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The Use of Milk and Flour Made from Almonds in the Production of Lactic Foods

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ABSTRACT

A nation's health and mental strength depend on its food consumption which is one of the main conditions for the full functioning of the human body. In modern times, the demand for sour milk products has increased significantly due to their dietary and medicinal features. The research object was pure cow's milk, almond milk, almond flour, and samples of sour milk products. During the work, a study of the physicochemical and sensory indicators of the raw materials added almond milk, and the finished product was performed. Based on the sensory and physicochemical indicators of the product, the optimal dosages are as 70 % of cow's milk, 30 % of almond milk, and 1.5 % of almond flour were determined. Based on the above, it is recommended to introduce the developed technology of lactic acid products in production, which will complement the assortment of sour milk products, enrich the chemical composition of the product, and increase the body's resistance and digestibility.

Introduction

Recently, lactase enzyme deficiency, an enzyme disease characterized by the ability to break down milk sugar (lactose) due to a decrease in activity or lack of lactase enzyme, has been recorded mainly in adults and children. The expediency of using almond milk to increase the biological value of sour milk products is scientifically and theoretically justified. The technological parameters for dairy product production using almond milk and flour have been developed. The introduction of the developed technology of a new type of lactic acid production in production will expand the range of sour milk products. This will complete the product's chemical composition, and increase the body's resistance and digestibility. Almond milk is a rich source of biologically active substances; it has a rich chemical composition. (Kasyanov, 2001; Margaryan and Shaninyan, 1976).

Materials and methods

Sour milk products are prepared by technology specific to the dairy product. Sour milk products have dietary

and medicinal properties due to the action of lactic acid bacteria, lactic acid gases, vitamins, ethyl alcohol, flavoring substances, enzymes, proteins, fatty acids, and others, which destroy pathogenic microbes. Sour dairy products are also prepared using curds containing lactic acid bacteria and bifid bacteria. Such dairy products acquire functional properties that benefit human health (Galstyan, 2018; Granato et al., 2010).

Almond milk is a drink made from unroasted and ground almonds and water. It tastes like protein drinks, soy milk and other plant-based milk. In the Middle Ages, almond milk was often used in confectionery as a substitute for cow's milk. This is because it has a longer shelf life than cow's milk without refrigeration. Almonds are commonly called nuts, but they are kernels. Walnut contains a record amount of choline, 52.1 mg per 100 g of raw material, which is responsible for the youth and general health of the body. In addition, walnuts contain vitamins of groups *B, E, C,* and *PP*. Potassium, phosphorus, calcium, and magnesium stand out as the macro elements (Diagram 1).

Taking into account the traditional and advanced technologies for the production of yogurts, their production based on almond milk was proposed. Almond milk is rich in vitamins and minerals, such as vitamin *E* – 28.3 %, and manganese – 16.7 %. Vitamin *E* has antioxidant features, is necessary for the work of gonads, and heart muscle, and is a universal stabilizer of cell membranes. Almond milk improves vision, promotes weight loss, strengthens bones, and improves heart health. It also strengthens muscles, normalizes blood pressure, and helps the kidneys work properly (www.health-diet.ru).

Based on the above-mentioned circumstances, the problem is topical and has both theoretical and practical significance. The work aims to obtain sour milk products with rich chemical composition using almond milk and flour. To achieve the goal, it is necessary to solve the following problems (Diagram 2, 3):

- to study the chemical composition of almond milk, its properties, significance, and effect on the manufactured product
- to determine the optimal amount of almond milk addition
- to define the optimal parameters of technological regimes of food production
- to study sensory, physicochemical, and biochemical indicators of prepared food.

The research object was pure cow's milk, almond milk, almond flour, and samples of sour milk products. During the research, a study of the physicochemical and sensory indicators of raw materials added to almond milk and the finished product was performed. Test and check samples were prepared using classic drinkable yogurt technology (Beglaryan R., Beglaryan A., 2003).

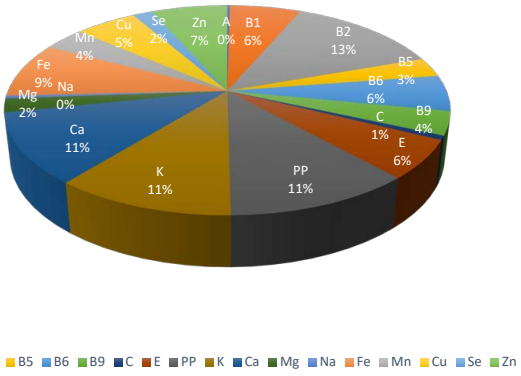

Diagram 1. Vitamins, minerals (https://productplanet.ru).

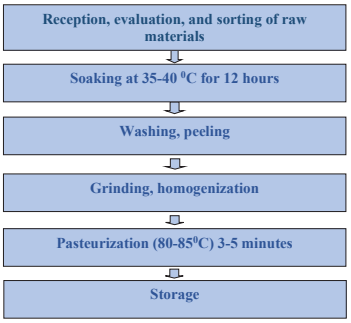

Diagram 2. Almond milk preparation diagram (*composed by the authors*).

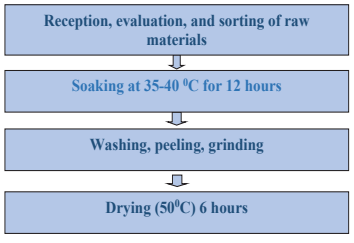

Diagram 3. Almond flour preparation diagram (*composed by the authors*).

Results and discussions

The research was carried out under laboratory and semi-production conditions. The experimental works were carried out in the laboratory of the Chair of Livestock Products Processing Technologies (Krus, et al., 2006).

Accepted scientific research methods were used during the investigation. Batches of almond milk and almond flour (experimental) and traditional (control) were produced by traditional biotechnology (Aydinyan and Chatinyan, 2009).

The subjects of the study were cow's milk, almond milk, almond flour DVS-type dry mass, and products made with sour milk technology.

The sensory and physicochemical indicators of cow's milk and almond milk were studied. (Rodionov, et al., 2020).

Sensory parameters of cow's milk are as follows: color – white to slightly yellowish, taste – naturally sweet, without extraneous taste and smell, consistency – certain thickness, without sediment. Sensory indicators of almond milk: color – white, taste – typical of almond milk, without extraneous taste and smell, consistency – a certain thickness, with a slightly expressed sediment. Composition of almond milk: water – 1000 g, almonds – 190 g.

Table 1. Physicochemical parameters of the studied cow's milk*

	Mechanical pollution	Microbial pollution	Titratable acidity, ^{0}T	Density, kg/m^3	Protein, %	Fat, %
Experimental	I	I	19	1030	3.2	2.5
Control	I	I	19	1030	3.2	2.5

Table 2. Physicochemical parameters of almond milk that are under investigation*

	Mechanical pollution	Titratable acidity ^{0}T	Density kg/m^3	Fat %
Experimental	I	10.5	1020	9.1
Checker	I	10.5	1020	9.1

*Composed by the authors.

Table 3. Determining optimal amounts of almond milk addition*

Sample	Amount of almond milk, %	Amount of almond flour, %	Amount of cow's milk, %	Hour
Control	0	0	100	5
Experimental 1	30	1.5	70	4.5
Experimental 2	50	1.5	50	4.5
Experimental 3	30	1.0	70	5
Experimental 4	50	1.0	50	5

Table 4. Indicators of technological processes of food produced with the developed technology*

Technological indicators	Experimental	Control
The fat content of the mixture, %	3.2	3.2
Titratable acidity ^{0}T	18	18
Density kg/m^3	1028	1028
Homogenization temperature ^{0}C Pressure, MPa	60-65	60-65
Pasteurization temperature ^{0}C for 5 minutes	90-95	90-95
Condensation temperature,	43	43
Amount of clod to be added YF-L811	50 units per 500 liters of milk	50 units per 500 liters of milk
Amount of almond flour to be added, %	1.5	0
Duration of coagulation, hours	4.5	5
Acidity at the end of coagulation, ^{0}T	80	90

*Composed by the authors.

Physicochemical parameters of cow's milk are as follows: mechanical contamination is determined according to standard I class, microbial contamination – according to reductase test I class, fat content – 2.5 %, titratable acidity – 19 ^{0}T, density – 1030 kg/m^3, protein content – 3.2 %.

Physicochemical indicators of almond milk are as follows: mechanical pollution – according to standard I class, fat content – 9.1 %, titratable acidity – 10.5 ^{0}T, density – 1020 kg/m^3. Accepted scientific research methods were used during the investigation.

The research was conducted to determine the optimal dosage of almond milk. In the next phase of the research, experiments were carried out to determine the optimal amount of almond flour addition (Table 3).

Conclusion

Taking into account the results of the scientific research, theoretical and experimental works, the following conclusions and recommendations were made. The composition of cow's milk is enriched with easily digestible carbohydrates, vitamins, and minerals. It has been theoretically substantiated and experimentally confirmed that the composition of dairy products is enriched with carbohydrates, vitamins, and minerals due to almond milk and flour. It is mainly useful for people with lactase enzyme deficiency, a fermentopathy characterized by the inability to decompose lactose. As a result of the research, it was discovered that with the addition of the optimal amount of almond milk and flour, the experimental drinkable lactic acid product acquires a unique taste, smell, homogeneous fine consistency, and high digestibility. Taking into account the above, we can say that the use of vegetable raw materials allows for expanding the assortment, improving the quality of the product, and using it in therapeutic prophylactic food. The use of almonds in the dairy industry contributes to the increase of nutritional and biological value, obtaining a product with appropriate physicochemical indicators and a relatively long shelf life.

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