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BIOLOGICAL VALUE OF JAM FROM FRUIT ACTINIDIA

Abstract.
In this article are presented results of innovative research on the possibility of producing a unique food product, in particular the suitability of actinidia fruits for making jam. It was found that jam made from actinidia fruits of Kyyivs'ka hibrydna and Purpurna sadova varieties using different technologies of fruit pretreatment has original characteristics and meets the standard. The information obtained is important in the process of expanding the range of natural and biologically valuable food products from rare crops.

Keywords: *actinidia fruits, jam, biological value, functional products.*

Introduction.

Modern food technologies make it possible to create products without natural ingredients, which certainly affect people health. Most synthetic products have low biological value. Research by nutritionists has revealed a deficiency of vital nutrients in the diets of people in developed European countries. One of the ways to solve this problem is to expand the range of processed foods from currently valuable crops that are not widely available. Therefore, the development of functional products is one of the ways to regulate metabolic processes in the human body to improve health [1, 7, 10].

Actinidia fruits are consumed as a tasty and healthy food product containing bioavailable ascorbic acid, folic acid, sugars, tannins, carotene (up to 10%), vitamins (E, P, Q, K, B6), trace elements (potassium, manganese, zinc, calcium, iodine, phosphorus), alkaloids in small amounts, saponins and fiber. The pulp of actinidia fruit has a pleasant sweet and sour taste and a large number of seeds. It should be noted that one small fruit contains potassium (one-sixth of the daily value), phosphorus (one-third of the daily value) and beta-carotene (one-fifth of the daily value). Vitamin Q plays a unique role in the process of energy formation and lipid metabolism in the body, and it has been scientifically proven that this compound inhibits the growth of cancer cells and the formation of metastases, as well as binds and removes radionuclides from the body. Folic acid is considered to be one of the most important essential vitamins, responsible for cell growth and DNA preservation, and has a positive effect on female reproductive health and baby development during pregnancy. In addition, folic acid is essential for maintaining immunity, strong nerves, and supporting hematopoietic function [11, 14, 16, 17].

Due to the ability to form a complex of vitality components, consumption of fresh and processed actinidia fruits helps to improve digestion, increase the body's defenses, provide easily digestible vitamins and minerals, help to prevent worm infestations, lower and normalize blood pressure, improve mood, strengthen the body and prevent the emergence and spread of cancer cells, having calming, hemostatic, analgesic, wound healing and easily anesthetizing effects. and expectorant properties. Flowers, leaves, roots and bark of the liana are used as medicinal raw materials [1, 9, 13].

Despite several beneficial properties of the plant, consumption of the fruit can be harmful only in case of individual intolerance. It is also not recommended to consume a lot of fruit in case of the following problems: vasodilation, thrombophlebitis, increased blood clotting, and excessive overeating can lead to food poisoning [1].

The plant is used for culinary purposes both fresh and cooked. The berries are also frozen, dried, pickled, and dried to be consumed at any season of the year. The fruits are used to make a variety of sweet and refreshing drinks, such as juice, jelly, compote, and others. You can also make syrup, jam, preserves, or marmalade [4, 7].

The purpose of the study is to expand the range of functional food products based on actinidia fruits and to evaluate the preservation of the complex of essential substances.

Materials and methods.

The research was conducted at the Department of Technology of Storage and Processing of Fruits and

Vegetables of Uman National University of Horticulture. The objects of research were actinidia fruits of Kyyivs′ka hibrydna and Purpurna Sadova varieties. Biochemical studies and processing were carried out according to generally accepted methods [2, 3, 5, 6, 8, 12, 15, 18].

Results and discussion.

In fresh actinidia fruits of the Kyivska hybrid variety, the content of dry soluble substances was 16.6 % and of the Purpurna sadova variety - 15.5 %, including sugars, respectively, 8.07 and 8.20 %, the proportion of titratable acids - 0.63 and 0.90 %. However, the main value of actinidia fruits is the ability to accumulate a significant amount of vitamin C. The fruits of the Kyyivs′ka hibrydna variety contained $160{,}2\times10^{-3}$ % of it, and the Purpurna sadova variety contained 2.4 times less.

The physicochemical parameters of jam quality normalized in the current standard [7] are the mass fraction of dry soluble substances and titratable acids, as well as the content of sugars and their components (Table 1).

The content of dry soluble substances in the finished product was 61.2 - 61.4 %, which fully corresponds to the calculations and the standard for sterilized jam (at least 61 %).

In the variant of the experiment, with mechanical grinding of actinidia fruits and rubbing only - without heat treatment, the produced jam contained 61.3% of dry soluble substances, the majority of which were sugars (mass fraction 58.0%), most of them are represented by inverted sugar - 34.0%, or 58.6% of the share of total sugars in the product. Sucrose accounted for 41.4%, with a mass fraction of 24%.

A positive effect was observed when ascorbic acid, a powerful antioxidant, was added. The mass fraction of sugars, although at the level of other variants (57.3%), changed significantly in their qualitative composition: the share of sucrose was 21.4%, or 37.4% of the total amount of sugars. Accordingly, inverted sugar amounted to 35.9%, or 62.6%. The content of titrated acids fluctuated at 0.44%. That is, the use of an antioxidant contributed to the nutritional characteristics of the product.

When using fruit blanching with steam before wiping, the jam had the following chemical and technological characteristics: the content of dry soluble substances - 61.4%, total sugars - 57.9, titrated acids - 0.46%. A significant improvement in all indicators compared to other methods of preliminary heat treatment is explained by the shorter duration of high temperatures when processing fruit with steam rather than in water.

The sugar-acid index of jam produced by different technologies ranged from 120.0 to 133.2.

1. Physicochemical parameters of jam quality under different methods of actinidia fruit pretreatment

Pretreatment option	Mass fraction, %			Sugar-acid index
	dry soluble substances	total sugars	titrated acids	
Wiping, without treatment (control)	61.30	58.0	0.48	120.00
Heating of the fruit to a temperature of 70 - 75°C for 8 minutes, with the addition of 10% water	61.20	57.30	0.43	133.20
Heating of the fruit to a temperature of 70 - 75°C for 8 minutes, with the addition of 10% water and 0.1% ascorbic acid	61.40	57.30	0.44	130.00
Steam blanching for 4 minutes	61.40	57.90	0.46	125.90
$LSDP_{05}$	0.12	0.14	0.02	0.60

In terms of organoleptic characteristics, the jam made from mashed fruit without heat treatment had a homogeneous mass, no seeds, sweet and sour taste, olive color with a slight light brownish tint, and a smeary consistency. Blanching in water with the addition of ascorbic acid had a positive effect on the retention of fruit color. When the fruit was steamed, the product lost its color, the consistency was thicker, the taste and smell were less pronounced than with other heat treatment options.

The biological value of the jam was evaluated by the content of ascorbic acid and β-carotene (Table 2). In the jam made without heat treatment of the fruit, the content of vitamin C was 108.4 mg/100 g, with its preservation of 68.9%.

When the fruit was heated to a temperature of 70 - 75 °C for 8 min with the addition of 10 % water, the loss of ascorbic acid was 26 %. Compared to the control, this method of fruit processing contained 2.8 mg/100 g less vitamin C in the finished product. The highest C-vitamin value was found in canned fruit made by heating the fruit to a temperature of 70-75˚C for 8 minutes, with the addition of 10% water and 0.1% ascorbic acid. The biological value of this product increased by 10.4 mg/100 g compared to the control. The lowest preservation of ascorbic acid was observed when actinidia fruits were treated with steam for 4 min, the value exceeded the control by 3.3 %.

2. The content and retention of biologically active substances in sterilized jam from actinidia fruits of the 2010 harvest.

Variants of the experiment	Mass fraction, mg/100g		Preservation, %.	
	ascorbic acid	β-carotene	ascorbic acid	β-carotene
Wiping, without treatment (control)	108.40	0.21	68.90	53.30
Heating of the fruit to a temperature of 70 - 75°C for 8 minutes, with the addition of 10% water	105.60	0.20	74.00	72.40
Heating of the fruit to a temperature of 70 - 75°C for 8 minutes, with the addition of 10% water and 0.1% ascorbic acid	118.80	0.24	88.90	94.80
Steam blanching for 4 minutes	110.00	0.22	72.20	71.50
HIP_{05}	0.30	0.02	0.70	0.90

The jam produced by different methods of preliminary heat treatment contained 0.20 - 0.24 mg/100 g of β-carotene. The highest content and preservation of β-carotene was observed when the fruit was heated to 70 - 75 °C for 8 min, with the addition of 10% water and 0.1% ascorbic acid. When blanching the fruit in water and steam, the content of β-carotene was 0.20 and 0.22 mg/100g, respectively, and the preservation was on average 72.4 and 71.5 %.

Conclusions and suggestions.

The jam made from the fruits of Kyyivs′ka hibrydna and Purpurna sadova actinidia varieties using different technologies of preliminary heat treatment of raw materials met the requirements of the current standard. The physical and chemical characteristics of these products did not differ significantly. The content of ascorbic acid and its preservation (68.9-88.9 %) differed significantly. In the production of actinidia jam, the best method of pretreatment is blanching the fruit in water with the addition of ascorbic acid. The data obtained should be considered in the production of unique high-quality actinidia products in order to expand the range of biologically valuable products of this species.

List of references:

1. Меженский В. Витаминний релікт. Огородник плюс. 2010. 3. 10-15.

2. Методи технохімічного контролю у виноробстві: за ред. Гержикової В.Г. Сімферополь: Таврида, 2002. 206.

3. Продукти перероблення фруктів та овочів. Методи визначання цукрів: ДСТУ 4954:2008 К.: Держспоживстандарт, 2008. 22.

4. Подпрятов Г.І., Войцехівський В.І., Кіліан М., Сметанська І.М. та ін. Технології зберігання, переробки та стандартизація сільськогосподарської продукції. К.: ЦІТ Компрінт. 2017. 658.

5. Продукти перероблення фруктів та овочів. Методи визначення титрованої кислотності: ДСТУ 4957:2008. К.: Держстандарт, 2008. 14.

6. Савчук Н.Т., Подпрятов Г.І., Скалецька Л.Ф. та ін. Технохімічний контроль продукції рослинництва: навч. посіб. К.: Арістей, 2005. 256.

7. Технологія продуктів харчування функціонального харчування [монографія] / [Пересічний М.І., Кравченко М.Ф., Федорова Д.В. та ін.; ред. М.І. Пересічного]. – К.: КНТЕУ, 2008. 718.

8. Фрукти, овочі та продукти їх перероблення. Метод визначання вмісту каротину. ДСТУ 4305:2004. К.: Держспоживстандарт, 2004. 10.

9. Duan X.-J., Zhang W.-W., Li X.-M., Wang B.G. Evaluation of antioxidant property of extract and fractions obtained from a red alga, Polysiphonia urceolata. Food Chemistry. 2006. 95. 37-43.

10. Eliseeva L.G., Blinnikova O.M. Comparative characteristics of consumer properties of breeding varieties of actinidia species kolomikta. Merchandiser of food products. 2011. 7. 20-27.

11. Ferrandino A., Guidoni S. Chemical composition of Actinidia deliciosa fruits as influenced by harvest date and storage period. Acta Hort. 1999. 498. 313-318.

12. France J., Thornley J.H.M. Mathematical models in agriculture. London: Butterworths. 1984. 335.

13. Heinonen I.M., Meyer A.S., Frankel E.N. Antioxidant activity of berry phenolis on human low-density lipoprotein and liposome oxidation. J. of Agricultural and Food Chemistry. 1998. 46(10). 4107-4112.

14. Kalayda K., Tokar A., Voitsekhivskyi V. et. al. The content of vital nutrients in actinidia fruits. Colloquium-journal. 12 (171). 2023. 38-40.

15. Kondratenko P.V., Shevchuk L., Lev L. Methodology for evaluating the quality of fruit and berry production. К.: СПД «Жителев С.И.». 2008. 79.

16. Makarova N.V., Sobolev G.I., Dmitrieva A.N. Chemical composition and antioxidant activity of actinidia. News of universities, 2012. 2(3). 39-42.

17. Netzel M., Netzel G., Tian Q. et. al. Sources of Antioxidant Activity in Aus-tralian Native Fruits Indentification and Quantification of Anthocyanins. J. of Agricultural and food chemistry, 2006. 54. 9820-9826.

18. Roginsky V., Lissi E.A. Review of methods to determine chain-breaking antioxidant activity in food. Food Chemistry, 2005. 92. 235-254.