

UDC 664.66

TECHNOLOGICAL PROPERTIES AND NUTRITIONAL VALUE OF THE SEMI-FINISHED PRODUCT FOR FROZEN DESSERTS

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Abstract. It has been proven that the rational formulation of the mixture from the point of view of the properties of the obtained semi-finished product should be considered formulations based on serum with the content of lactulose 1%, fructose 11%, stabilizer 0.4%, dry milk 8%. The optimal pasteurization process for the semi-finished product was determined – at a temperature of 80...82°C for $(5.8...6.2) \times 60^{-1}$ s. A technological scheme for obtaining a semi-finished product for frozen desserts based on whey with lactulose, fructose, stabilizer was developed. A set of data characterizing the quality of the developed semi-finished product was obtained, and its high nutritional and biological value was proven. Modes and terms of storage of semi-finished products are substantiated: temperature -4...6°C, no more than 3 months, in unsealed form – no more than 48 hours.

Key words: semi-finished product, frozen desserts, heat resistance. functional and technological indicators, nutritional value.

Introduction.

Production of ice cream and frozen desserts is one of the most promising segments of the dairy industry. Ice cream is an affordable complete food product with high digestibility and a valuable source of important functional nutrients. The technologies of frozen dessert products allow adding additives that play the role of functional and technological components to their composition. This makes it possible to expand the range of targeted products for various types of food, taking into account age, individual needs, national and social requests [1].

The analysis of modern nutrition shows its inconsistency with the requirements of nutrition due to insufficient consumption of proteins, minerals, vitamins and an overload of saturated fats and easily digestible carbohydrates. The modern diet needs to improve the recipes of frozen products according to priority directions: increasing the content of functional ingredients (sulfur-containing amino acids, dietary fibers) against the background of reducing the content of fatty components and reducing the sugar content. The modern approach to the creation of food products is definitely

related to the use of the concept of glycemic indices and glycemic load [2].

It is the presence of simple sugars in ice cream that determines its high glycemic index, which forces consumers to significantly limit its consumption, and patients with diabetes, cardiovascular diseases or obesity to exclude ice cream from their diets altogether. Solving this problem is possible in two ways: making unsweetened ice cream or using sweeteners or fructose instead of sugar [3]. By the way, unsweetened ice cream is extremely popular in European countries and in Japan, where they make ice cream with the flavors of meat, seafood (shrimp, octopus, cuttlefish), seaweed, beer, as well as vegetable ice cream – tomato, pumpkin, carrot, garlic, onion, cucumber with spicy herbs, beet, potato, etc. However, such ice cream is not popular in Ukraine and is not produced by any manufacturer. Ukrainians perceive ice cream exclusively as a dessert. Therefore, today the problem of lowering the glycemic index of ice cream can only be solved by using sweeteners or fructose [4]. Thus, the scientific and practical task of creating a new generation of frozen desserts with reduced glycemic load, enriched with functional ingredients, is relevant and timely.

The purpose of this work is the scientific substantiation and development of the semi-finished product technology for frozen desserts based on whey with lactulose and fructose. In accordance with the set goal, the following tasks are to study the complex of physico-chemical and technological properties, nutritional and biological value of the semi-finished product.

Main text.

Pasteurization is one of the most important operations in the production of mixes for soft ice cream and frozen desserts. The defining parameters of this treatment are the temperature and duration of its effect on the mixture, which determine its effectiveness.

The heat resistance of model mixtures is influenced by individual recipe components. Therefore, in order to develop the necessary modes of heat treatment of liquid semi-finished products for frozen desserts, a study of their heat resistance was conducted. Research on thermal stability was carried out in the temperature range of 80...95°C.

In order to determine the objective assessment of quality, the functional and technological properties of the developed semi-finished products were investigated: the ability to whip, the ability to form stable foams, the degree of dispersion of the fat phase. As a control, a mixture for soft ice cream was used [5].

Table 1 – Heat resistance of model mixtures for sweet dishes

The name of the sample	Heat resistance of mixtures during heat treatment, $\cdot 60^{-1}$ sec			
	80 \pm 2 $^{\circ}$ C	85 \pm 2 $^{\circ}$ C	90 \pm 2 $^{\circ}$ C	95 \pm 2 $^{\circ}$ C
Control [5]	12 \pm 0,3	6 \pm 0,2	4 \pm 0,3	2 \pm 0,2
A mixture based on whey with lactulose and fructose	6 \pm 0,2	4 \pm 0,2	3 \pm 0,15	0

The results of the conducted research confirm that the composition of mixtures for frozen desserts affects their heat resistance. It was established that the addition of recipe components significantly reduces heat resistance: at a processing temperature of 80...82 $^{\circ}$ C, the heat resistance of the mixture [8] decreases by 1.7 times, and that of the developed 1% mixture by 2 times. With a further increase in temperature, the heat resistance of the above-mentioned mixtures decreased. The decrease in the level of heat resistance of the latter can be explained by the fact that with an increase in dry substances in the mixtures, the content of mineral elements increases, which leads to a change in the ionic balance in the system and affects the stability of milk proteins, as well as due to an increase in the acidity of the mixtures. Thus, it is rational to carry out the pasteurization process for the semi-finished product – at a temperature of 80...82 $^{\circ}$ C for (5.8...6.2) $\cdot 60^{-1}$ s.

Thus, on the basis of the set of researches, the most rational formulation of the mixture from the point of view of the properties of the obtained semi-finished product should be considered the formulation based on whey with the content of lactulose 1%, fructose 11.0%, stabilizer 0.4%, milk powder 8%. All the results obtained in this section were taken into account in subsequent studies, namely during the development of technological schemes of semi-finished products for frozen desserts.

The degree of dispersity of the fat phase was assessed by determining the average diameter of fat globules of control and developed semi-finished products.

The obtained data are given in table 2.

Table 2 – Functional and technological indicators of the semi-finished product

Indicators	Control [5]	Semi-finished product
Beating ability, %	60±1,5	70±1,8
The ability to form stable foams, %	65±1,5	80±2,0
The degree of dispersion of the fat phase, µm	110±2,8	90±2,3

The analysis of research results showed that the semi-finished product has a higher whipping capacity (by 9.8...10.2%) compared to the control sample. The developed semi-finished product is able to form more stable foams – 1.3 times more than the control sample. The degree of dispersion of the fat phase of the semi-finished product is 1.2 times higher than that of the control sample. The obtained data were used during the development of the semi-finished product quality model.

Since the developed semi-finished products are new, non-traditional products planned for further use in the production of culinary products, it was necessary to investigate their nutritional value.

The concept of quality of food products is understood as a wide set of properties characterizing nutritional and biological value, organoleptic, structural-mechanical, functional-technological, sanitary-hygienic and other properties of the product, as well as the degree of their expressiveness. From the point of view of quality indicators, a food product must contain components necessary for the human body for normal metabolism.

The content of the main food substances in the developed semi-finished product, as well as its energy value are presented in the table 3. On the basis of the results, which are presented in table , it is possible to produce biscuits, which the disintegration of the finished product is enriched with a high content of all nutrients, and it is possible to use vikoristany for processing in the product of eating without reducing the nutritional value. In addition, the disintegration of the finished product against lactulose i

n the amount of $1 \pm 0.02 \text{ g} / 100 \text{ g}$.

Table 3 – Nutritional value of the semi-finished product

Product names	Content, g per 100 g					Energetic value, kcal
	Dry substances	Proteins	Lipids	Carbo-hydrates	Ash	
Control [5]	29,0±0,5	3,8±0,1	8,0±0,2	15,0±0,3	0,7	147,0
Semi-finished product	19,75	3,8±0,1	3,1±0,2	12,0±0,3	0,8	91,3

It is important to characterize the protein speeches of the napivfabrikativ, that the stench can be brought up to the high-bility, high-yield and sufficient balance for the amino acid warehouse of the produktiv. Advances in protein allow recommending the inclusion of dietary supplements on the basis of dispersed beverages in the consumption of protein diets. In this manner, we carried out an investigation about the high biological value of the dispersed beverages.

Summary and conclusions.

It has been proven that the rational formulation of the mixture from the point of view of the properties of the obtained semi-finished product should be considered formulations based on serum with the content of lactulose 1%, fructose 11%, stabilizer 0.4%, dry milk 8%. The optimal pasteurization process for the semi-finished product was determined – at a temperature of 80...82°C for $(5.8...6.2) \times 60^{-1}$ s.

The whipping ability was $70 \pm 1.8\%$, the ability to form stable foams was $80 \pm 2.0\%$. A set of data characterizing the quality of the developed semi-finished product was obtained, and its high nutritional and biological value was proven.

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Article sent: 29.08.2023 г.

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