



**Universitatea Tehnică a Moldovei**

# **Interacțiunile aliment-ulei la prăjirea în baia de ulei a barelor de topinambur**

**Student :**

**Andronic Alexandru**

**Conducator :**

**Chirsanova Aurica**

**Chisinau 2019**

## **Rezumat**

Aceasta lucrare prezinta cercetarea interactiunilor dintre ulei si barele de topinambur in timpul baii de ulei in friteuza. In primul capitol am studiat si analizat proprietatile plantei de topinambur , beneficiile acesteia asupra sanatatii dar si posibilele utilizari ale acesteia in diferite ramuri ale industriei alimentare pentru o valorificare eficienta a plantei. De asemenea ,am studiat si descris procesele care au loc in timpul prajirii in baia de ulei , procese ce induc schimbari atat in ulei cit si in produs. Din analiza bibliografica am conclud ca tip de ulei este necesar sa alegem dar si cum sa tratam cit mai eficient barele sau cuburile de topinambur. In capitolul 2 am descris materialele utilizate dar si metodele de cercetare pentru a efectua partea experimentală. Capitolul 3 cuprinde descrierea experientelor in sine precum : aflarea cantitatii de substanta uscata in produs, schimbarea temperaturii in produs in timpul tratarii la diferite temperaturi , determinarea pierderilor de apa dar si absorbtiei de ulei in produs dupa tratare. Finalul lucrării prezinta concluziile dar si recomandările proprii pentru tratatarea termica a topinamburului in baia de ulei in cel mai benefic mod.

## **Abstract**

This paper presents the research of the interactions between the oil and the topinambur bars during the frying in oil bath. In the first chapter I studied and analyzed the properties of the topinambur plant, its health benefits but also its possible uses in different branches of the food industry for a better use. We also studied and described the processes that occur during frying in the oil bath, processes that induce changes in both the oil and the product. From the bibliographic analysis I concluded what kind of oil is necessary to choose but also how to treat the topinambur bars or cubes more effectively. In chapter 2 we described the materials used but also the research methods to perform the experimental part. Chapter 3 contains the description of the experiences themselves such as: finding out the quantity of dry substance in the product, changing the temperature in produced during treatment at different temperatures, determining losses of water but also the oil absorption in the product after the treatment. The end of the paper presents the conclusions but also my own recommendations for the thermal treatment of the topinambur in the oil bath in the most beneficial way.

# CUPRINS

## Introducere

### Capitolul 1

1. Studiul bibliographic .....	9
1.1 Caracteristica agrobiologica .....	9
1.2 Compozitia chimica .....	10
1.2.1 Compozitia chimica generala .....	10
1.2.2 Glucide .....	11
1.2.3 Proteine .....	12
1.2.4 Lipide .....	13
1.2.5 Minerale si vitamine .....	13
1.2.6 Compuși bioactivi .....	14
1.2.7 Substante toxice .....	15
1.3 Recoltarea si pastrarea tuberculilor .....	15
1.4 Valorificarea industrială a topinamburului .....	17
2. Procesul de prajire .....	40
2.1 Operațiunea de prajire .....	41
2.1.1 Obiectivele operațiunii de prajire .....	41
2.1.2 Principiile fizice ale operațiunii de prajire .....	42
2.1.3 Descrierea transferurilor de apă în diferite stări .....	42
2.1.4 Descrierea transferurilor de ulei .....	43
2.1.5 Cuplarea dintre transferuri și transformări .....	44
2.1.6 Localizarea uleiului absorbit .....	44
2.1.7 Perioada absorbției uleiului .....	44
2.2 Mecanisme de absorbție a uleiului .....	45
2.3 Proprietățile produsului .....	45
2.4 Alegerea uleiului de gătit .....	46
2.5 Modificări în produsele alimentare cauzate de prajire .....	47
2.6 Modificări de culoare, gust și aromă cauzate de reacțiile Maillard .....	47
2.7 Modificări de culoare, gust și aromă cauzate de ulei .....	48
Concluzii preventive .....	49

### Capitolul 2

Materiale si metode de cercetare .....	50
2.1 Material .....	50
2.2 Metodele de lucru .....	53
2.2.1 Determinarea substanței uscate .....	53
2.2.2 Prajirea in baia de ulei a cuburilor de topinambur .....	54
2.2.3 Determinarea conținutului de vitamina C .....	54
2.2.4 Analiza potențialilor consumatori .....	56

### Capitolul 3

Partea experimentală	
3.1 Substanța uscată .....	57
3.2 Conținutul de vitamina C .....	57
3.2 Prajirea in ulei .....	58
3.4 Rezultatele chestionarului .....	62
<b>Concluzii</b> .....	<b>67</b>
<b>Bibliografie</b> .....	<b>68</b>

## Bibliografie

1. Aryana, K.J., McGrew, P. (2007): Quality attributes of yogurt with *Lactobacillus casei* and various probiotics. *LWT Food Science and Technology* 40, 1808-1814.
2. ЯРОШЕВИЧ, М.И., ВЕЧЕР, Н.Н. Топинамбур (*Helianthus tuberosus* L.) – перспективная культура многоцелевого использования. Труды БГУ 2009 : Том 4. Часть 2. с. 198-208
3. Titei V., Teleuta A. (2014). Specii perene si soiuri de plante pentru fondarea plantatiilor energetice in Republica Moldova. *Intellectuss*, 4, p.86-92
4. ANSES. Table de composition nutritionnelle des aliments, CIQUAL, 2014 – via le site internet [www.anses.fr](http://www.anses.fr).
5. Gunnarsson, I.B.; Svensson, S.-E.; Johansson, E.; Karakashev, D.; Angelidaki, I. Potential of Jerusalem artichoke (*Helianthus tuberosus* L.) as a biorefinery crop. *Ind. Crops Prod.* 2014, 56, 231–240.
6. Baldini, M.; Danusco, F.; Turi, M.; Vannozzi, G.P. Evaluation of new clones of Jerusalem artichoke (*Helianthus tuberosus* L.) for inulin and sugar yield from stalks and tubers. *Ind. Crops Prod.* 2004, 19, 25–40.
7. Kalyani Nair, K.; Kharb, Suman; Thompkinson, D. K. 2010). Inulin Dietary Fiber with Functional and Health Attributes—A Review". *Food Reviews International*. **26** (2): 189–203.
8. Franck, A. Technological functionality of inulin and oligofructose. *Br. J. Nutr.* 2002, 87, S287–S291.
9. Kaur, N.; Jain, H.; Mann, P.; Gupta, A.K.; Singh, R. A comparison of properties of invertases and inulinase from chicory. *Plant Physiol. Biochem.* 1992, 30, 445–450.
10. Kaur, N.; Gupta, A.K. Applications of inulin and oligofructose in health and nutrition. *J. Biosci.* 2002, 27, 703–714.
11. Krivorotova, T. & Sereikaite (2014). Seasonal changes of carbohydrates composition in the tubers of Jerusalem artichoke. *J. Acta Physiol Plant* (2014) 36: 79
12. Clausen, Bach V, Edelenbos M, Bertram HC (2012) Metabolomics reveals drastic compositional changes during overwintering of Jerusalem artichoke (*Helianthus tuberosus* L.) tubers. *J Agric Food Chem* 60:9495–9501
13. Krivorotova, T. & Sereikaite (2014). Seasonal changes of carbohydrates composition in the tubers of Jerusalem artichoke. *J. Acta Physiol Plant* (2014) 36: 79

14. Marx SP, Nosberger J, Frehner M (1997) Seasonal variation of fructan- $\beta$ -fructosidase (FEH) activity and characterization of a  $\beta$ -(2-1)-linkage specific FEH from tubers of Jerusalem artichoke (*Helianthus tuberosus*). *New Phytol* 135:267–277
15. Scorr-Galindo S, Ghommidh C, Guiraud JP (1995) Simultaneous production of sugar and ethanol from inulin-rich extracts in a chemostat. *Biotechnol Lett* 17:655–658
16. Cieřlik E., Filipiak-Florkiewicz A., 2000. Topinambur (*Helianthus tuberosus* L.) – możliwości wykorzystania do produkcji żywności funkcjonalnej . *Nauka Techn. Jakość* 1, 73-81 [in Polish].
17. Florkiewicz A., Cieřlik E., Filipiak-Florkiewicz A., 2007. Wpływ odmiany i terminu zbioru na skład chemiczny bulw topinamburu (*Helianthus tuberosus* L.)
18. *Żywn. Nauka Techn. Jakość* 3, 71-81 [in Polish].
19. Cieřlik E., A. Gębusia, A. Florkiewicz, B. Mickowska. The content of protein and of amino acids in jerusalem artichoke tubers (*helianthus tuberosus* l.). *Acta Sci. Pol., Technol. Aliment.* 10(4) 2011, 433-441
20. DTU: National Food Institute, Copenhagen, Denmark , 2009
21. [http://www.foodcomp.dk/v7/fcdb\\_details.asp?FoodId=0101](http://www.foodcomp.dk/v7/fcdb_details.asp?FoodId=0101)
22. Kays S.J., Nottingham S.F. (2008). *Biology and Chemistry of Jerusalem Artichoke: Helianthus tuberosus*. CRC Press, USA, 478 pp.
23. Petkova N., I. Ivanov, P. Denev, A. Pavlov. Bioactive Substance and Free Radical Scavenging Activities of Flour from Jerusalem Artichoke (*Helianthus tuberosus*L.) Tubers – a Comparative Study. *Turkish Journal of Agricultural and Natural Sciences . Special Issue: 2, 2014*
24. Johansson E., T. Prade, I. Angelidaki , S-E. Svensson, W. R. Newson, I. B. Gunnarsson and H. P. Hovmalm (2015). Economically Viable Components from Jerusalem Artichoke (*Helianthus tuberosus* L.) in a Biorefinery Concept. *Int. J. Mol. Sci.*, 16, 8997-9016;
25. Johansson, E.; Hussain, A.; Kuktaite, R.; Andersson, S.C.; Olsson, M.E. Contribution of organically grown crops to human health. *Int. J. Environ. Res. Public Health* 2014, 11, 3870–3893.
26. Yuan, X.; Gao, M.; Xiao, H.; Tan, C.; Du, Y. Free radical scavenging activities and bioactive substances of Jerusalem artichoke (*Helianthus tuberosus* L.). *Food Chem.* 2012, 133, 10–14.
27. Cabello-Hurtado, F.; Durst, F.; Jorin, J.V.; Werck-Reichhart, D. Coumarins in *Helianthus tuberosus*: Characterization, induced accumulation and biosynthesis. *Phytochemistry* 1998, 49, 1029–1036.

28. Pan, L.; Sinden, M.R.; Kennedy, A.H.; Chai, H.; Watson, L.E.; Graham, T.L.; Kinghorn, A.D. Bioactive constituents of *Helianthus tuberosus* (Jerusalem artichoke). *Phytochem. Lett.* 2009, 2, 15–18.
29. Ahmed, M.S.; El-Sakhawy, F.S.; Soliman, S.N.; Abou-Hussein, D.M.R. Phytochemical and biological study of *Helianthus tuberosus* L. *Egypt J. Biomed. Sci.* 2005, 18, 134–147.
30. Chadwick, M.; Trewin, H.; Gawthrop, F.; Wagstaff, C. Sesquiterpenoids lactones: Benefits to plants and people. *Int. J. Mol. Sci.* 2013, 14, 12780–12805.
31. Sawicka B., D. Kalembasa.(2013). Annual Variability of Some Toxic Element of Two Jerusalem Artichoke Varieties. *Pol. J. Environ. Stud.* Vol. 22, No. 3, 861-871
32. Judprasong K., N. Archeepsudcharit, K. Chantapiriyapoon, P. Tanaviyutpakdee, P. Temviriyankul.(2017). Nutrients and natural toxic substances in commonly consumed Jerusalem artichoke (*Helianthus tuberosus* L.) tuber. *Food Chemistry, Volume 238*, Pages 173-179
33. Kays S.J., Nottingham S.F. (2008). *Biology and Chemistry of Jerusalem Artichoke: Helianthus tuberosus*. CRC Press, USA, 478 pp.
34. Roberfroid M. B., Coxam V., Delzenne N. *Aliments fonctionnels* (2e ed). TEC et DOC, 2008, 1088 pages
35. Лисовой В. В., Першакова Т. В., Купин А. Г. Современные способы производства инулина. ФГБНУ «Краснодарский научно-исследовательский институт хранения и переработки сельскохозяйственной продукции», 2016, 14 стр.
36. <https://www.gminsights.com/industry-analysis/inulin-market>
37. Franck, A. (2006). Inulin. In: A. M. Stephen, G. O. Phillips, P. A. Williams (Eds.), *Food polysaccharides and their application* (2nd ed., pp. 335–351). Taylor and Francis Group, CRC Press LLC, Boca Raton, FL.
38. Leyva-Porras, C., Saavedra-Leos, M.Z., López-Pablos, A.L., Soto-Guerrero, J.J., Toxqui-Terán, A. and Fozado-Quiroz, R.E. (2017), Chemical, Thermal and Physical Characterization of Inulin for its Technological Application Based on the Degree of Polymerization. *Journal of Food Process Engineering*, 40: 1-14.
39. Kim, Y., Faqih, M. N., Wang, S. S. (2001). Factors affecting gel formation of inulin. *Carbohydrate Polymers*, 46, 135–145.
40. Stephen A.M., Phillips G.O. (2006). *Food Polysaccharides and Their Applications*, CRC Press, 752 pages

41. Hala S. Sayed and Soha R. Khalil.(2017). Effect of Chicory Inulin Extract as a Fat Replacer on Texture and Sensory Properties of Cookies. *Middle East Journal of Applied Sciences*, 1, 168-177
42. Mensink A.M., H. W.Frijlink, K. V. Maarschalk, W. L.J.Hinrichs. (2015). Inulin, a flexible oligosaccharide I: Review of its physicochemical characteristics. *Carbohydrate Polymers* 130 (2015), 405–419
43. Roberfroid M.B., Introducing Inulin-Type Fructans.*British Journal Of Nutrition*, 93: S13-S25, 2005.
44. Khan R. *Low-Calorie Foods and Food Ingredients*. Springer Science & Business Media, 2012 - 183 pages
45. Villegas B, Costell E. Flow behaviour of inulin-milk beverages. Influence of inulin average chain length and of milk fat content. *Int Dairy J*. 2007;17:7767–7781.
46. Villegas B, Carbonell I, Costell E. Inulin milk beverages: sensory differences in thickness and creaminess using R-index analysis of the ranking data. *J Sens Stud*. 2007;22:377–393
47. Karimi R, Azizi MH, Ghasemlou M, Vaziri M . Application of inulin in cheese as prebiotic, fat replacer and texturizer: a review. *Carbohydrate Polymers* [20 Nov 2014, 119:85-100]
48. J. Gao, M. A. Brennan, S. L. Mason, and C. S. Brennan. Effect of sugar replacement with stevianna and inulin on the texture and predictive glycaemic response of muffins *International Journal of Food Science & Technology*, June 2016
49. Bojnanska T., M Tokar and A Vollmannova (2015). Rheological parameters of dough with inulin addition and its effect on bread quality. *J. Phys.: Conf. Ser.*602
50. Mayer D, Peters B 2009 Enhancing the nutritional value of bread with inulin. *Agro Food Industry Hi-Tech* 20(3) pp 48-50
51. Hager A S, Ryan L A M, Schwab C, Gänzle M G, O’Doherty J V, Arendt E K 2011 Influence of the soluble fibres inulin and oat  $\beta$ -glucan on quality of dough and bread. *European Food Research and Technology* 232 pp 405-413
52. Ilga Gedrovica I., , D. Karklina Influence of jerusalem artichoke powder on dough rheological properties. *Conference Proceedings 6th Baltic Conference on Food Science and Technology “Innovations for Food Science and Production” “FOODBALT-2011”*, May 5–6, 2011, Jelgava, Latvia, pag. 7-12
53. Karolini–Skaradzinska Z., Bihuniak P., Piotrowska E., Wdowik L. (2007) Properties of dough and qualitative characteristics of wheat bread with addition of inulin. *Pol. J. Food Nutr. Sci.*, Vol. 57, No. 4 (B), pp. 267–270

54. Hosney R. C., Rogers D. E. (1990) The formation and properties of wheat flour doughs. CRC critical reviews in food science and nutrition, vol. 29, n 2, pp. 73–93.;
55. Андреев А. Н. Влияние добавок топинамбура и продолжительности хранения на свойства клейковины и текстуру мякиша диетического хлеба // Материалы V Международной конференции «Низкотемпературные и пищевые технологии в XXI веке», СПбГУНиПТ, 2011. С.402-404.
56. Afshinpajouh R., S. Heydarian, M. Amini, E. Saadatmand and M. Yahyavi. Studies on physical, chemical and rheological characteristics of pasta dough influenced by inulin. African Journal of Food Science, Vol. 8(1), pp. 9-13, 2014
57. Peressini D, Sensidoni A (2009). Effect of soluble dietary fibre addition on rheological and breadmaking properties of wheat doughs. J. Cereal Sci. 49(2):190-201
58. Manno D, Filippo E, Serra A, Negro C, De Bellis L, Miceli A (2009). The influence of inulin addition on the morphological and structural properties of durum wheat pasta. Int. J. Food Sci. Technol. 44(11):2218-2224
59. Probert HM, Apajalahti JH, Rautonen N, Stowell J, Gibson GR (2004). Polydextrose, lactitol, and fructo-oligosaccharide fermentation by colonic bacteria in a three-stage continuous culture system. Appl. Environ. Microbiol. 70(8):4505-4511.
60. Özer D, Akin S, Özer B (2005). Effect of Inulin and Lactulose on Survival of Lactobacillus AcidophilusLA-5 and Bifidobacterium Bifidum BB-02 in Acidophilus-Bifidus Yoghurt. Food Sci. Technol. Int. 11(1):19-24.
61. Meyer, D., Bayarri, S., Tárrega, A. Costell, E. “Inulin as texture modifier in dairy products”, Foods Hydrocolloids, 2011, Vol. 25, pp.1881–1890.
62. Cardarelli, HR; Buriti, FCA; Castro, IA and Saad, SMI (2008). Inulin and oligofructose improve sensory quality and increase the probiotic viable count in potentially synbiotic petit-suisse cheese. LWT Food Sci. Technol., 41: 1037-1046.
63. Shah, NP (2007). Functional cultures and health benefits. Int. Dairy J., 17: 1262-1277.
64. Gibson, GR; Probert, HM; van Loo, J; Rastall, RA and Roberfroid, MB (2004). Dietary modulation of the human colonic microbiota: updating the concept of prebiotics. Nut. Res. Rev., 17: 259-275
65. Roberfroid, M (2000). Prebiotics and probiotics: are they functional foods?. Am. J. Clin. Nut., 71: 1682-1687
66. Guven, M; Yasar, K; Karaca, OB and Hayaloglu, AA (2005). The effect of inulin as a fat replacer on the quality of set-type low-fat yogurt manufacture. Int. J. Dairy Tech., 58: 180-184.



67. Mazloomi, S. M., Shekarforoush, S. S., Ebrahimnejad, H. and Sajedianfard, J. (2011). Effect of adding inulin on microbial and physico-chemical properties of low fat probiotic yogurt. *Iranian Journal of Veterinary Research*, Vol. 12, No. 2, Ser. No. 35, p.93-98
68. Aryana, KJ; Plauche, S; Rao, RM; McGrew, P and Shah, P (2007). Fat-free plain yogurt manufactured with inulins of various chain lengths and *Lactobacillus acidophilus*. *J. Food Sci.*, 72: 79-84.
69. Aryana, KJ and McGrew, P (2007). Quality attributes of yogurt with *Lactobacillus casei* and various prebiotics. *LWT Food Sci. Technol.*, 40: 1808-181
70. MONTANUCI F.V., T. C. PIMENTEL, S. GARCIA, S. H. PRUDENCIO.(2012). Effect of starter culture and inulin addition on microbial viability, texture, and chemical characteristics of whole or skim milk Kefir. *Ciênc. Tecnol. Aliment.*, Campinas, 32(4): 850-861
71. Akbari M., M. H.Eskandari, M. Niakosari, A. Bedeltavana. The effect of inulin on the physicochemical properties and sensory attributes of low-fat ice cream. *International Dairy Journal* Volume 57, June 2016, Pages 52-55
72. Akalin, A.S. and Erisir, D. “Effects of inulin and oligofructose on the rheological characteristics and probiotic culture survival in low-fat probiotic ice cream”, *Journal of Food Science*, Vol. 73 No.4, 2008, pp. 184-188.
73. Pandiyan, C., Annal, V. R., Kumaresan, G., Murugan, B.,Rajarajan, G “Effect of incorporation of inulin on the survivability of *Lactobacillus acidophilus* in synbiotic ice cream”, *International Food Research Journal*, . 2012, Vol. 19 No. 4, pp. 1729-1732.
74. El-Nagar, G., Clowes, G., Tudorica, C.M., Kuri, V., Brennan, C.S. “Rheological quality and stability of yog-ice cream with added inulin”. *International Journal of Dairy Technology*, Vol. 55 No. 2, 2002, pp. 89-93
75. 55 No. 2, 2002, pp. 89-93
76. J. MIOČINOVIĆ et al.: Development of low fat UF cheese technology, *Mljekarstvo* 61 (1), 33-44 (2011)
77. Šimunek, M., Evačić, S. (2009): Effect of inulin on the growth and survival of *Bifidobacterium longum* in fermented goat’s and cow’s milk. *Mljekarstvo* 59 (3), 209-216.
78. 209-216.
79. Niness, K.R. (1999): Inulin and Oligofructose: What Are They? *Journal of Nutrition* 129 (7), 1402-1406.

80. Hygreeva, D., Pandey, M.C. & Radhakrishna, K. (2014). Potential applications of plant based derivatives as fat replacers, antioxidants and antimicrobials in fresh and processed meat products. *Meat Science*, 98, 47-57.
81. Felisberto, M.H.F., Galvão, M.T.E.L., Picone, C.S.F., Cunha, R.L. & Pollonio, M.A.R. (2015). Effect of prebiotic ingredients on the rheological properties and microstructure of reduced-sodium and low-fat meat emulsions. *LWT - Food Science and Technology*, 60, 148-155.
82. Olmedilla-Alonso, B., Jiménez-Colmenero, F. & Sanchez-Muniz, F.J. (2013). Development and assessment of healthy properties of meat and meat products designed as functional foods. *Meat Science*, 95, 919-930.
83. Young, J.F., Therkildsen, M., Ekstrand, B., Che, B.N., Larsen, M.K., Oksbjerg, N., & Stagsted, J. (2013). Novel aspects of health promoting compounds in meat. *Meat Science*, 95, 904-911.
84. García, M.L., Cáceres, E. & Selgas, M.D. (2006). Effect of inulin on the textural and sensory properties of mortadella, a Spanish cooked meat product. *International Journal of Food Science and Technology*, 41, 1207-1215.
85. Brewer, M.S. (2012). Reducing the fat content in ground beef without sacrificing quality: A review. *Meat Science*, 91, 385-395
86. Álvarez, D. & Barbut, S. (2013). Effect of inulin,  $\beta$ -Glucan and their mixtures on emulsion stability, color and textural parameters of cooked meat batters. *Meat Science*, 94, 320-327.
87. Bodner, J.M. & Sieg, J. (2009). Fiber. In R. Tarté (Ed.), *Ingredients in meat products: properties, functionality and applications*, Springer Publishing, USA.
88. Coussement, P. & Franck, A. (2001). Inulin and oligofructose. In S. S. Cho & M.L. Dreher (Eds.), *Handbook of dietary fibre*, New York
89. Angiolillo, L., Conte, A. & Del Nobile, M.A. (2015). Technological strategies to produce functional meat burgers. *LWT - Food Science and Technology*, 62, 697-703.
90. Huang, S.C., Tsai, Y.F. & Chen, C.M. (2011). Effects of wheat fiber, oat fiber, and inulin on sensory and physico-chemical properties of Chinese-style sausages. *Asian-Australasian Journal of Animal Sciences*, 24, 875-880
91. Menegas, L.Z., Pimentel, T.C., Garcia, S. & Prudencio, S.H. (2013). Dry-fermented chicken sausage produced with inulin and corn oil: physicochemical, microbiological, and textural characteristics and acceptability during storage. *Meat Science*, 93, 501-506
92. CALCATINIUC, Dumitru; GRIȚCO, Cătălina; CHIRSANOVA, Aurica; BOIȘTEAN, Alina. The impact of organic food on the moldavan market. In: *Microbial Biotechnology*.

Ediția 4, 11-12 octombrie 2018, Chișinău. Chișinău, Republica Moldova: Institutul de Microbiologie și Biotehnologie, 2018, p. 76. ISBN 978-9975-3178-8-7.

[https://ibn.idsi.md/vizualizare\\_articol/72333](https://ibn.idsi.md/vizualizare_articol/72333)

93. Chirsanova Aurica, Reșitca Vladislav. Factori de bază ce influențează politicile alimentare și nutriționale la nivel internațional. *Meridian ingineresc*. Universtitatea Tehnică a Moldovei. Nr.3, 2013, ISSN 1683-853X. p.86-92. [https://ibn.idsi.md/ro/vizualizare\\_articol/27531](https://ibn.idsi.md/ro/vizualizare_articol/27531)
94. GÎNCU, Ecaterina; CHIRSANOVA, Aurica; POPA, Irina; CALCATINIUC, Dumitru. Proprietățile fizico-chimice a făinii de topinambur (*helianthus tuberosus*). Conferința tehnico-științifică a colaboratorilor, doctoranzilor și studenților 2016. P. 440-443. <http://repository.utm.md/handle/5014/1601>
95. Chirsanova, Aurica. Analiza senzorială a produselor lactate : Ciclul de prelegeri, Univ. Tehn. a Moldovei, Fac. Tehnol. și Manag. în Industria Alimentară, Cat. Tehnol. și Organiz. Alimentației Publice.- Ch.: U.T.M., 2009.
96. Chirsanova, Aurica, Vladislav Reșitca, Alina Boiștean, and Boaghi Eugenia Covaliov. "Influența condițiilor de păstrare asupra conținutului unor micotoxine în nuci." *Meridian Ingineresc* 3 (2013): 63-75.
97. Boiștean Alina, Chirsanova Aurica, POSSIBILITIES OF USING SOY PROTEINE ISOLATE FOR THE PACKAGING OF JUGLANS REGIA L. NUTS International Scientific Conference on Microbial Biotechnology 4th edition, Chisinau, Moldova, October 11-12, 2018 ,p.75, ISBN 978-9975-3178-8-7
98. Boiștean Alina, Chirsanova Aurica, Ciumac Jorj, The particularities of the clarification process with bentonite of the wine vinegar. The 9th international symposium. 5-6 september 2019, Galati, România, p. 60, ISSN 1843-5114.
99. Боиштян Алина,. Кирсанова Аурика. Влияние озонирования и технологических обработок на количество остаточных пестицидов в овощах. the 8th International Specialized Scientific and Practical Conference September 12, 2019 Kyiv, Ukraine , p.68, ISBN 978-966-612-227-1
100. Boiștean Alina, Chirsanova Aurica, Națibulina Maria. Influence of the edible coatings viscosity on organoleptic characteristics of walnut kernels. International Conference Modern Technologies in the Food Industry, Chisinau, Moldova, October 18-20, 2018, ISBN 978-9975-87-428-1 [https://ibn.idsi.md/sites/default/files/imag\\_file/113-114\\_5.pdf](https://ibn.idsi.md/sites/default/files/imag_file/113-114_5.pdf)
101. BOIȘTEAN Alina, CHIRSANOVA Aurica, Possibilities of using soy proteine isolate for the packaging of juglans regia l. nuts International Scientific Conference on Microbial

Biotehnologi 4th edition, Chisinau, Moldova, October 11-12, 2018, ISBN 978-9975-3178-8-7

102. Chirsanova Aurica, Reșitca Vladislav - Influence du teneur du calcium sur les proprietes de texture de fromage. International Conference Modern Technologies in the Industry-2016”, (MTFI-2016), ISBN 978-9975-80-645-9, p.211-216.
103. Gîncu Ecaterina, Chirsanova Aurica. Determinarea proprietăților fizico-chimică ale făinii de topinambur (*Helianthus Tuberosus*). Conferința "25 de ani de reformă economică în Republica Moldova: prin inovare și competitivitate spre progres economic" Chișinău, Moldova, 23-24 septembrie 2016. Pag. 323-326
104. Gheorghîța D., Martiney-Alonso S., CHIRSANOVA A. Substitution de la matière grasse dans un fromage crème au chocolat. Proceedings of the International Conference MODERN TRECHNOLOGIES, IN THE FOOD INDUSTRY- 2016, 20-22 October, 2016. p. 406-411
105. Micleușanu Sanda, Croguennec Thomas., CHIRSANOVA Aurica. L'imagerie de la micelle de caséine par microscopie à force atomique. Proceedings of the International Conference MODERN TRECHNOLOGIES, IN THE FOOD INDUSTRY- 2016, 20-22 October, 2016. p. 418-423
106. CHIORU Ana, PANAINTE Cristina, Irina POPA, Iana ȚISLINSCAIA, Aurica CHIRSANOVA. Bunele practici de instruire online. Enseignement mixte: motivation, attentes et perceptions des etudiants (temoignage). Conferința internațională CRUNT 2014. 24-27 septembrie 2014.
107. Gore E, Chirsanova A. La géosmine- molécule responsable du goût moisi-terreux des vins. Conferința tehnico-științifică a doctoranzilor, cercetătorilor și studenților. UTM, Chișinău. Volumul II. 2016, p.57.
108. Usatîi Agafia, Molodoi Elena, Moldoveanu Tamara, Topală Lilia, Calcatiniuc Aurica, Screeningul drojdiilor de perspectivă pentru biotehnologii de producere a sterolilor. Buletinul Academiei de Științe a Moldovei. Științele vieții. Nr.3. 2007. p.106-111.
109. Usatîi Agafia, Topală Lilia, Chirița Elena, Calcateniuc Aurica, Borisova Tamara. Productivitatea, lipidogeneza și carotenogeneza drojdiei *Rhodotorula gracilis*-CNM-YS-III/20 la cultivarea în prezența compușilor coordinativi ai Mo (IY). 2003.
110. Ciumac, Jorj; Reșitca, Vladislav; Chirsanova, Aurica; Capcanari, Tatiana; Boaghi. Eugenia. Общая технология пищевых производств. Chișinău, Editura „Tehnică – UTM”, 2019. – 435p. ISBN 978-9975-45-582-4. CZU 663/664(075.8), O-280. Coli de tipar 54,5.
111. Chirsanova, Aurica ; Capcanari, Tatiana ; Prelucrarea sanitară în cadrul unităților de alimentație publică. INSTRUCȚIUNI.Chișinău, Editura „Tehnică – UTM”, 2018. – 33p. ISBN

- 978-9975-45-559-6. CZU 613.6:663/664(083.13), C 45. Coli de tipar 4.125.
112. Ciumac, Jorj; Reșitca, Vladislav; Chirsanova, Aurica; Capcanari, Tatiana; Boaghi, Eugenia. Tehnologia generală a produselor alimentare. Îndrumar metodic pentru efectuarea lucrărilor de laborator. Chișinău, Editura „Tehnică – UTM”, 2019. – 147 p. ISBN 978-9975-45-586-2. CZU 663/664.0(076.5), T 32. Coli de tipar 9,18.
113. Paladi, Daniela; Chirsanova, Aurica ; Mija, Nina; Capcanari, Tatiana. Toxicologie și securitate alimentară. Îndrumar metodic pentru îndeplinirea lucrărilor de laborator. CHIȘINĂU: Editura „Tehnică – UTM”, 2017. - 45 p. Coli de tipar 2,8.
114. Popovici, Cristina ; Deseatnicova, Olga ; Chirsanova, Aurica. Tehnologia produselor alimentației publice : Culegere de fișe tehnologice / red. resp.: Cristina Popovici ; Univ. Teh.a Mold., Fac. Tehnol. Alimentelor, Dep. Alimentație și Nutriție. – Ch.: Tehnica – UTM, 2017.– 88 p.
115. Попович, К. Десятникова, О. И., Кирсанова А. И. Технология производства продукции общественного питания : Сб. технол. карт /отв. ред.: К. М. Попович ; Техн. Унив. Молдовы, Фак. Пищевых Технологий, Деп. Продовольствия и Питания – Ch.: Tehnica – UTM, 2017. – 91 p.
116. Turtă C., Mereacre V., Șova S., Prodiș D., Usafii A., Rudic V., Topală L., Calcatiniuc A. Trimetanol-hexakis- $\mu$ -tricloraacetato (O, O')- $\mu$ 3-oxo-difier(III) mangan(II), care manifestă proprietăți de stimulator al productivității biomasei de tulpini de drojdie din genul *Rhodotorula*. MD 2283 G2. Buletinul Oficial de Proprietate Industrială (BOPI), Chișinău, 2003.
117. Usafii A., Calcatiniuc A., Grosu L., Șirșov T. Procedeu de extracție a lipidelor din drojdie. MD 1930 G2. Buletinul Oficial de Proprietate Industrială (BOPI), Chișinău, 2002.
118. Usafii A., Calcatiniuc A., Șirșov T., Rudic V., Gulea A., Borisov T. Mediu nutritiv pentru cultivarea drojdiei *Sporobolomyces pararoseus*. MD 1328 G 2, 1999.09.30. Buletin Oficial de Proprietate Industrială (BOPI), Chișinău, 1999.
119. Usafii A., Borisov T., Calcatiniuc A., Șirșov T. Tulpina *Sporobolomyces pararoseus* – sursă de lipide. MD 892 G. Buletin Oficial de Proprietate Industrială (BOPI), Chișinău, 1997.
120. Jorj Ciumac, Aurica Chirsanova, Vladislav Reșitca. Technologie culinaire. ISBN 978-9975-87-563-9. 2020. CZU 641.5(075.8). Aporbat spre editare la Senatul UTM din 26.11.2019. 201 p.
121. Siminiuc R., Chirsanova A., Coșciug L. Research of quality changes of gluten-free cookies of sorghum flour (*Sorghum oryzoides*) during the storage, Papers of the Sibiu Alma Mater University Conference, Fifth Edition 24-26 March 2011, ISSN 2064-1423, 106-112 pag

122. Siminiuc, Rodica; Gutium, Olga; Reșitca, Vladislav; Chirsanova, Aurica. Analiza senzorială și controlul fizico-chimic al produselor alimentației publice. Savoarea. 75 p. Suport de curs. Chișinău Editura „Tehnica–UTM” 2016. Disponibil: <http://www.repository.utm.md/handle/5014/15390>
123. Siminiuc, Rodica; Coșciug, L. et al. The effect of dehulling and thermal treatment on the protein fractions in sorghum (*Sorghum oryzoidum*) grains (2012). *The Annals of the University Dunarea De Jos of Galati. Fascicle VI - Food Technology* 36 (1), p. 97-103. ISSN: 1843-5157.
124. Disponibil: <https://www.gup.ugal.ro/ugaljournals/index.php/food/article/view/2280>.
125. Siminiuc, Rodica. Distribuția granulometrică a făinii de soriz. Conferința jubiliară tehnico-științifică a colaboratorilor, doctoranzilor și studenților consacrată celei de-a 50-a aniversări a UTM., 20-21 octombrie 2014. V. 2, UTM. Chișinău: Tehnica\_UTM, 2015. Disponibil: <http://cris.utm.md/handle/5014/628>
126. Siminiuc, Rodica; Cosciug, Lidia. Impact of decortication of sorghum oryzoidum on glycemia. *Modern Technologies in the Food Industry*, 2018. p. 109-112.pdf. ISBN: 978-9975-87-428-1.
127. Gutium, Olga; Ciumac, Jorj; Siminiuc, Rodica. Proprietățile funcționale ale făinii de năut (*Cicer arietinum* l). *Modern Technologies in the Food Industry*, 2016. p.194-197. p.207-213. ISBN:978-9975-87-138 . Disponibil: [http://repository.utm.md/bitstream/handle/5014/6976/MTFI\\_2016\\_pg207-213.pdf?sequence=1&isAllowed=y](http://repository.utm.md/bitstream/handle/5014/6976/MTFI_2016_pg207-213.pdf?sequence=1&isAllowed=y)
128. Siminiuc, Rodica; Chirsanova, Aurica. L'impact de plantago ovata sur les indices de qualite des produits de boulangerie sans gluten. *Colloquium Francophone for Healthy LifeStyle of Youth*. Publication date 2018/5/31. Vol. 10. P.95. ISBN 978-973-744-672-5. [https://www.researchgate.net/profile/Alina\\_Petrache2/publication/330514840\\_HOMEOPATHY\\_COULD\\_BE\\_THE\\_SOLUTION/links/5c45abf3458515a4c7356d9b/HOMEOPATHY-COULD-BE-THE-SOLUTION.pdf#page=102](https://www.researchgate.net/profile/Alina_Petrache2/publication/330514840_HOMEOPATHY_COULD_BE_THE_SOLUTION/links/5c45abf3458515a4c7356d9b/HOMEOPATHY-COULD-BE-THE-SOLUTION.pdf#page=102).
129. Capcanari Tatiana. Tehnologii de obținere a emulsiilor alimentare din amestec de uleiuri de floarea-soarelui și semințe de struguri. Autoreferatul tezei de doctor în tehnică. Specialitatea 05.18.01 – Tehnologia produselor alimentare (Tehnologia produselor alimentației publice). Cu titlu de manuscris C.Z.U: 664.34:664.31. Chișinău, 2012
130. Tatiana Capcanari. КАПКАНАРЬ, Т. Изучение влияния общего содержания полифенолов на антиоксидантную активность экстрактов прясной зелени. В: Meridian

Ingineresc. 2010, nr. 3, pp. 74-70. ISSN 1683-853X

131. Tatiana Capcanari. Incorporation of sweet pepper extracts to improve thermal stability of vegetable oil mixtures. Journal Food and Environment Safety of Ștefan cel Mare University of Suceava. Food Engineering. ISSN:2068-6609. EX ISSN 1842-4597. Volume X, Issue 2 – 2011, pp.13-18. <http://www.fia.usv.ro/fiajournal/index.php/FENS/article/view/355/353>
132. Tatiana Capcanari, Olga Deseatnicov, Daniela Paladi, Natalia Suhodol. Programa și indicațiile metodice cu privire la desfășurarea practicii și susținerea raportului de către studenții ciclului I – Licență, specialitatea 541.1 Tehnologia Alimentației Publice. CHIȘINĂU: Editura „Tehnică – UTM”, 2017. - 54 p. Coli de tipar 3,25.
133. Camelia Vizireanu, Tatiana Capcanari, Rodica Dinică, Madalina Alexei, Livia Patrașcu. Prospects of using walnut (*Juglans Regia* L.) products to obtaining functional aliments. 79 Міжнародна наукова конференція молодих учених, аспірантів і студентів “Наукові здобутки молоді – вирішенню проблем харчування людства у XXI столітті” частина 1. 15 – 16 квітня 2013 р. Київ НУХТ 2013. Pp. 64-65.
134. Tatiana Capcanari, Daniela Istrati, Felicia Dima, Camelia Vizireanu. Prospect of using the mixtures of sunflower and walnut oils for production of functional mayonnaise emulsions. Journal of Agroalimentary Processes and Technologies. Timișoara. ISSN: 2069-0053 (print) (former ISSN: 1453-1399), Agroprint; ISSN (online): 2068-9551, 2015, pp. 296-301. [https://www.journal-of-agroalimentary.ro/admin/articole/4490346\\_A1\\_2014\\_Articol\\_Vizireanu\\_Capcanari\\_296-301.pdf](https://www.journal-of-agroalimentary.ro/admin/articole/4490346_A1_2014_Articol_Vizireanu_Capcanari_296-301.pdf)
135. Daniela Paladi, Tatiana Capcanari. Toxicologia și securitatea produselor alimentare. Note de curs, partea I. Chișinău, Editura „Tehnică – UTM”, 2019. – 84 p. ISBN 978-9975-45-584-8. CZU 615.9+614.31(075.8), P 14. Coli de tipar 5,25.
136. DESEATNICOV, Olga, STURZA, Rodica, POPOVICI, Cristina, SUHODOL, Natalia, CAPCANARI, Tatiana. Maioneză. Brevet MD 317, A23L 1/24, A23L 1/221. Universitatea Tehnică a Moldovei. Nr. depozit: s 2010 0143. Data depozit: 2010.09.10. Data public.: 2011.01.31. In: BOPI. 2011, nr. 1.
137. Violina Popovici, Oxana Radu, Viacheslav Hubenia, Eugenia Covaliov, Tatiana Capcanari, Cristina Popovici. Physico-chemical and sensory properties of functional confectionery products with Rosa Canina powder. Ukrainian Food Journal, Volume 8, Issue 4, 2019, ISSN 2313–5891 (Online) ISSN 2304–974X, p.815-827. DOI: 10.24263/2304-974X-2019-8-4-12  
<http://ufj.ho.ua/Archiv/UKRAINIAN%20FOOD%20JOURNAL%202019%20V.8%20Is.4.p>

[df](#)

138. Eugenia Boaghi, Tatiana Capcanari, Nina Mija, Olga Deseatnicova, Nicolae Opopol. The evolution of food products consumption in Republic of Moldova in the demographic transition period. Journal of Engineering Science. Chişinău, Vol. XXV, no. 4 (2018), pp. 74 – 81. ISSN 2587-3474. eISSN 2587-3482. [https://jes.utm.md/wp-content/uploads/sites/20/2019/03/JES-2018-4\\_74-81.pdf](https://jes.utm.md/wp-content/uploads/sites/20/2019/03/JES-2018-4_74-81.pdf)
139. RADU, Oxana, FUIOR, Adelina, CAPCANARI, Tatiana. The study of biological and nutritional potential of walnut oil. In: 79 Міжнародної наукової конференції молодих вчених, аспірантів і студентів «Наукові здобутки молоді – вирішенню проблем харчування людства у XXI столітті». 2013, Kiev, P. 1. pp. 472-473.
140. RADU, Oxana, CAPCANARI, Tatiana. Uleiul din semințe de struguri – produs de perspectivă în fabricarea alimentelor funcționale. In: Conferința Tehnico-Științifică a Colaboratorilor, Doctoranzilor și Studenților, Universitatea Tehnică a Moldovei, 15-17 noiembrie, 2012. Chişinău, 2013, vol. 2, pp. 99-102. ISBN 978-9975-45-249-6. ISBN 978-9975-45-251-9 (Vol.2).