth and prepared for analysis. On the other hand, pomegranates were cut into two pieces and squeezed and prepared in the same way.
The fruit juices were heated at constant temperature (200 ˚C) and HMF determination was made by taking samples at certain intervals. At the same time, temperature, pH value and Brix values of the samples taken at regular intervals were measured. Heating was continued until 68 ˚Bx for white grape juice, 74 ˚Bx for red grape juice and 37.5 ˚Bx for pomegranate juice.

2.2. Methods

HMF determination was performed in all sample groups of white grape, red grape and pomegranate juices obtained from raw materials. In addition to this; Brix, pH value, titratable acidity and sugar analyzes were also performed.

2.2.1. Determination of HMF

The HMF content of fruit juices was determined according to TS 6178/ISO 7466 Turkish Standard (Turkish Standards Institution (TSE), 2002). 2 ml of juice samples were transferred to each 3 glass test tubes and 5 ml of ρ-toluidine solution was added to all tubes. 1 ml of pure water was added to one (blank) tube and the same amount of barbituric acid solution was added to the other tubes. The absorbance values of the samples at 550 nm were determined on the spectrophotometer. The HMF content of the samples was calculated as mg/kg.

2.2.2. Determination of water soluble solids (Brix)

The amount of water soluble solids in grape and pomegranate juices was determined by refractometer. For this purpose, ATAGO brand RX-7000a model abbe refractometer was used. The measurements were made at 20 °C and the results were expressed as °Bx (Yılmaz, 2005).

2.2.3. Determination of pH value

The pH values (at 25 ˚C) of samples taken at certain intervals were measured with using WTW-Inolab branded pH-meter (Cemeroğlu, 2010).

2.2.4. Determination of titratable acidity

The grape and pomegranate juice samples were titrated with 0.1 N NaOH solution to pH 8.1. The titration acidity of the samples was calculated as tartaric acid for grape juice and citric acid for pomegranate juice as g/100 mL (Cemeroğlu, 2010).

2.2.5. Determination of the sugar content

The amount of invert sugar and total sugar in white grape, red grape and pomegranate juices was determined according to Lane Eynon method (Cemeroğlu, 2010).

3. Results and Discussion

Before heating process, the ˚Bx, pH value, titratable acidity, total sugar and invert sugar content of juices were determined and was given in Table 1. As shown in Table 1, the ˚Bx of white grape juice was higher than both red grape and pomegranate juices. The pH value of pomegranate juice was the lowest with 3.09 while the pH value of white and red grape juice was similar. The titratable acidity of white and red grape juice was found as 8 g/100 mL and 4.4 g/100 mL in terms of tartaric acid, respectively. On the other hand, the titratable acidity of pomegranate juice was determined as 18.7 g/100 mL in terms of citric acid.

Table 1: The ˚Bx, pH value, titratable acidity, total sugar and invert sugar content of juices

	White grape juice	Red grape juice	Pomegranate juice
˚Bx	20.5	18	15.5
pH value	4.37	4.78	3.09
Titratable acidity (g/100 mL)	8.0	4.4	18.7
Total sugar (%)	14.58	14.92	14.22
Invent sugar (%)	18.11	18.04	16.15

The pH values, water soluble solids (˚Bx) and HMF content analysis results of white grape, red grape and pomegranate juices were given in Table 2, Table 3 and Table 4. It was indicated that HMF content increased with increasing temperature of the juices. In white grape juice, heating was continued until the ˚Bx reached at 68. When the temperature increased from 22 to 95 ˚C in 190 minutes, HMF content increased 21.44 mg/kg to 3292.01 mg/kg. In other words, HMF content of white grape juice increased by 153 times with increasing temperature.

Table 2: Effect of temperature on ˚Bx, pH value and HMF (mg/kg) in white grape juice

Time (min)	Temperature (˚C)	˚Bx	pH value	HMF (mg/kg)
0	22.0	20.5	4.37	21.44
20	61.0	21.0	4.27	36.29
60	90.5	23.5	4.20	55.97
80	94.5	25.8	4.22	119.85
120	94.5	33.0	4.32	320.55
160	95.0	49.5	4.18	1543.85
190	95.0	68.0	4.34	3292.01

As seen in Table 3, heating was continued until the ˚Bx reached at 74 in red grape juice. While the initial HMF content of red grape juice was 26.46 mg/kg, after 220 minutes (from 21.5 ˚C to 95 ˚C) the HMF content increased 103-fold to 2741.61 mg/kg.

Table 3: Effect of temperature on ˚Bx, pH value and HMF (mg/kg) in red grape juice

Time (min)	Temperature (˚C)	˚Bx	pH value	HMF (mg/kg)
0	21.5	18	4.78	26.46
60	93.0	21	4.61	31.28
100	93.0	24	4.59	80.66
140	93.5	28	4.47	334.10
180	94.5	35	4.54	417.22
200	95.0	50	4.54	854.33
210	95.0	67	4.48	1082.42
220	95.0	74	4.28	2741.61

The initial ˚Bx of pomegranate juice was expressed as 15.5 (Table 4). Heating was stopped at 360 minutes when the ˚Bx reached at 37.5. When the temperature increased from 22.5 to 93.5 ˚C in 360 minutes, HMF content increased 27.32 mg/kg to 2867.79 mg/kg. In other words, HMF content of

pomegranate juice increased by 104 times with increasing temperature. Besides, it was generally seen that the pH value decreased at the end of the process although the pH values of all samples fluctuated.

Table 4: Effect of temperature on ˚Bx, pH value and HMF (mg/kg) in pomegranate juice

Time (min)	Temperature (˚C)	˚Bx	pH value	HMF (mg/kg)
0	22.5	15.5	3.09	27.32
30	47.0	15.5	3.00	49.95
90	86.0	17.0	2.80	51.44
120	90.5	17.0	2.83	66.67
150	91.0	18.5	2.82	202.62
180	86.5	20.0	2.89	472.20
210	86.0	21.5	2.91	751.90
270	86.5	25.5	2.83	837.94
300	87.0	29.5	2.79	1551.65
330	90.5	32.0	2.83	2338.94
360	93.5	37.5	2.81	2867.79

As a result, it was determined that the amount of HMF increased in all samples during the heating process. This increase in the amount of HMF could be explained by the increase in Maillard reaction rate with temperature. Studies show that every 10 °C temperature increase increases the Maillard reaction rate by 4 times (Eskin, 1990). Besides the temperature effect (Carabasa Giribet and Ibarz-Ribas 2000, Tsai et al., 2005; Yılmaz and Toledo, 2005), water activity (a_w) (Fellows, 2000), acidity and pH value (Telatar, 1985), sugar and amino acid composition of juices (Richardson, 2001; Şimşek et al., 2007) may cause the Maillard reaction to increase the HMF content. As a result, all these factors affected each other and increased the HMF content of the fruit juices.

4. Conclusion

In conclusion, food product goes through many stages from the farm to our table. Among these stages, especially the storage of sugary foods at inappropriate temperatures or the formation of HMF formed as a result of high heat treatment norm has been the subject of quality parameters in molasses, honey, milk and milk products, coffee, bread and many other products. The limited number of proven studies of adverse health effects does not undermine the amount of intake of HMF, but even the existence of doubts about this issue should be encouraged to increase the number of studies on the subject.

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