About the use of plant-based complex of alfalfa in production of dairy products

L E Glagoleva, N P Zatsepilina, I P Nesterenko¹ and D M Pevneva

Federal State Budget Educational Institution of Higher Education «Voronezh State University of Engineering Technologies», Voronezh, Russia

¹E-mail: irochka2n@gmail.com

Abstract. Fermented milk products perform a special role in rational human nutrition and is an important factor in treatment and prevention of various diseases of gastrointestinal tract. Today, close attention is paid to development and inclusion of various herbal components in production technologies of fermented dairy products. The article discusses the issue of using the plant complex of alfalfa in production technology of fermented dairy products. Alfalfa contains many useful substances that are so necessary for a human body in the realities of today's adverse environmental impact. The use of the plant complex of alfalfa in fermented milk products will fortify them with protein, vitamins and minerals. The work considered the technological scheme for production of the fermented dairy product with alfalfa seeds, as well as the organoleptic characteristics of finished product. Based on the obtained results, it was concluded that the alfalfa plant complex can be used in production of fermented milk products.

1. Introduction

For decades, food has been viewed as a means of satisfying a person's basic need for food. In recent years, in Russia and abroad, due to increase in the number of chronic diseases associated with the use of unbalanced food products a high demand for functional food products using various plant components has appeared. Thus, functional nutrition has become quite widespread, being a fairly new and promising direction in food industry for modernizing its structure and supporting public health.

The dairy industry has been one of the leaders in food industry for many years. Milk and dairy products contain substances that human body needs for correct, balanced work. Such substances include proteins, fats, carbohydrates, minerals and vitamins, lipids, and etc. The content of all these elements in milk constitutes its nutritional value.

A characteristic feature of milk and dairy products is a high level of calcium, which is an essential element of bone tissue, which, in turn, takes part in many processes in the human body. For example, it regulates blood clotting, helps build immune bodies, and much more. A specific feature of milk is that calcium in it is in a special interdependence with phosphorus and magnesium, increasing its ability to absorb in the intestine.

It is impossible to dispute the dignity of the nutritional value of milk containing products, milk is a product necessary for the human body and is irreplaceable throughout life. The range of milk-containing products today is quite extensive, it includes various yoghurts, curdled milk, kefir, cottage cheese, sour cream, cheeses, butter, etc. The Institute of Nutrition of the Russian Academy of Medical Sciences has recommended the following milk consumption rates: 1090 g per day and about 392 kg per year.
Currently, various methods are used to improve and modernize the technological process for the production of dairy products, technicalization, increase the assortment line of these products, increase their value, thanks to the accumulated experience in the production of milk-containing products. Presently, scientists face the problem of the development of e-quality new products that can meet not only the physiological needs of the consumers in the nutrients and energy, but also perform therapeutic and preventive function that meet the adopted "Concept of the State Policy in the field of healthy nutrition of the population of our country" [1,2,3].

One of the key roles among the assortment of milk-containing products that support human health and its adaptability to negative environmental conditions is given to fermented milk products.

In recent decades, fermented milk products that contain various plant components have received special recognition among public, they are able to have a beneficial effect on the gastrointestinal tract. The composition of fermented milk products with plant components contains a large amount of essential amino acids, vitamins and minerals necessary for the human body for normal life (the amino acid content in fermented milk products is 7-11 higher than in milk) [4, 5].

The production of combined dairy products with the addition of various natural components of plant origin is a promising direction for the food industry [6, 7]. Plant raw materials in finished product act as a prebiotic. The enrichment of a fermented milk product with certain herbal supplements contributes to the preventive effect. Prebiotics play the role of stimulating the growth of probiotic cultures in the product.

The purpose of the study is to determine the possibility of using the plant complex of alfalfa in production of fermented milk products.

In accordance with the goal, the following tasks were set:

- to investigate the possibility of using the plant complex of alfalfa in production of fermented milk products;
- describe production technology of the fermented milk product with addition of alfalfa seeds;
- to study the organoleptic characteristics of the obtained fermented milk products.

2. Materials and research methods

Not so long ago, it was proved that a substance obtained from alfalfa, called saponin, is the only natural biologically active substance today that interferes with absorption of fats and cholesterol into stomach, which are consumed by humans with food. Table 1 shows the physical and chemical composition of alfalfa seeds.

| Table 1. Physical and chemical composition of alfalfa. |
|-------------------------------------------------------|
| Content in 100g                                      |
| Proteins, g                                          |
| Fat, g                                               |
| Carbohydrates g                                      |
| Alfalfa seeds                                        |
| 3.99                                                 |
| 0.8                                                  |
| 2.1                                                  |

In the course of the work, functional and technological properties of the plant complex were studied in order to determine method and stage of introduction of the developed composition.

The studies the complex were carried out under static conditions at temperatures (T = 290 K, T = 310 K, and T = 330 K), in water, normalized milk with a different mass fraction of fat, fermented milk products.

Based on the obtained data, a temperature of 330 K and swelling time of 10 min were chosen for the preliminary swelling of a sample, containing alfalfa seeds. As a basis for the production of an innovative product, the following were selected: Yo-Mix 200 bacterial concentrate and micronized complex from alfalfa seeds.

The amount of starter culture varies in the range of 3-5%, taking into account the organoleptic characteristics and acidity.

As a result of the research carried out, a yoghurt product has been developed that has high consumer qualities, the main indicators of which correspond to the normative data.
Alfalfa contains a wide range of active substances such as iron, phosphorus and calcium. The plant also contains: vitamins A and C, D, E, K, B vitamins (B₁, B₂, B₁₂), chlorophyll, unsaturated fatty acids, tannins, amino acids, phytoestrogens (coumestrol and genistein), cyclic compounds and saponosides [2]. The concentration of vitamins and the accumulation of nutrients in the seeds increase during the ripening of the pod. Table 2 shows main vitamin and mineral composition of alfalfa seeds.

**Table 2. Vitamin and mineral composition of alfalfa seeds.**

| Vitamins | Content in 100 g | A, mg | B₁, mg | B₂, mg | PP, mg | C, mg |
|----------|------------------|-------|--------|--------|--------|-------|
| Alfalfa seeds | 0.01 | 0.13 | 0.5 | 0.08 | 8.2 |

| Minerals | Content in 100g | Sodium, mg | Potassium, mg | Calcium, mg | Magnesium, mg | Phosphorus, mg | Iron, mg |
|----------|-----------------|-------------|---------------|-------------|---------------|---------------|---------|
| Alfalfa seeds | 6.0 | 78.98 | 31.96 | 26.87 | 70.0 | 0.968 |

Alfalfa belonging to the blue-hybrid variable species, Feya variety, was selected for the study. This variety was obtained from 3 varieties: Krasnodar early, Ladak and Glasye. The advantage of the Fairy variety is its resistance to temperature extremes, as well as resistance to dry weather. This variety has been cultivated since 2011, it is widespread in the southern regions of Russia. The yield of this variety is about 70 tons per hectare, during its growing season it gives 4-5 mows, the protein content in the seeds is about 20%.

In the course of the work, a technological scheme for the production of a fermented milk product with alfalfa seeds was made (figure 1).

**Figure 1.** Technological scheme for the production of fermented milk product with alfalfa seeds.

In the course of the work, a study of organoleptic indicators of the obtained samples was carried out with the addition of alfalfa seeds in an amount of 10%, 20% and 30% and wheat germ seeds (table 3).

**Table 3. Organoleptic indicators of the studied samples.**

| Sample | Finished product appearance and consistency | Taste and smell | Color |
|--------|-------------------------------------------|----------------|-------|
| The sample containing wheat germ seed | Consistency – homogeneous; clot is not broken | There are no foreign tastes and odors. The taste is pure, fermented milk. | Uniform milky white color |
The sample containing 10% alfalfa seeds
Consistency – homogeneous; clot is not broken
There is a barely noticeable specific flavor of alfalfa seed additive.
Uniform milky white color

The sample containing 20% alfalfa seeds
Consistency – homogeneous; clot is slightly broken
There is specific flavor of alfalfa seed additive. The taste is pure, fermented milk.
Milky white color with a grayish tint

The sample containing 30% alfalfa seeds
Consistency – heterogeneous; Clot is not broken; mealiness is not very pronounced
There is specific flavor of alfalfa seed additive. The taste is pure, fermented milk, mealiness.
Uneven milky white color with a grayish tint (due to color of the added ingredient)

From table 3 it follows that the sample with 10% content of alfalfa seed is optimal for production.

3. Conclusion
One of the promising plant complexes for introduction into the food industry is the plant complex of alfalfa. Alfalfa is a legume that until recently was used only as a forage grass. To date, more than 100 species of this plant are known: sickle, hop, blue, changeable, northern and many others [3]. The advantage of alfalfa is its richness in various minerals. The roots of the plant penetrate deep into the soil for 30-40 m and can reach the layers of the soil rich in minerals, transforming the obtained substances into a favorable form for the human body.

The plant complex of alfalfa has a fairly extensive therapeutic and prophylactic effect [2]. Alfalfa is able to reduce the level of cholesterol, fat and sugar in the blood, normalize the balance of intestinal microflora, has an extensive antioxidant and anticarcinogenic effect on a human body [3].

Based on the foregoing, it follows that a new fermented milk product with the addition of alfalfa seeds will expand the assortment line of dairy products recommended for organizing healthy nutrition of the population, as well as turn over the idea of this plant culture and bring its use to a new level in the food industry.

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