



**Universitatea Tehnică a Moldovei**

**Tehnologia de fabricare a unor  
produse gelifiante funcționale cu  
coloranți naturali din surse  
autohtone**

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## **Rezumat**

Consumatorii de astăzi își doresc alimente sănătoase care oferă fitonutrienți pentru a promova sănătatea și bunăstarea fără a sacrifica gustul, textura sau comoditatea. Consumul de fructe și legume face parte din menținerea unui stil de viață sănătos, pentru diversificarea jeleurilor și promovarea alimentației sănătoase, s-a urmărit valorificarea unei materii prime precum gutuile și cătina alba. Scopul studiului a fost de a cerceta utilizarea potențială a unor fructe sau legume în bomboane de jaleu, prin analize fizico-chimice și acceptarea generală a consumatorilor.

În cadrul acestui studiu, bomboanele moi pe bază de gelatină au fost formulate utilizând diferite sucuri și adaosuri (măceș, cafea, cătină, gutui) în scopul creșterii valorii biologice a bomboanelor și în același timp folosind componente de culoare naturale.

De asemenea s-au efectuat și determinări ce țin de parametri fizico-chimici ai produselor noi elaborate, prin determinarea conținutului de umiditate, fermității, substanței uscate solubile, activitatea antiradicalică DPPH, vitamina C și conținutul total de fenoli. Totodată s-a studiat și influența încorporării ingredientelor ce conferă culoare asupra acestor parametri.

S-a stabilit că utilizarea unor ingrediente în rețetă, care reprezintă și sursă de coloranți naturali, contribuie nu doar la ameliorarea aspectului exterior, dar totodată contribuie și la creșterea valorii biologice a produselor exprimată prin conținut mai mare de vit. C, activitate antioxidantă sporită, gust deosebit, etc.

## **Abstract**

Nowadays consumers request healthful foods with a high biological value, that provide phytonutrients to promote good health and well-being without affecting taste, texture, or convenience. Consumption of fruits and vegetables is part of maintaining a healthy lifestyle, in order to diversification of jellies and promote healthy eating; the aim of the thesis was to valorization of the raw material such as quince and Sea buckthorns. The aim of the study was to investigate potential use of some fruits or vegetables in jelly candies, by physicochemical analyses and general consumer's acceptance.

In this study, the soft jellies based on gelatin were formulated using different juices and additions (apricots, coffee, sea bream, quince) in order to increase the biological value of the sweets and at the same time using natural color components.

Also, determinations were made regarding the physico-chemical parameters of the new products, by determining the moisture content, firmness, soluble dry matter, DPPH antiradical activity, vitamin C and total phenol content. At the same time, the influence of the incorporation of the ingredients that confer color on these parameters was studied.

It has been established that the use of ingredients in the recipe, which also represent a source of natural dyes, not only contributes to the improvement of the external appearance, but also contributes to the increase of the biological value of the products expressed through a higher content of cattle. C, increased antioxidant activity, great taste, etc.

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## BIBLIOGRAFIE

1. A. Cilla, A. Alegría, B. De Ancos et al., "Bioaccessibility of tocopherols, carotenoids, and ascorbic acid from milk- and soybased fruit beverages: Infuence of food matrix and processing," Journal of Agricultural and Food Chemistry, vol. 60, no. 29, pp. 7282–7290, 2012.
2. Sharma S., Dhaliwal Y.S., Kalia M. (1998): Candied apples: A new perspective. Journal of Food Science and Technology, 35: 79–82
3. A. Cilla, L. Bosch, R. Barbera, and A. Alegría, "Efect of processing on the bioaccessibility of bioactive compounds—a review focusing on carotenoids, minerals, ascorbic acid, tocopherols and polyphenols," Journal of Food Composition and Analysis, 2016
4. A. Kaulmann, C. M. Andre, Y.-J. Schneider, L. Hofmann, and T. Bohn, "Carotenoid and polyphenol bioaccessibility and cellular uptake from plum and cabbage varieties," Food Chemistry, vol. 197, pp. 325–332, 2016.
5. A. Wojdyło, J. Oszmianski, and P. Bielicki, "Polyphenolic composition, antioxidant activity, and polyphenol oxidase (PPO) activity of quince (*Cydonia oblonga* Miller) varieties," Journal of Agricultural and Food Chemistry, vol. 61, no. 11, pp. 2762–2772, 2013.
6. Adehbi, F.; Hasib, A.; Quatmane, A.; Elbatal, H.; Jausad, A. Physicochemical Characteristics of Moroccan Prickly Pear Juice (*Opuntia ficusindica* L.). International Journal of Emerging Technology and Advanced Engineering 2014, 4, 300–306.
7. Ali, N.Y.; Abbas, A.; Ali, M.; Shahnawaz, N.; Hussain, A. Physico-chemical Nutritional and Sensory Evaluation of Local Quince Fruit of Nomal Village, Gilgit - Baltistan, Pakistan. International Journalof Nutritionand Food Science 2015, 4, 600–608.
8. Amiri ME. The status of genetic resources of deciduous, tropical, and subtropical fruit species in Iran. Acta Hort 2008; 769: 159-67.
9. Andrade PB, Carvalho ARF, Seabra RM, Ferreira MA. A previous study of phenolic profiles of quince, pear, and apple purees by HPLC diode array detection for the evaluation of quince puree genuineness. J Agric Food Chem 1998; 46: 968-72.
10. Ashraf, M.U.; Muhammad, G.; Hussain, M.A.; Bukhari, S.N. A. *Cydonia oblonga*: A Medicinal Plant Rich in Phytonutrients for Pharmaceuticals. International Journal Food Research 2016, 7, 1–20.
11. Aslam M, Sial AA. Effect of hydroalcoholic extract of *Cydonia oblonga* Miller (Quince) on sexual behaviour of Wistar rats. Adv Pharma Sci 2014; 2014: 282698.
12. Aslan S, Lu H. On the sensitivity of ASL MRI in detecting regional differences in cerebral blood flow. Magn Reson Imaging 2010; 28(7): 928-35.
13. B. Guldiken, G. Toydemir, K. Nur Memis, S. Okur, D. Boyacioglu, and E. Capanoglu, "Home-processed red beetroot (*Beta vulgaris* L.) products: changes in antioxidant properties and bioaccessibility," International Journal of Molecular Sciences, vol. 17, no. 6, article 858, 2016.
14. B. M. Silva, P. B. Andrade, A. C. Gonçalves, R. M. Seabra, M. B. Oliveira, and M. A. Ferreira, "Infuence of jam processing upon the contents of phenolics, organic acids and free amino acids in quince fruit (*Cydonia oblonga* Miller)," European Food Research and Technology, vol. 218, no. 4, pp. 385–389, 2004.
15. B. M. Silva, P. B. Andrade, F. Ferreres, A. L. Domingues, R. M. Seabra, and M. A. Ferreira, "Phenolic profile of quince fruit (*Cydonia oblonga* Miller) (pulp and peel)," Journal of Agricultural and Food Chemistry, vol. 50, no. 16, pp. 4615–4618, 2002.
16. B. M. Silva, P. B. Andrade, P. Valentao, F. Ferreres, R. M. Seabra, and M. A. Ferreira, "Quince (*Cydonia oblonga* Miller) fruit (pulp, peel, and seed) and Jam: antioxidant activity," Journal of Agricultural and Food Chemistry, vol. 52, no. 15, pp. 4705–4712, 2004.

17. Badan Standarisasi Nasional (BSN ). (2008 ). SNI 3547.1.2008. Bonbon-Section 1 : Hardness, Badan Standarisasi Nasional, Jakarta.
18. C. A. Torres, L. A. Romero, and R. I. Diaz, "Quality and sensory attributes of apple and quince leathers made without preservatives and with enhanced antioxidant activity," *LWT—Food Science and Technology*, vol. 62, no. 2, pp. 996–1003, 2015.
19. Naama j, Alwan G, Obayes H, Al-Amiry A, Al-Temimi A, Kadhum A, et al. Curcuminoids as antioxidants and theoretical study of stability of curcumin isomers in gaseous state. *Research on Chemical Intermediates*. 2013; 39(9): 4047.
20. C. Kaur and H. C. Kapoor, "Antioxidants in fruits and vegetables. Te millennium's health," *International Journal of Food Science and Technology*, vol. 36, no. 7, pp. 703–725, 2001.
21. Catunescu, C.M., Tofana, M., Muresan, C., Ranga, F., David, A., Muntean, M. (2012). The effect of cold storage on some Quality Characteristics of Minimally Processed parsley (*Petroselinum Crispum*), Dill (*Anethum graveolens*) and Lovage (*Levisticum officinale*), *Bulletin USAMV, Agriculture Volume* 69 (2):213-221.
22. Costa RM, Magalhães AS, Pereira JA, Andrade PB, Valentão P, Carvalho M, et al. Evaluation of free radical-scavenging and antihemolytic activities of quince (*Cydonia oblonga*) leaf: a comparative study with green tea (*Camellia sinensis*). *Food Chem Toxicol* 2009; 47(4): 860-5.
23. D. Saha, P. Alluri, and A. Gan, "Prioritizing Highway Safety Manual's crash prediction variables using boosted regression trees," *Accident Analysis & Prevention*, vol. 79, pp. 133–144, 2015.
24. De Bruin D, Baars E. Citrus/Cydonia comp. use in general practice. A survey among anthroposophic physicians. Driebergen: Louis Bolk Instituut; 2001.
25. De Tommasi N, De Simone F, Pizza C, Mahmood N. New tetracyclic sesterterpenes from *Cydonia vulgaris*. *J Nat Prod* 1996; 59: 267-70.
26. Desrosier, NormanW. 2008. *Teknologi Pengawetan Pangan*. Jakarta: Penerbit Universitas Indonesia (UI-Press).
27. Duke JA, Bogenschutz-Godwin MJ, duCellier J, Duke PA. *Handbook of medicinal herbs*. 2nd ed. Boca Raton: CRC Press; 2002, p. 605.
28. Erdoğan T, Gönenç T, Hortoğlu ZS, Demirci B, Başer KH Kılçak B. Chemical composition of the essential oil of quince (*Cydonia oblonga* Miller) Leaves. *Med Aromat Plants* 2012; 1: 134.
29. Fattouch S, Caboni P, Coroneo V, Tuberoso CI, Angioni A, Dessi S, et al. Antimicrobial activity of Tunisian quince (*Cydonia oblonga* Miller) pulp and peel polyphenolic extracts. *J Agric Food Chem* 2007; 55(3): 963-9.
30. Ferreres F, Silva BM, Andrade PB, Seabra RM, Ferreira MA. Approach to the study of C-glycosyl flavones by ion trap HPLCPAD-ESI/MS/MS: application to seeds of quince (*Cydonia oblonga*). *Phytochem Anal* 2003; 14(6): 352-9.
31. Fisher, E.L. (2011). Physicochemical Characterization of a Novel Strawberry Confection for Delivery of Fruit Bioactives to Human Oral Mucosa ,Thesis, Graduate School of The Ohio State University.
32. Ghazarian B. *Simply quince*. Monterey: Mayreni Publishing; 2009, p. 216.
33. Habilla, C., Slim, S.Y., Nor Azizah, & Cheng, L.H. (2011). The properties of jelly candy made of acid-thinned starch supplemented with konjac glucomannan or Psyllium Husk Powder. *International Food Research Journal*, 18, 213-220.
34. Hambali. E., A. Suryani dan Wadli. *Membuat Aneka Olahan Rumput Laut*. Jakarta: Penebar Swadaya. 2004.
35. Hamid, R.G.; Khadijeh, A.H. Drying Method Effect on the Antioxidant of Quince (*Cydonia oblonga*) Tea. *Acta Scientiarum Polonorum Technologia Alimentaria* 2014, 13, 129–134.
36. Hidayat, Nur dan Ken Ikartziana. *Membuat Permen Jelly*. Surabaya: Trubus Agrisarana. 2004.

37. J. Elith, J. R. Leathwick, and T. Hastie, "A working guide to boosted regression trees," *Journal of Animal Ecology*, vol. 77, no. 4, pp. 802–813, 2008.
38. Jaswir I. Memahami Gelatin. Artikel Iptek.<http://www.duniapangankita.file.wordpress.com/gelatin.pdf>. 2007.
39. Kader, A.A.; Influence of Preharvest and Postharvest Environmental on Nutritional Composition of Fruits and Vegetable. *Journal of Horticulture and Human Health* 1998, 4, 18–32.
40. Khoubnasabjafari, M.; Jouyban, A. A Review of Phytochemistry and Bioactivity of Quince (*Cydonia oblonga*) Fruit. *Journal of Medicinal Plants Research* 2011, 5, 3577–3594.
41. Kirtikar KR, Basu BD. Indian medicinal plants. Vol. 3. Dehradun: International book distributors; 1999, p. 985-6.
42. Koswara, Sutrisno. Teknologi Pembuatan Permen. Ebookpangan. 2009.
43. Legua P, Serrano M, Melgarejo P, Valero D, Martínez JJ, Martinez R, et al. Quality parameters, biocompounds and antioxidant activity in fruits of nine quince (*Cydonia oblonga* Miller) accessions. *Sci Hortic* 2013; 154: 61-5.
44. M. S. Lingua, M. P. Fabani, D. A. Wunderlin, and M. V. Baroni, "From grape to wine: Changes in phenolic composition and its influence on antioxidant activity," *Food Chemistry*, vol. 208, pp. 228–238, 2016.
45. M. V. Baroni, R. D. Di Paola Naranjo, C. Garc'ia-Ferreyra, S. Otaiza, and D. A. Wunderlin, "How good antioxidant is the red wine? Comparison of some in vitro and in vivo methods to assess the antioxidant capacity of Argentinean red wines," *LWT—Food Science and Technology*, vol. 47, no. 1, pp. 1–7, 2012.
46. Magalhces, A.; Silva, B.; Pereira, J.; Paula, B.; Andrade, P.; Valentco, P.; Carvalho, M. Protective Effect of Quince (*Cydonia oblonga*) Fruit against Oxidative Hemolysis of Human Erythrocytes. *Food Chemistryand Toxicology* 2009, 47, 1372–1377. DOI: 10.1016/j.fct.2009.03.017.
47. Marwat, S.K.; Khan, M.A.; Ahmad, M.; Zafar, M.; Rehman, F.; Sultana, S. Fruit Plant Species Mentioned in the Holy Quran and Ahadith and Their Ethnomedicinal Importance. *Journal of Agricultureand Environmental Sciences* 2009, 5, 284–295.
48. N. Miletic, O. Mitrovic, B. Popovic, V. Nedovic, B. Zlatkovic, and M. Kandic, "Polyphenolic content and antioxidant capacity in fruits of plum (*Prunus domestica L.*) Cultivars 'Valjevka' and 'Mildora' as influenced by air drying," *Journal of Food Quality*, vol. 36, no. 4, pp. 229–237, 2013
49. N. S. Podio, M. V. Baroni, and D. A. Wunderlin, "Relation between polyphenol profile and antioxidant capacity of different Argentinean wheat varieties. A Boosted Regression Trees study," *Food Chemistry*, vol. 232, pp. 79–88, 2017.
50. N. S. Podio, R. Lopez-Froil ' an, E. Ramirez-Moreno et al., ' "Matching in vitro bioaccessibility of polyphenols and antioxidant capacity of soluble coffee by boosted regression trees," *Journal of Agricultural and Food Chemistry*, vol. 63, no. 43, pp. 9572–9582, 2015.
51. Oktavianti, S. (2003). Study of formulation and product texture on making brown sugar chewy candy. Bachelor's Thesis. Fakultas Teknologi Pertanian, Institut Pertanian Bogor, Bogor.
52. Oliveira AP, Pereira JA, Andrade PB, Valentão P, Seabra RM, Silva BM. Phenolic profile of *Cydonia oblonga* Miller leaves. *J Agric Food Chem* 2007; 55(19): 7926-30.
53. Oliveira AP, Pereira JA, Andrade PB, Valentão P, Seabra RM, Silva BM. Organic acids composition of *Cydonia oblonga* Miller leaf. *Food Chem* 2008; 111: 393-9.
54. Oliveira, A.P.; Perera, J.A.; Andrade, P.B.; Valento, P.; Seabra, R.M.; Silva, B.M. Phenolic Profile of Quince (*Cydonia oblonga*) Leaf. *Journal of Agriculture and Food Chemistry* 2007, 55, 7926–7930. DOI: 10.1021/jf0711237.

55. Postman J, Hummer K, Stover E, Krueger R, Forsline P, Grauke LJ, et al. Fruit and nut genebanks in the U.S. National Plant Germplasm System. *HortScience* 2006; 41(5): 1188-94.
56. Postman J. *Cydonia oblonga*: the unappreciated quince. *Arnoldia* 2009; 67(1): 2-9.
57. Prajapati ND, Purohit SS, Sharma AK, Kumar T. A handbook of medicinal plants. Jodhpur: Agrobios; 2007; p. 184.
58. Pranata, Sinung., Purwajatiningsinh, Ekawati, Oktaviana Putri. Kualitas Permen Jelly dari Albedo Kulit Jeruk Bali dan Rosela dengan Penambahan Sorbitol. Fakultas Teknobiologi Universitas Atma Jaya Yogyakarta. 2010
59. Rop, O.; Balik, J.; Reznicek, V.; Jurikova, T.; Skardova, P.; Salas, P.; Sochor, J.; Mlcek, J.; Kramarova, D. Chemical Characteristics of Fruits of Some Selected Quince (*Cydonia oblonga*) Cultivars. *Czech Journal of Food Science* 2011, 29, 65–73. DOI: 10.17221/212/2009-CJFS.
60. Rumpunen K, Kvilklys D. Combining ability and patterns of inheritance for plant and fruit traits in Japanese quince (*Chaenomeles japonica*). *Euphytica* 2003; 132: 139-49.
61. S. Kamiloglu, A. A. Pasli, B. Ozcelik, J. Van Camp, and E. Capanoglu, “Colour retention, anthocyanin stability and antioxidant capacity in black carrot (*Daucus carota*) jams and marmalades: efect of processing, storage conditions and in vitro gastrointestinal digestion,” *Journal of Functional Foods*, vol. 13, pp. 1–10, 2015.
62. S. Rohn, H. M. Rawel, and J. Kroll, “Antioxidant activity of protein-bound quercetin,” *Journal of Agricultural and Food Chemistry*, vol. 52, no. 15, pp. 4725–4729, 2004.
63. Schucha MW, Cellinib A, Masiab A, Marino G. Aluminium-induced effects on growth, morphogenesis and oxidative stress reactions in in vitro cultures of quince. *Sci hort* 2010; 125: 151-8.
64. Setyaningsih, D., Apriyantono, P. & Sari, M. *Analisis Pangan Sensori Untuk Industri Pangan Dan Argo*. Bogor: IPB Press. 2010.
65. Sharma R, Joshi VK, Rana JC. Nutritional composition and processed products of quince (*Cydonia oblonga* Mill). *Indian J Nat Prod Res* 2011; 2: 354-7.
66. Shinomiya, F.; Hamauza, Y.; Kawahara, T. Anti-allergic Effect of a Hot Extract of Quince (*Cydoniaoblonga*). *Bioscience Biotechnology and Biochemistry* 2009, 73, 1773–1778. DOI: 10.1271/bbb.90130. 2326 M. RASHEED ET AL.
67. Sholekhudin, M. Menu Sehat. Edisi 10/V/07 (<http://kesehatanvegan.com/2010/01/29/pilih-yang-segar-diblender-ataudijus>). 2010.
68. Silva BM, Andrade PB, Ferreres F, Seabra RM, Oliveira MB, Ferreira MA. Composition of quince (*Cydonia oblonga* Miller) seeds: phenolics, organic acids and free amino acids. *Nat Prod Res* 2005; 19(3): 275-81.
69. Silva BM, Casal S, Andrade PB, Seabra RM, Oliveira MB, Ferreira MA. Free amino acid composition of quince (*Cydonia oblonga* Miller) fruit (pulp and peel) and jam. *J Agric Food Chem* 2004; 52(5): 1201-6.
70. Silva BM, Valentão P, Seabra RM. Quince (*Cydonia oblonga* Miller): an interesting dietary source of bioactive compounds. In: Papadopoulos KN, editor. *Food chemistry research developments*. New York: Nova Science Publishers, Inc.; 2008, p. 243-66.
71. Sularjo. Pengaruh Perbandingan Gula Pasir dan Daging Buah Terhadap Kualitas Permen Pepaya. Universitas Widya Dharma Klaten. 2010.
72. Sykes JT. A description of some quince cultivars from Western Turkey. *Econ Bot* 1972; 26: 21-31.
73. Traxler, Hans. (1993). *The Life and Times Of Gummy Bears*. Harper Collins.
74. U. M. Acuna, D. E. Atha, J. Ma, M. H. Nee, and E. J. Kennelly, “Antioxidant capacities of ten edible North American plants,” *Phytotherapy Research*, vol. 16, no. 1, pp. 63–65, 2002.

75. Utomo, B.S.B., Darmawan, M., Rahman, A.H., Ardi, D.T. (2014). Physicochemical properties and sensory evaluation of jelly candy made from different ratio of carrageenan and konjac, Squalen Bulletin of Marine & Fisheries Postharvest & Biotechnology, 9(1):25-34.
76. Viskelis, J.; Bobinaite, R.; Shalkevich, M.; Pigul, M.; Urbonaviciene, D. Biochemical Composition and Antioxidant Activity of Japanese Quince (*Chaenomeles japonica*) Fruit, Their Syrup and Candied Fruit Slices. Sodininkysteir Darzininkyste 2014, 33, 1–2.
77. Wahyuni, R. Pemanfaatan Dan Pengolahan Kulit Buah Naga Super Merah. Skripsi Universitas Brawijaya. Malang. 2010.
78. Wijayakusuma, Hembing. Ramuan Lengkap Herbal Taklukkan Penyakit. Jakarta: Pustaka Bunda. 2008.
79. Winarno, F. G. Kimia Pangan dan Gizi. Jakarta: Gramedia. 2004
80. Wirakusumah, Emma. Jus Buah dan Sayuran. Jakarta: Penebar wadaya. 2005.
81. Z. He, Y. Tao, M. Zeng et al., "High pressure homogenization processing, thermal treatment and milk matrix affect in vitro bioaccessibility of phenolics in apple, grape and orange juice to different extents," Food Chemistry, vol. 200, pp. 107–116, 2016.
82. Suryanarayana, Ravishankar, Muninarayana Chandrappa, and R. Santhosh. "Awareness of use of artificial colourants in sweets preparation and their harmful effects." International Journal Of Community Medicine And Public Health 4.10 (2017): 3893-3898.
83. Sahar SA, Soltan, Manal ME, Shehata M. The Effects of Using Colour Foods of Children on Immunity Properties and Liver, Kidney on Rats. Food Nutrition Sci. 2012;3:897-904.
84. Joshi P, Jain S, Sharma. Acceptability assessment of yellow colour obtained from turmeric in food products and at consumer level. As J Food Ag-Ind. 2011;4:1-15.
85. Nidasaleem, Umar ZN, Khan SI. Survey on the use of synthetic food colours in food samples procured from different educational institutes of Karachi city. J Tropical Life Sci. 2013;3:1-7.
86. Roy K, Gullapalli S, Chaudhary UR, Chakraborty R. The use of a natural colorant based on betalain in the manufacture of sweet products in India. Int J Food Sci Tech. 2004;39:1087–91.
87. Lakshmi CG. Food colouring: The natural way. Research J Chem Sci. 2014;4:87-96.
88. Downham, Alison, and Paul Collins. "Colouring our foods in the last and next millennium." International journal of food science & technology 35.1 (2000): 5-22.
89. Mehta. U., S. Bajaj. 1984. Changes in the chemical composition and organoleptic quality of citrus peel candy during preparation and storage. J Food Sci Technol 21:422–424
90. Kadhum A, Al-Amiery A, Musa A, Mohamad A. The Antioxidant Activity of New Coumarin Derivatives. Int J Mol Sci. 2011; 12(9): 5747–5761. pmid:22016624
91. ГОСТ 6442-89. Мармелад. Технические условия
92. Boiștean Alina, Chirsanova Aurica, Ciumac Jorj, The particularites 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.
93. 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.ids.md/sites/default/files/imag\\_file/113-114\\_5.pdf](https://ibn.ids.md/sites/default/files/imag_file/113-114_5.pdf)
94. Boiștean Alina, Chirsanova Aurica, POSSIBILITIES OF USING SOY PROTEINE ISOLATE FOR THE PACKAGING OF JUGLANS REGIA L. NUTS International Scientific Conference on Microbial Biotechnologgi 4th edition, Chisinau, Moldova, October 11-12, 2018 ,p.75, ISBN 978-9975-3178-8-7

95. BOIȘTEAN Alina, CHIRSANOVĂ Aurica, Possibilities of using soy protein isolate for the packaging of juglans regia l. nuts International Scientific Conference on Microbial Biotechnology 4th edition, Chisinau, Moldova, October 11-12, 2018, ISBN 978-9975-3178-8-7
96. CALCATINIUC, Dumitru; GRÎTCO, Cătălina; CHIRSANOVĂ, Aurica; BOIȘTEAN, Alina. The impact of organic food on the moldovan 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)
97. CHIORU Ana, PANAINTE Cristina, Irina POPA, Iana ȚISLINSCAI, Aurica CHIRSANOVĂ. Bunele practici de instruire online. Enseignement mixte: motivation, attentes et perceptions des étudiants (témoignage). Conferința internațională CRUNT 2014. 24-27 septembrie 2014.
98. Chirisanova Aurica, Reșitca Vladislav - Influence du teneur du calcium sur les propriétés de texture de fromage. International Conference Modern Technologies in the Industry-2016", (MTFI-2016), ISBN 978-9975-80-645-9, p.211-216.
99. Chirisanova Aurica, Reșitca Vladislav. Factori de bază ce influențează politicile alimentare și nutriționale la nivel internațional. Meridian ingineresc. Univestitatea 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)
100. Chirisanova, 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.
101. Chirisanova, Aurica. Analiza senzorială a produselor lactate : Ciclu de prelegeri, Univ. Tehn. a Moldovei, Fac. Tehnol. și Manag. în Industria Alimentară, Cat. Tehnol. și Organiz. Alimentației Publice.- Ch.: U.T.M., 2009.
102. Ciumac, Jorj; Reșitca, Vladislav; Chirisanova, 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.
103. Chirisanova, Aurica ; Capcanari, Tatiana ; Prelucrarea sanitată în cadrul unităților de alimentație publică. INSTRUCTIUNI.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.
104. Ciumac, Jorj; Reșitca, Vladislav; Chirisanova, Aurica; Capcanari, Tatiana; Boaghi, Eugenia. Tehnologia generală a produselor alimentare. Îndrumar metodice 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.
105. Paladi, Daniela; Chirisanova, Aurica ; Mija, Nina; Capcanari, Tatiana. Toxicologie și securitate alimentară. Îndrumar metodice pentru îndeplinirea lucrărilor de laborator. CHIȘINAU: Editura „Tehnică – UTM”, 2017. - 45 p. Coli de tipar 2,8.
106. Popovici, Cristina ; Deseatnicova, Olga ; Chirisanova, Aurica. Tehnologia produselor alimentației publice : Culegere de fișe tehnologice / red. resp.: Cristina Popovici ; Univ. Tehn. Mold., Fac. Tehnol. Alimentelor, Dep. Alimentație și Nutriție. – Ch.: Tehnica – UTM, 2017.– 88 p.
107. 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 р.
108. Gheorghita D., Martiney-Alonso S., CHIRSANOVĂ A. Substitution de la matière grasse dans un fromage crème au chocolat. Proceedings of the International Conference MODERN TECHNOLOGIES, IN THE FOOD INDUSTRY- 2016, 20-22 October, 2016. p. 406-411
109. Gîncu Ecaterina, Chirisanova 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
- 110.GÎNCU, Ecaterina; CHIRSANOVА, Aurica; POPA, Irina; CALCATICIUC, Dumitru. Proprietățile fizico-chimice a făinii de topinambur (*helianthus tuberosus*). Conferința tehnico-științifică a colaboratorilor, doctoranzilor și studenților 2016. P. 440-443.
- 111.Gore E, Chirisanova 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.
- 112.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)
- 113.<http://repository.utm.md/handle/5014/1601>
- 114.Jorj Ciumac, Aurica Chirisanova, 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.
- 115.Micleușanu Sanda, Croguennec Thomas., CHIRSANOVА Aurica. L'imagerie de la micelle de caséine par microscopie à force atomique. Proceedings of the International Conference MODERN TECHNOLOGIES, IN THE FOOD INDUSTRY- 2016, 20-22 October, 2016. p. 418-423
- 116.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>
- 117.Siminiuc, Rodica; Chirisanova, Aurica. L'impact de plantago ovata sur les indices de qualité 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).
- 118.Siminiuc, Rodica; Coșciug, 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.
- 119.Siminiuc, Rodica; Coșciug, L. et al. The effect of dehulling and thermal treatment on the protein fractions in soryz (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. Disponibil: <https://www.gup.ugal.ro/ugaljournals/index.php/food/article/view/2280>.
- 120.Siminiuc, Rodica; Gutium, Olga; Reșitca, Vladislav; Chirisanova, 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>
- 121.SiminiucR., Chirisanova A., Coșciug L. Research of quality changes of gluten-free cookies of soryz flour (Sorghum oryzoidim) during the storage, Papers of the Sibiu Alma Mater University Conference, Fifth Edition 24-26 March 2011, ISSN 2064-1423, 106-112 pag
- 122.Turtă C., Mereacre V., Șova S., Produis D., Usatîi A., Rudic V., Topală L., Calcatiniuc A. Trimetanol-hexakis- $\mu$ -tricloracetato (O, O')- $\mu$ 3-oxo-difier(III) mangan(II), care manifestă proprietăți de stimulator al productivității biomasei de tulpini de drojdii din genul Rodotorula. MD 2283 G2. Buletinul Oficial de proprietate Industrială (BOPI), Chișinău, 2003.

- 123.Usatîi A., Borisov T., Calcatiniuc A., Şirşov T. Tulpina Sporobolomyces pararoseus – sursă de lipide. MD 892 G. Buletin Oficial de Proprietate Industrială (BOPI), Chişinău, 1997.
- 124.Usatîi A., Calcatiniuc A., Grosu L., Şirşov T. Procedeu de extracţie a lipidelor din drojdiei. MD 1930 G2. Buletinul Oficial de Proprietate Industrială (BOPI), Chişinău, 2002.
- 125.Usatîi A., Calcatiniuc A., Şirşov 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), Chişinău, 1999.
- 126.Usatîi Agafia, Molodoi Elena, Moldoveanu Tamara, Topală Lilia, Calcatiniuc Aurica, Screningul drojdiilor de perspectivă pentru biotehnologii de producere a sterolilor. Buletinul Academiei de Științe a Moldovei. Științele vieții. Nr.3. 2007. p.106-111.
- 127.Usatîi Agafia, Topală Lilia, Chiriță 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.
- 128.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