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RESOURCE-SAVING TECHNOLOGY OF RAW MILK RECYCLING

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Abstract. Resource-saving technologies of dessert product cooking are developed. The necessity of establishing dispersion of air phase of precooked soft ice-cream based on milk whey with addition of vegetable puree is proved. The rational modes of milling process for the new ice cream are defined.

Keywords: resource-saving technology, whey, pumpkin, soft ice-cream, dispersion, milling.

1. Introduction

Today the range of problems associated with finding solutions to obtain high quality [18] safe food is on the first place of researches in the world [7].

Based on the national course chosen by Ukraine towards resource-and energy saving, high priority for the food industry is to reduce losses during processing of agricultural raw materials.

Food processing of whole raw milk, comprising skimmed milk, buttermilk and whey, received in the scientific literature the definition of protein-carbohydrate raw milk, because it has a high biological value and nutritional potential. However, the existing condition of use of this potential is extremely unsatisfactory, as modern processes and recycling technologies targeted for only certain types of food and feed, besides many of them even lost.

For restaurants protein-carbohydrate raw milk is an unconventional type of raw material, as technology culinary products based on it are virtually absent. At the same time, following some experience and achievements in processing of these raw materials in the food industry, it can be argued that its use in technology of the restaurant industry products in conjunction with other sources of food raw materials will provide an opportunity to release nutritional foods, food products and some other products of new generations that have high nutritional value and functional properties.

2. Objects and problems

To address the above important and actual applied problems we have conducted scientific justification of protein-carbohydrate raw milk processing technologies based on the study and implementation of its main functional and technological properties, considering optimizing the nutritional value of the final product and its organoleptic characteristics.

It was received a set of basic data about the impact of processes and physicochemical methods on the properties of food systems using protein-carbohydrate raw milk.

The main focus in the dairy industry is the accumulation and management of raw milk by improving product mix, increasing its production by resource-saving technologies, the development of technology to create new materials, products with increased food and biological value, rich in protein, fruit and other ingredients [15].

At present, much attention is paid to the formation of dairy of dessert destination.

In countries with developed dairy industry is quite wide range of desserts. It contains milk-based desserts with various additives, fillers, flavoring and aromatic substances [1].

The researchers [14] developed technologies and formulations for aerated dessert products with using of protein bases derived from skim milk and buttermilk by acid coagulation.

Lots of desserts made by mixing raw milk (or dairy component) with all sorts of food additives or fillers fruit berry.

In Switzerland was proposed a method for sweet desserts based on milk [10]. Desserts contain fruit sauce, Sabayon and dairy products such as yogurt.

The author [9] developed a technology of whipped desserts with using of protein base with skim milk and buttermilk. Based on the analysis of organoleptic, physic-chemical, structural and

mechanical characteristics saving mode of whipped dessert products is reasoned.

There was elaborated a method for obtaining a dessert-like dessert with yogurt cheese. They prepare milk and cream syrup by mixing milk, cream and sifted sugar until dissolved. Syrup is pasteurized and cooled. Then it must be dispersed with low-fat cheese at a temperature 30...40°C, installed to pH 5.0...5.5 through the addition of sodium bicarbonate. Product packed and cooled [2].

The method of cooking dairy dessert product containing pressed cheese, sour cream, flavors, stabilizers, emulsifiers with monoglycerides is proposed. The product has the consistency of pudding [5].

In America the technology of cooking low-fat foods such as cream cheese is patented [20]. Sour concentrate skim milk mixed with emulsifying salt is heated. In the mix they add skimmed milk powder, xanthan gum, then heat it, add salt, sugar and carrageenan and homogenize it all to obtain a product such as cream cheese.

The authors [19] consider carrot, pumpkin and squash puree as promising raw material in the production of combined dairy products, selecting this range as filler based on the study of its chemical composition. It is determined that the selected components are high in β-carotene (carrots -8060 mg% pumpkin-630 mg%), and other valuable macro and micro elements such as potassium, phosphorus, calcium, magnesium, iron, copper, zinc, vitamins: C, PP, group B. Inadequate consumption has a negative impact on human health.

The way of ice-cream producing with using a complex of stabilizers - emulsifiers is stated [6]. These figures indicate a high profitability of ice-cream "Jubileyne" with stabilizer Shereks 9632.

There was shown an expediency of using flavoring additives of different nature and natural ingredients Butter Buds of company Butter Food Ingredients (USA), derived from specially selected varieties of milk, cream and other dairy products with using modern biotechnological methods [13].

To create high quality milk products the stabilizers as a mixture of modified starch, sodium alginate, and carrageenan are used. When manufacturing an ice-cream they are used to store the dispersed fat phase [4].

Functional foods with high biological value are developed and obtained. It is advisable to use bee pollen in the production of dairy products (cheeses and milkshakes), which increases the amount of amino acids, lipids and phospholipids [16].

The authors [17] examined the composition and functional and technological properties of milk protein concentrates obtained by ultra filtration, in connection with the use of products with spumy structure. It is determined the distribution of protein fractions depending on its mass fraction. It is shown that increasing the mass fraction of protein leads to an increase in the absolute content of amino-acids.

Based on the conducted literary analysis we can identify the main trends of milk-based desserts:

1. Use of whole milk, skim, dry, cream, cheese, whey, buttermilk as a base;

2. Adjustment of food and biological value, chemical composition through the use of flavoring ingredients in different combinations: fruit, vegetable excipients, vitamins and minerals;

3. Improve the consistence stability and shelf life of desserts by adding to their prescription of emulsifiers, stabilizers and their systems.

Consequently, the development of technology for preparation of whipped milk protein desserts with adding plant material is relevant task.

During the development of new technologies not only chemical composition but functional properties of the output gained special importance, this stipulated necessity of their investigation.

In the technology of producing desserts, one of the determinative indexes of mixtures is their ability to absorb and keep particular volume of air or gas. Mixtures' ability to whip predetermines their composition, namely contents of surface-active substances.

There is a need for a thorough study of the composition, physic-chemical, rheological and functional properties of the combined dairy products made with the use of plant supplements, and the development of production technologies.

Foreign experience and experience of some Cold store facilities demonstrates the feasibility and need of urgent development in the country of manufacture and sale of soft ice-cream and low frozen desserts through retail outlets in major shopping and through modular ice-cream parlor in modern trade networks and centers [8].

In this regard, we have developed a technology of making an ice-cream from whey with the addition of pumpkin puree. There was proposed using an egg powder as a stabilizer.

One of the important stages of making ice cream, which determines the quality of the finished product, is the process of milling. During the milling mixture is saturated with air, which forms a

series of small balloons or cells that are separated from each other films from partially frozen mixture [12].

It is known that the dispersion of air in ice cream phase largely determines its taste, structural, mechanical and thermal characteristics. Changing of the prescription mixture changes the dispersion of air in ice cream [3; 21].

Previous studies have shown that the use of milk whey and vegetable puree in ice-cream cooking leads to changes in the composition and increase of mixtures viscosity, besides foam forming and foam stabilized properties of such mixtures increases. Therefore, we hypothesized that the dispersion of air phase of new ice cream is different from the traditional.

They studied the impact of using of whey, pumpkin puree and egg powder on the state of air dispersion phase of modeling samples of ice cream during mixtures milling.

Figure 1 shows the results of study of depending of air dispersion phase of ice-cream modeling samples based on whey containing 25% pumpkin puree on the duration of milling (with sugar content 20...30% and egg powder 1...4%). As a control was used traditional ice-cream, the average diameter of the balloons in which is 100...120 microns [12].

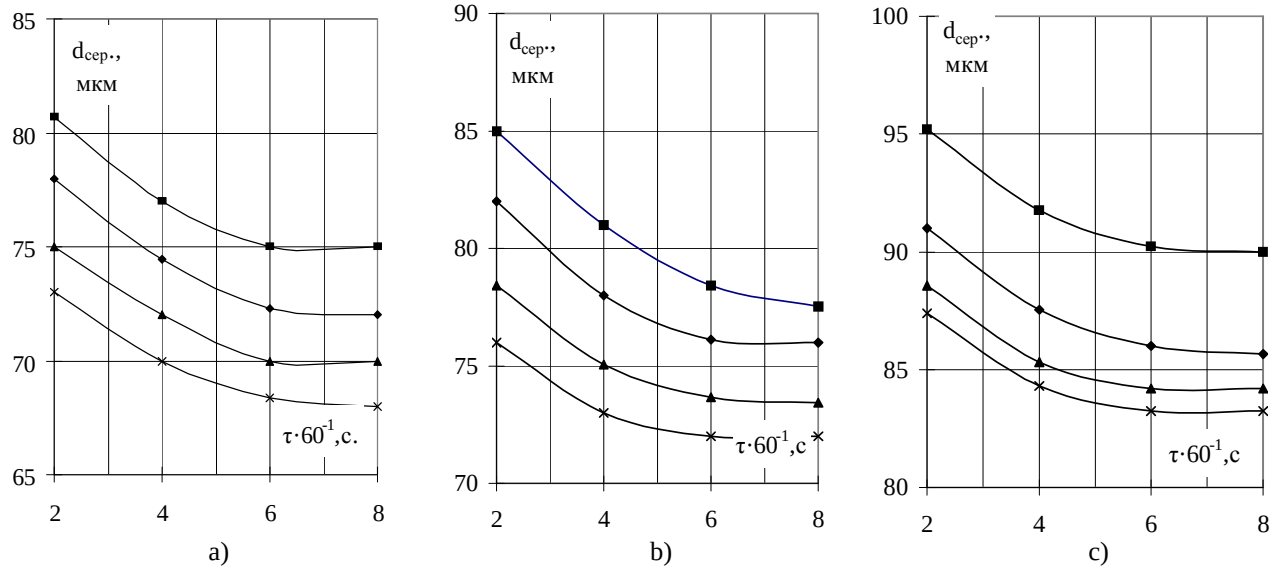

Figure 1. The dependence of the air dispersion phase of ice-cream based on whey containing 25% pumpkin puree, on the duration of milling with content of sugar 20% (a), 25% (b), 30% (c) and the concentration of egg powder, %:

1,0; 2,0; 3,0; 4,0 .

According to the research we can make the following conclusions: multicomponent mixtures based on whey with the addition of vegetable filler provides a soft ice cream with higher dispersion of air phase than in controls: the dispersion of air in ice cream from whey with the addition of pumpkin puree is higher compared to controls on 18...43%

Also, the evidence suggests that increasing concentrations of egg powder in the mixture leads to increased dispersion of air phase (reducing the average diameter balloons). Since the increase in its concentration leads to an increase in viscosity of mixtures, it promotes air atomization.

It was found negative effect of increasing the sugar content on the dispersion state of ice cream. By increasing of sugar content from 20 to 30% the average diameter balloons for mixtures based on whey with adding a pumpkin puree increased to 16...18%. According to the authors, this can be explained by a decrease in the degree of hydration of surfactants with higher sugar content in mixtures.

Also, the assessment shows that the maximum increase dispersion of air phase in the process of milling is observed during the first $(2...6)\cdot 60^{-1}$ sec. and gets it's maximum value. Further milling does not significantly affects on the dispersion of air phase of ice-cream, which is associated with decreasing of temperature of the mixture and, as a consequence, increase the viscosity of the product.

The maximum possible dispersion of air, according to [11], is a measure of ice-cream preparedness. In this state, the product has sufficient cooling effect, supple texture and good shape retention.

Conclusion

Creating of the new processes and technologies of protein and carbohydrate raw milk processing in the semis and finished culinary products for the network of the restaurants is an important task, a decision of which will significantly expand the range of products, improve its nutritional value, will promote resource-saving technology in the dairy industry.

As the result of the investigation, about 20 personal technologies of dishes with the use of semi-finished products and food stuff with the increased nutritive value and high organoleptic parameters on the basis and with the use of whey.

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