ХАРЧОВІ ТЕХНОЛОГІЇ

DOI: https://doi.org/10.32782/2708-4949.3(17).2025.1

UDC 658.6:336.43

Artem Antonenko, Larisa Bal-Prylypko
National University of Life and Environmental Sciences of Ukraine

TECHNOLOGY OF EGG-OIL SAUCE USING DIETARY ADDITIVES

The article presents an innovative technology for creating an egg-butter sauce "Avocado" using dietary supplements, in particular gum arabic and avocado fruit oil, which allows to increase the nutritional value and functional properties of the product compared to traditional technology. The classic sauce "Polish" was used as a control sample. As part of experimental studies, butter was partially replaced with avocado oil, which contains monounsaturated fatty acids, vitamins (E, K) and antioxidants. The article describes the raw materials used to create the sauce and indicates the percentage of butter replacement with avocado oil. The use of gum arabic as a natural stabilizer helps to improve the consistency of the sauce, preventing emulsion stratification, and increases its organoleptic characteristics. The conducted studies have shown that the addition of gum arabic and avocado oil maintains the technological stability of production and improves the chemical composition of the product. The article calculates a comprehensive quality indicator for the "Avocado" sauce, which includes an assessment of organoleptic, physicochemical and biological characteristics. The results of the research confirm that the "Avocado" sauce exceeds the traditional "Polish" sauce in biological value due to the higher content of useful nutrients. The optimal amount of dietary additives (gum arabic and avocado oil) was experimentally determined, which ensures the stability of the technological process without a negative impact on the quality of the finished product. The chemical composition of the "Avocado" sauce was analyzed, and its advantages were substantiated in terms of nutritional value and functionality. The sauce is recommended for introduction into production, in particular in catering establishments, due to its versatility and compliance with modern requirements for healthy eating. The product is useful for people living in environmentally polluted regions, working in harmful industries, as well as for all segments of the population, including those who adhere to a diet. The developed sauce "Avocado" meets the established quality standards, which is confirmed by the results of laboratory research. Introduction into production will contribute to the expansion of the range of functional products that meet modern trends in healthy eating and have the potential for wide application in cooking. The article also provides a technology for the production of sauce, which can be used to scale up production and adapt the recipe in different conditions.

Keywords: *sauce, oil, gum arabic, nutritional value, technology, functional product, dietary supplements.*

Statement of the problem and its relevance. Food quality is a set of properties of goods that determine their suitability to meet certain human needs. The quality of food products depends on factors in the field of production and conditions for growing plant products, the quality of raw materials, semi-finished products, their processing technology, equipment; factors in the field of distribution – the quality of storage, transportation, sales; factors in the field of consumption – the quality of short-term storage, consumption and assimilation [1–3].

International experience shows that the most effective and appropriate from an economic, social, hygienic and technological point of view measure for a radical solution to the problem is the development and establishment of production of various special food products, which are additionally enriched with deficient nutrients to a level that meets the physiological needs of a person [4].

Experts from the World Health Organization have proven that approximately 50% of human health is determined by a lifestyle characterized by the quality of nutrition, intensity of physical activity, place and natural climatic conditions of residence, habits, living and working conditions. The main violations of the nutritional status of various population groups in Ukraine include a deficiency of complete proteins, polyunsaturated fatty acids, dietary fiber, excessive consumption of simple, quickly digestible sugars, and a low content of vitamins, macro- and microelements in diets [5].

Analysis of recent research and publications. The development of special food products is currently a promising direction in the field of creating new types of products by regulating the content of essential substances in them. Functional products should enrich the diet of the population with physiologically active ingredients, because the biological value of food is determined precisely by the content of proteins, fats, carbohydrates, vitamins, minerals, organic acids, fiber, availability and digestibility of components [1, 2].

Research on egg-butter sauce technologies using dietary supplements is actively developing, especially in the context of healthy eating and expanding the range of sauces. Foreign scientists focus on the development and research of functional foods.

Garcia M.C.'s research shows that the use of avocado oil significantly improves not only the organoleptic characteristics, but also the chemical composition of the developed sauce. The introduction of additives rich in

minerals and vitamins allows you to increase the content of vitamins and minerals in sauces [6].

McClements D.J.'s research focuses on the development of innovative technologies for health food products based on fruit and vegetable raw materials. Also on the development of innovative technologies for new natural flavoring and aromatic additives [7].

Weiss J. is investigating the creation of products with specified consistency indicators, convenient for their further use. Also investigates the creation of food products to ensure multifunctional use and expansion of the range [8].

Dickinson E., Friberg S.E., Larsson K. and Holmberg K. investigate the enhancement of the nutritional and biological value of the finished product by adding additional ingredients [9, 10].

The purpose of the article. The purpose of the work is to scientifically substantiate and develop the technology of Polish sauce using gum arabic, avocado fruit oil and study its quality.

The object of the study is the technology of sauce with gum arabic and avocado fruit oil.

The subject of the study is Polish sauce, avocado fruit oil (TU U 24.6-33398305-001:2007 "Avocado oil"), gum arabic.

Research methods are organoleptic, physicochemical, mathematical processing of experimental data based on computer technologies.

Scientific and information base – monographs, scientific articles, materials of scientific and practical conferences, regulatory and technical documentation.

Presentation of the main research material. Already 12 thousand years ago, nutritious and healthy avocado fruits were actively eaten by ancient Colombian and Mexican tribes. Since the time of Columbus, oil obtained by pressing ripe avocado fruits was considered a particularly valuable and delicious product. Today, avocado oil, grown in many countries around the world (USA, South America, South Africa, Kenya, Spain, Cuba, Australia, Israel, New Zealand), is widely used in cosmetology and cooking. Avocado oil, which has high nutritional value and excellent taste, contains a large amount of easily digestible fats, essential vitamins, macro- and microelements and other biologically active substances. In terms of calorie content, avocado oil is not inferior to meat and chicken eggs, and also exceeds most edible vegetable oils (this is confirmed by the fact that in 1998 avocado was listed in the Guinness Book of Records as the most high-calorie fruit in the world). In terms of protein content, avocado fruit is 2–3 times higher than grapes, apples, pears, bananas, citrus fruits, and in terms of fat content it is the leader among known fruits, second only to coconut. It is worth noting that 30% of the fats contained in avocado oil are easily digestible by the human body – unsaturated fatty acids [3].

Avocado oil also contains vitamins A, E, C, B1, B2, B3, B9, D, lecithin, saturated fatty acids, phytosteroids, essential oils, chlorophyll, squalene, the amino acid histidine and many useful macro- and microelements (potassium, magnesium, phosphorus, iron, calcium, sodium, manganese, zinc, iodine, cobalt, copper and others), the antioxidant vitamin E, which has powerful immunoprotective, wound-healing and rejuvenating properties, in avocado oil 5 times more than in olive oil. Avocado oil contains a large amount of an antibacterial substance – chlorophyll. Chlorophyll has a beneficial effect on the respiratory, cardiovascular, endocrine, digestive systems, relieves irritation of the mucous membrane, prevents the formation of stones in the kidneys and bladder, promotes effective cleansing of the human body from toxins and toxins. Avocado oil differs from other vegetable oils due to its high lecithin content. Lecithin plays a key role in the coordinated work of the cardiovascular, central and peripheral nervous systems, participates in the synthesis of hormones necessary for the proper functioning of the liver, pancreas and reproductive system, significantly improves the body's absorption of vitamins A and E [1, 5]. Gum arabic is a natural thickener and stabilizer used in the food industry, in particular in the production of mayonnaise. Gum arabic helps to achieve the desired consistency of mayonnaise, giving it a creamy texture, prevents the ingredients from separating, maintaining the homogeneity of the product. As a natural polymer, gum arabic is considered a healthier alternative to synthetic additives. The use of gum arabic can extend the shelf life of mayonnaise. Gum arabic has practically no taste, which allows you to preserve the original taste of mayonnaise and is able to improve the creaminess and visual appeal of the product. Gum arabic is usually added at the emulsification stage, when oil and water are mixed.

"Polish" sauce belongs to egg-butter mixtures, which are prepared from butter, raw egg yolks with the addition of lemon juice or citric acid and salt.

In egg-butter sauces, the emulsion of oil and egg yolks may break down (deoiling), as a result of which the taste and appearance of the sauce deteriorate, the sauce becomes unsuitable for serving with culinary products. To prevent the yolks from coagulating, which leads to deoiling of the sauce, cold water should be added to the mixture before boiling according to the recipe.

The boiling temperature of the sauce should not exceed 70°C. It is boiled in a water bath, and the water temperature should be within 85–90°C.

As can be seen from the above ingredients, emulsion sauces have insufficient nutritional value, which requires a large number of developments, namely in improving the recipes of egg-butter sauces and increasing their nutritional value.

The control was selected as the sauce "Polish" according to the traditional cooking technology. The sauce "Polish" is a spicy dressing for fish dishes and seafood dishes. The sauce can be served both warm and cold, such a sauce is tasty, aromatic, with a spicy sourness and a taste of freshness.

During the experimental work, part of the butter was replaced with avocado oil. The name of the raw material and the percentage of product replacement with avocado oil are given in Table 1. The technology for preparing "Avocado"

ISSN 2708-4949 (print), ISSN 2709-9776 (online)

sauce with the addition of gum arabic and avocado oil is shown in Fig. 1. During the organoleptic evaluation of the developed "Avocado" sauce, five important interrelated indicators were studied: appearance, color, consistency, smell and taste. A five-point system was used to study them, taking into account the weight coefficient, which was determined for each indicator.

The organoleptic evaluation of samples of "Avocado" sauce with the addition of gum arabic and avocado oil is given in Table 2.

After analyzing the data in Table 2, we can conclude that the second and third experimental samples (2 g and 3 g of dietary supplement, respectively) are at the control level in terms of quality characteristics, and the next three are characterized by a deterioration in all organoleptic indicators.

Table 1 – Raw material costs for preparing Polish "Avocado" sauce with the addition of gum arabic and avocado oil (per 100 g)

Raw material name	Control, g	Experiment 1	Experiment 2	Experiment 3	Experiment 4	Experiment 5
	Sauce "Polish"					
Butter	40	39	38	37	36	35
Lemon	10	10	10	10	10	10
Eggs	40	40	40	40	40	40
Salt	1	1	1	1	1	1
Parsley	10	10	10	10	10	10
Gum Arabic	–	1	3	5	7	9
Avocado oil	–	1	2	3	4	5
Dish output, g	100	100	100	100	100	100

Source: developed by the author based on the research of A.V. Antonenko

The situation is similar with the use of gum arabic – the third experimental sample has the best result. According to the organoleptic assessment, the rational content of avocado fruit oil is 3%, and gum arabic – 5%, because this amount of dietary supplements does not worsen the organoleptic indicators of the developed "Avocado" sauce. After developing the "Avocado" sauce and establishing the rational content of the dietary supplement, it is necessary to determine its nutritional value (Table 3).

Based on the analysis of the data in Table 3, it can be concluded that compared to the control, the experimental sauce contains a larger amount of dietary fiber – 42%, unsaturated fatty acids – 6.3%, vitamin A – 26%, vitamin B1 – by 6%, B6 – by 12.5%, B9 – by 45%, vitamin C – by 7.69%. In addition, the content of minerals increased: K – by 17.8%, Ca – by 1%, Mg – by 18%. Thus, the use of avocado oil significantly improves not only the organoleptic indicators, but also the chemical composition of the developed sauce.

A complex quality indicator was calculated and a quality model of the "Avocado" sauce with the addition of avocado oil was built (Table 4).

According to the calculations given in Table 4, it was determined that the complex quality indicator of the experimental sample is 3.85, and of the experimental sample is 14.33, which is almost twice as high as the control.

Conclusions. As a result of the conducted research, it was found that adding avocado oil and gum arabic to

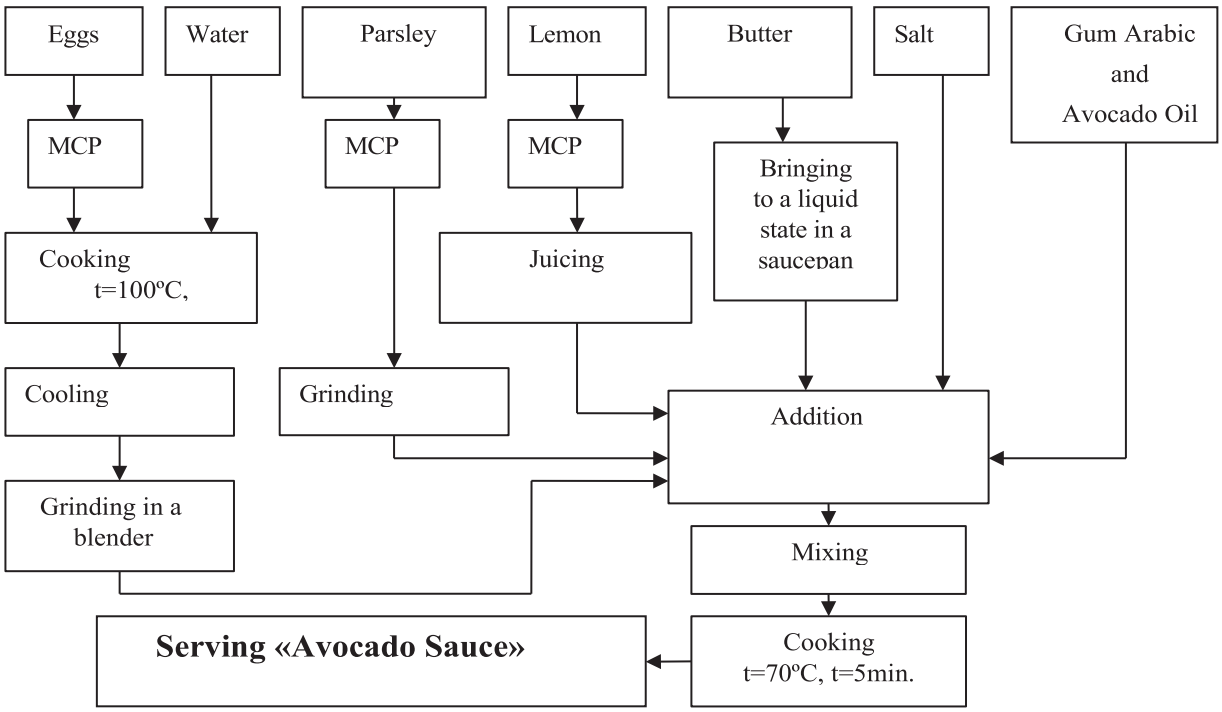

Fig. 1. Technological scheme of "Avocado" sauce with the addition of gum arabic and avocado oil

Source: developed by the author based on the research of A.V. Antonenko

Table 2 – Organoleptic evaluation of samples of "Avocado" sauce with the addition of gum arabic and avocado oil, scores

Quality indicators	Importance factor	CONTROL	Amount of additive, g				
			1	2	3	4	5
Appearance	0,3	5	4,9	4,9	5	4,85	4,5
Color	0,1	5	4,9	4,9	5	4,8	4,4
Consistence	0,2	5	4,8	5	5	4	3,4
Scent	0,2	5	4,6	5	4,9	4,3	3,5
Taste	0,2	5	4,7	5	5	4,4	3,5
Overall rating	1	5	4,78	4,96	4,98	4,47	3,86

Source: developed by the author based on the research of A.V. Antonenko

Table 3 – Nutritional value of "Avocado" sauce with the addition of gum arabic and avocado oil (per 100 g)

Indicator	CONTROL	Experiment	Difference, g	Difference, %
Energy value, kCal	559,0	563,80	4,80	0,86
Proteins, g	5,00	5,06	0,06	1,20
Fats, g	59,50	59,94	0,44	0,74
Carbohydrates, g	1,0	1,05	0,05	5,40
Mono-disaccharides	0,40	0,42	0,02	4,95
Dietary fiber, g	0,05	3,25	3,20	42,00
Starch, g	0,03	0,03	0,003	11,00
Saturated fatty acids, g	1,0	1,06	0,06	6,30
Water, g	29,0	31,17	2,17	7,47
Ash, g	0,40	0,45	0,05	11,25
Vitamins				
Vitamin A, mg	0,80	1,01	0,21	26,25
Vitamin B1 (thiamine), mg	0,03	0,03	0,002	6,00
Vitamin B2 (riboflavin), mg	0,20	0,20	0,004	1,95
Vitamin B6 (pyridoxine), mg	0,06	0,07	0,01	12,50
Vitamin B9 (folic acid), mcg	5,40	7,83	2,43	45,00
Vitamin C, mg	3,90	4,20	0,30	7,69
Macronutrients				
Calcium, mg	34,30	34,66	0,36	1,05
Potassium, mg	81,40	95,95	14,55	17,87
Magnesium, mg	6,80	7,67	0,87	12,79
Sodium, mg	54,00	54,21	0,21	0,39
Phosphorus, mg	84,60	86,16	1,56	1,84
Micronutrients				
Iron, mg	1,10	1,12	0,02	1,50
Zinc, mg	0,46	0,48	0,02	4,17
Copper, mcg	31,70	37,40	5,70	17,98

Note: control – Polish sauce using the original cooking technology; experiment – "Avocado" sauce with the addition of gum arabic and avocado oil

Source: developed by the author based on the research of A.V. Antonenko

Table 4 – Comprehensive quality indicator of Polish "Avocado" sauce with the addition of gum arabic and avocado oil

Name	Weighting factor	CONTROL	Experiment
Proteins, g	0,35	1,03	4,52
Fats, g	0,1	1,20	2,70
Vitamin B1, mg	0,1	0,29	1,29
Vitamin B2, mg	0,13	0,38	1,68
Calcium, mg	0,11	0,32	1,42
Phosphorus, mg	0,1	0,29	1,29
Iron, mg	0,11	0,32	1,42
Comprehensive quality indicator	1	3,85	14,33

Source: developed by the author based on the research of A.V. Antonenko

the composition of the Polish sauce does not disrupt the technological process of production. These components are integrated without changes in the standard stages of preparation, ensuring the stability of production and preservation of the quality characteristics of the product. The use of avocado oil and gum arabic helps to enrich the sauce with important nutrients, in particular vitamins (for example, E, K), minerals (potassium, magnesium) and dietary fiber. This increases the nutritional value of the product, making it more useful for consumers. Gum arabic, as a natural stabilizer and thickener, improves the texture and consistency of the sauce, ensuring its uniformity and pleasant appearance. Avocado oil adds a delicate taste and creamy structure, which positively affects the organoleptic indicators. The developed "Avocado" sauce is a universal

product suitable for the nutrition of all segments of the population, including those who adhere to a healthy lifestyle or have specific dietary needs. It can be used in restaurants for both everyday menus and specialized dishes. The introduction of "Avocado" sauce in restaurants can help increase the competitiveness of establishments due to the unique composition and beneficial properties of the product. This corresponds to modern trends in demand for functional and natural products. The developed "Avocado" sauce, as a functional product, is recommended for introduction in restaurants for catering to all segments of the population.

References:

1. Cherevko O. I. (2017). Innovacijni tekhnologiї harchovoї produkciї funkcional'nogo priznachennya: monohrafiia [Innovative technologies of functional food products: monograph]. Kharkiv: HDUHT. 591 p. [in Ukrainian]
2. Antiushko D., Bozhko T. (2021). Nutritional value of a dry soluble gerodietetic product for enteral nutrition. *Eastern-European Journal of Enterprise Technologies*, vol. 5, pp. 35–42.
3. Igor Dudarev, Oleh Kuzmin, Nataliia Stukalska etc. (2024). Using oat milk to reduce the caloric value of a functional mayonnaise sauce. *Acta Sci. Pol. Technol. Aliment*. №23 (1), pp. 29–38.
4. Halytska L. Yu., Khyzhniak O. O. (2014). Netradytsiina oliievmisna syrovyna v Ukraini [Non-traditional oil-containing raw materials in Ukraine]. In Tekhnichni nauky: stan, dosiahnennia i perspektyvy rozvytku m'iasnoi, oliiezhyrovoi ta molochnoi haluzei [Engineering Sciences: Status, Achievements and Prospects for Meat, Oil and Dairy Development], Proceedings of the 3rd International Conference. Kyiv: NUKhT, pp. 144–146. [in Ukrainian]
5. Peresichnyi, M. I., Kravchenko, M. F. (2002). Tekhnolohiia produktsii hromadskoho kharchuvannia z vykorystanniam biolohichno aktyvnykh dobavok [Food technology using biologically active additives: monograph]. Kyiv: KNTEU. 320 p. [in Ukrainian]
6. Garcia M. C. (2020). Novel approaches to improve the nutritional profile of mayonnaise. Food Chemistry. 318 p.
7. McClements D. J. (2017). Designing functional foods: Principles and applications. *Annual Review of Food Science and Technology*. № 8, pp. 29–57.
8. Weiss J. (2010). Emulsions for food applications. *Food Biophysics.* № 5 (4), pp. 328–349.
9. Dickinson E. (2009). Emulsions and foams in food technology. John Wiley & Sons.
10. Friberg S.E., Larsson K., Holmberg K. (2003). Food emulsions. CRC press.

Список використаних джерел:

1. Черевко О. І. Інноваційні технології харчової продукції функціонального призначення. Харків : ХДУХТ, 2017. 591 с.
2. Antiushko, D., Bozhko, T. Nutritional value of a dry soluble gerodietetic product for enteral nutrition. *Eastern-European Journal of Enterprise Technologies*. 2021. №5. С. 35–42.
3. Igor Dudarev, Oleh Kuzmin, Nataliia Stukalska etc. (2024). Using oat milk to reduce the caloric value of a functional mayonnaise sauce. *Acta Sci. Pol. Technol. Aliment.*, 2024. №23 (1). P. 29–38.
4. Галицька Л. Ю., Хижняк О. О. Нетрадиційна олієвмісна сировина в Україні. В Технічні науки: стан, досягнення і перспективи розвитку м'ясної, олієжирової та молочної галузей: матеріали 3 Міжнародної науково-технічної конференції. Київ: НУХТ, 2014. С. 144–146.
5. Пересічний М.І., Кравченко М.Ф.. Технологія продукції громадського харчування з використанням біологічно активних добавок. Київ : КНТЕУ, 2002. 320 с.
6. Garcia M.C. (2020). Novel approaches to improve the nutritional profile of mayonnaise. Food Chemistry. 318 p.
7. McClements D. J. Designing functional foods: Principles and applications. *Annual Review of Food Science and Technology*. 2017. № 8. pp. 29–57.
8. Weiss J. Emulsions for food applications. *Food Biophysics*. 2010. № 5 (4). Pp. 328–349.
9. Dickinson E. (2009). Emulsions and foams in food technology. John Wiley & Sons.
10. Friberg S.E., Larsson K., Holmberg K. (2003). Food emulsions. CRC press.

А. В. Антоненко, Л. В. Баль-Прилипко
Національний університету біоресурсів і природокористування України

ТЕХНОЛОГІЯ ЯЄЧНО-МАСЛЯНОГО СОУСУ З ВИКОРИСТАННЯМ ДІЄТИЧНИХ ДОБАВОК

У статті представлено інноваційну технологію створення яєчно-масляного соусу «Avocado» з використанням дієтичних добавок, зокрема гуміарабіка та олії з плодів авокадо, що дозволяє підвищити харчову цінність і функціональні властивості продукту порівняно з традиційною технологією. Як контрольний зразок використано класичний соус «Польський». У рамках експериментальних досліджень частково замінено вершкове масло на олію авокадо, що містить мононенасичені жирні кислоти, вітаміни (Е, К) та антиоксиданти. У статті описано сировину, використану для створення соусу, та вказано відсоткове співвідношення заміни вершкового масла олією авокадо. Застосування гуміарабіка як натурального стабілізатора сприяє покращенню консистенції соусу, запобігаючи розшаруванню емульсії, та підвищує його органолептичні характеристики. Проведені дослідження показали, що додавання гуміарабіка та олії авокадо зберігає технологічну стабільність

виробництва та покращує хімічний склад продукту. У статті здійснено розрахунок комплексного показника якості соусу «Avocado», який включає оцінку органолептичних, фізико-хімічних і біологічних характеристик. Результати досліджень підтверджують, що соус «Avocado» перевищує традиційний соус «Польський» за біологічною цінністю завдяки вищому вмісту корисних нутрієнтів. Оптимальна кількість дієтичних добавок (гуміарабіка та олії авокадо) була експериментально визначена, що забезпечує стабільність технологічного процесу без негативного впливу на якість готового продукту. Хімічний склад соусу «Avocado» проаналізовано, а його переваги обґрунтовано з точки зору поживної цінності та функціональності. Соус рекомендується для впровадження у виробництво, зокрема в закладах ресторанного господарства, завдяки його універсальності та відповідності сучасним вимогам до здорового харчування. Продукт є корисним для людей, які проживають в екологічно забруднених регіонах, працюють на шкідливих виробництвах, а також для всіх верств населення, включаючи тих, хто дотримується дієтичного харчування. Розроблений соус «Avocado» відповідає встановленим стандартам якості, що підтверджується результатами лабораторних досліджень. Впровадження у виробництво сприятиме розширенню асортименту функціональних продуктів, які відповідають сучасним тенденціям здорового харчування та мають потенціал для широкого застосування в кулінарії. У статті також наведено технологію виробництва соусу, що може бути використана для масштабування виробництва та адаптації рецептури в різних умовах.

Ключові слова: *соус, олія, гуміарабік, харчова цінність, технологія, функціональний продукт, дієтичні добавки.*

Стаття надійшла: 20.09.2025
Стаття прийнята: 05.10.2025
Стаття опублікована: 18.11.2015