

MODERN TECHNOLOGIES OF DAIRY PROTEIN PRODUCTS

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One of the priority directions of development of the dairy industry. The creation of combined dairy and protein products of new generation is. Changing technology and raw material factors (temperature control treatment, pH, mass fraction of fat and milk solids basis, the type of stabilizers and microbiological starter cultures) products with milk and vegetable protein, adapted to the requirements of customers with desired physicochemical, rheological, organoleptic properties can be created. Daily demand of adult working population in Ukraine in proteins depends on gender, age and work intensity and for men it is - 58 ... 107 g (including 32 ... 59 g of animal protein), for women - 50 ... 84 g (respectively 28 ... 46 g of animal protein). However, in recent years there has been considerable lack of protein in the diet of the population, infraction of nutrition structure. The main reasons of the situation stated above is the lack of fresh plant foods and foodstuffs of animal origin, low culture of nutrition and the actual food purchasing possibility of people, poor diet, increasing of bakery products consumption [1].

Imperfect amino acid composition of the protein product may be corrected by the method of combining proteins of different origin, which has definite patterns, especially enrichment occurs when the protein components of the mixture are capable to correlation of amino acid deficiency of each source of protein.

One of the promising areas of milk protein products technology with principles of a balanced diet is putting grain and legume crops into protein compounding ingredients [2-3].

All kinds of vegetable substance legume seeds differ the most: soybean, beans, peas, etc.

Legume seeds contain a relatively large amount of dietary fiber, vitamins of group B, tocopherols, micro and macroelements. Characteristics of the chemical composition of legume seeds of some representatives in literature may vary. Analysis of these data shows that the protein content in the seeds of main leguminous is 2-3 times higher than in cereal grains. Amino acid composition of protein legume is thought to be full - content of lysine is 2,0-2,5 times more than in protein of other cereals. Fractional composition of the protein is largely represented by albumin and globulins, which leads to their high solubility and good digestibility.

Technological interest for dairy products processing industry is pea products processed to the state of flour - pea malt (TU 18.429-97) and flour from pea malt (TU 46.22.063-96). The process of germination significantly affects the total nitrogen content, but significantly alters the ratio of individual fractions of nitrogen-containing compounds [4].

One of the most important components of pea seeds is vitamin E, physiological value of which is characterized by vitamin activity and antioxidant action. During germination of pea seeds is a synthesis of d-tocopherol, which has plenty of high biological activity, and increase it to 2 times (from 6.57 to 12.20 mg / kg).

Pea malt can be considered as a natural carrier of bioactive d-tocopherol thanks to the presence of a sulfur-containing and aromatic amino acids and lecithin, which is synergistic of phenolic compounds, including tocopherols.

Pea malt is a promising raw material for combining protein with milk protein base.

Enrichment of cheese curd products is possible by the putting functional and technological components that increase the nutritional properties and biological value due to vegetable proteins, carbohydrates that are easily digested, dietary fiber, vitamins, minerals and other substances.

The most important functional and technological properties of pea malt may include: the ability to swell, solubility, compatibility with raw milk at organoleptic evaluation, rheological indexes, water-retaining capacity. The use of bean malt should not significantly complicate the technology of dairy products and provide no typical organoleptic characteristics of the finished products that are manufactured in the milk-based protein (extra floury feeling, fragility, etc.). Establishing the optimum preconditioning regimes before putting pea malt in milk-based protein in view to binding a certain amount of moisture by has an essential matter during the process and getting final product of the desired quality.

The ability of malts to bind water at its contact surface - one of the characteristic physico-chemical and functional properties of the process that is crucial in the organization of biological systems. In pea malt after swelling protein-polysaccharide aggregates can form complex link that keeps water and electrolyte

solutions in their cells. The mobility of water and its ability to dissolve water-soluble components are determined by the strength of its connection with biopolymers of malt supplements. That's why an important knowledge not only of quantitative characteristics of hydrated malt moisture content, but also the state of water in it is very important. The thermogravimetric method was used for a research with the help of which the assessment of water in feedstock was carried (low-fat cottage cheese, pea malt) at different temperatures of the dispersion medium - whey.

Research results. In raw milk (low-fat cottage cheese) there is free water and the amount of bound water is negligible. This product contains moisture 14.2 and 10.1 times more than malt and flour, respectively. Graphic representation of the results of measurements on the laboratory hygrometer ADS series produced by "AXIS" is shown in Fig. 1.

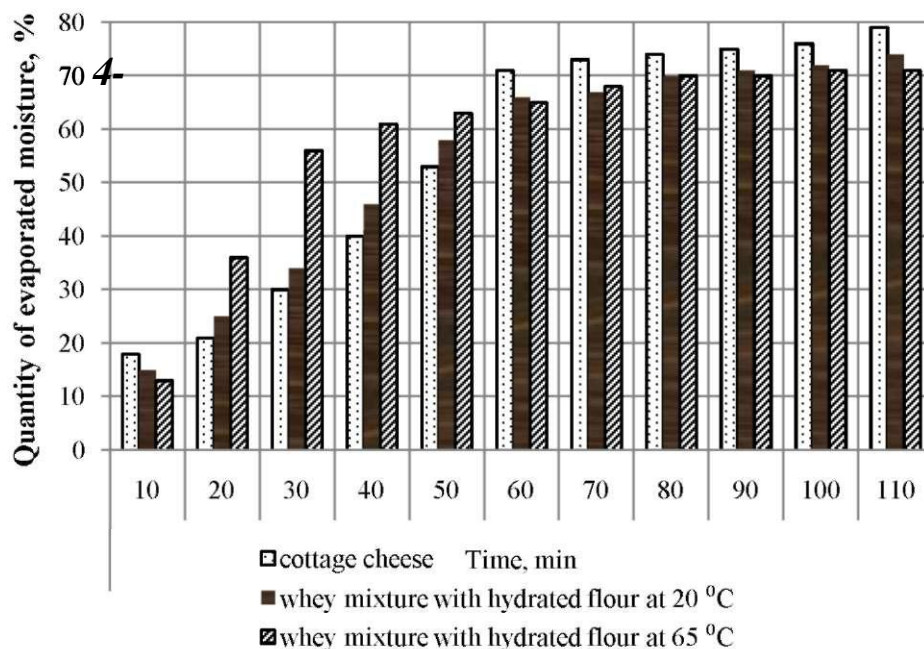


Figure 1. The dynamics of evaporation from model Designs.

It should be noted that pea malt moisture contain is 0.4% more than flour's, but in both cases the entire amount of water is inbound state. With addition of whey to the two components at temperature of 20°C moisture increases sharply with increasing of the amount of free water. Amount of bound water in hydrated pea malt is higher than the weight of the flour. Increasing of temperature of vegetable fillings processing to 65°C leads to a significant reduction in the quantity of free water in them and increasing of bound water. Occurred processes show that increasing of temperature of the pea malt flour processing increases the mobility of water molecules, is accompanied by intensive processes of hydration by increasing the availability of active sites in the protein, starch and ballast substances contained in supplements. These results correlate with the data obtained in determining indicators during swelling.

For getting cheese curd paste with ingredients of vegetable origin, that are approaching to the traditional cheese curd products according to the amount of quality indicators, it was necessary to establish the optimal quantity of pea malt and character of its pretreatment.

Pea malt was added in low-fat cottage cheese, after previous hydrothermal processing under the following conditions: heating with buttermilk in a ratio of 5:2 to a temperature (65 ± 2)°C for 2-3 minutes, followed by cooling to a temperature (42 ± 2)°C and holding for 10 min and stirring.

Organoleptic evaluation of modeling snack pastes samples allowed to establish that the samples with a mass of pea malt - 1.2% and 6.0% is not organoleptically suitable. So, first and second samples did not express visible bean flavor and color, but there was quite acceptable consistency. A sample with a mass of pea malt 6.0%, was the best in the evaluation of taste, odor and color, but the the texture was dense and pretty hard, with the presence of floury consistency and had not attractive yellowish tint. Samples of the product with a mass of pea malt - 3.4% and 5.0% are organoleptically suitable and have the organoleptic characteristics: homogeneous texture, moderately dense storage does not change, clean cheese flavor with barely pronounced flavor made by filler, white color with inclusions introduced by filler steady throughout the mass.

The choice of optimal dose of pea malt is based on keeping for the principle of conservation of organoleptic characteristics typical for traditional milk-protein products with additives and is 3.0-5.0% by

weight of the finished product. Smaller quantity of them does not affect the properties of the finished product, while the excess makes its structure not steady throughout the mass and too dense.

Studies have shown that thermogravimetric method can adequately carry out qualitative and quantitative assessment of the structure of hydrated vegetable filling and low-fat cottage cheese. Increasing of the temperature of pea malt processing from 45°C to 65°C leads to a drastic reduction of the quantity of free water and increasing of bound water to 20%.

The research made it possible to develop technology of snack pastes on the basis of cottage cheese with normalized values of moisture and steady consistency. Also it gives the opportunity to increase nutritional and biological value of products through nutrient enrichment, expand the range of products based on cottage cheese with domestic ingredients, save raw animal protein.

LITERATURE

1. Смоляр В.І. Фізіологія та гігієна харчування. - К.: Здоров'я, 2000. - С.336.
2. Козьміна Н.П. Технологические свойства зернобобовых культур. - М., 1975. - С.293.
3. Васютин А.С. Зернобобовые культуры - основной источник растительного белка. / Кормопроизводство. — 1996. — № 4. — С.26-29.
4. Солод гороху — промислове виробництво та перспективи використання / Б.І. Хіврич, І.К.Єгорова, В.А. Домарецький, С.О. Чернишов, А.І. Малоокій // Харчова промисловість. - 1996. - №42. - С.107-109.