Investigation of the properties of lentil cheese as a new food source in Russia

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Abstract. In this work, research has been carried out to obtain vegetable cheese from sprouted lentil grains. The conditions for enrichment of the protein clot with iodine were established when adding potassium iodide during the germination of lentil grains. Some indicators of the structure formation of the protein clot were determined, laboratory testing of the vegetable cheese technology was carried out. For the prevention and treatment of diseases, a physicochemical and organoleptic assessment of the finished experimental product was given.

Keywords: lentils, germination, potassium iodide, lentil cheese, coagulant, endemic diseases

The state policy of Russia is aimed at providing the population with high-quality food products. The main objectives of the strategy include improving nutritional value, preventive methods to prevent diseases, development and circulation of food of appropriate quality on the market. When analyzing the nutritional structure of the population of Russia, it was revealed that food products consumed by humans do not fully correspond to modern trends in the development of nutritional science. The reasons lie in the increased calorie content, deficiencies and imbalances in macro- and microelements in foods. Changes in the lifestyle of most of the population caused a decrease in the need for energy costs and, as a result, in food consumption, but human needs for micronutrients have practically not changed [1].

The activities of domestic and foreign scientists are actively aimed at the development of food products enriched with vitamins, mineral components, dietary fiber. Currently, the development of protein products from plant raw materials, especially legumes (soybeans, lentils, peas, chickpeas, etc.), is very popular.

The aim of the work is to assess the possibility of creating a protein product from a domestic vegetable source of raw materials that meets the needs of the population in high-grade proteins, vitamins, fiber, and is also able to replenish the iodine level in the human body to prevent the onset and development of thyroid diseases.

Lentils, known since the time of Tsarist Russia as a healing culture, were selected as a raw material source. Lentil grains were bioactivated by germination in a modified nutrient medium using potassium iodide. To obtain lentil cheese, seeds of sprouted red lentils were used. It is known that the germination process enriches lentil seeds with a large amount of nutritional ingredients, increases antioxidant activity, and also decreases the oligosaccharide fraction while increasing the proportion of vitamins.

The technology for obtaining lentil cheese consists in the following operations. Lentil seeds are germinated in cold conditions of 4-6°C, while irrigating with a nutrient solution with the addition of potassium iodide. In the process of germination of lentil grains, inorganic iodine in the nutrient medium is converted into an organic bioavailable form, which is better absorbed in the body and helps prevent the occurrence of endemic diseases. Then lentil seeds are crushed to a puree state with the addition of flavoring components and spices. Then the prepared mixture is added to the prepared agar-agar, mixed and poured into molds, cooled to 4-6°C and sent to maturation [2, 3].

As you know, the human body constantly needs to obtain the necessary minerals for the normal functioning of vital organs. Iodine is a chemical element that promotes the synthesis of thyroid hormones (triiodothyronine and thyroxine), thereby improving the growth and development of cells, regulating the exchange of vitamins, hormones, maintaining a stable functioning of the nervous and immune systems, etc. To determine the quantitative content of iodine in lentil cheese, a titrometric method was used. In the process of germination in various variations used the concentration of potassium iodide 2 g/l, 5 g/l, 10 g/l (figure 1) [4].

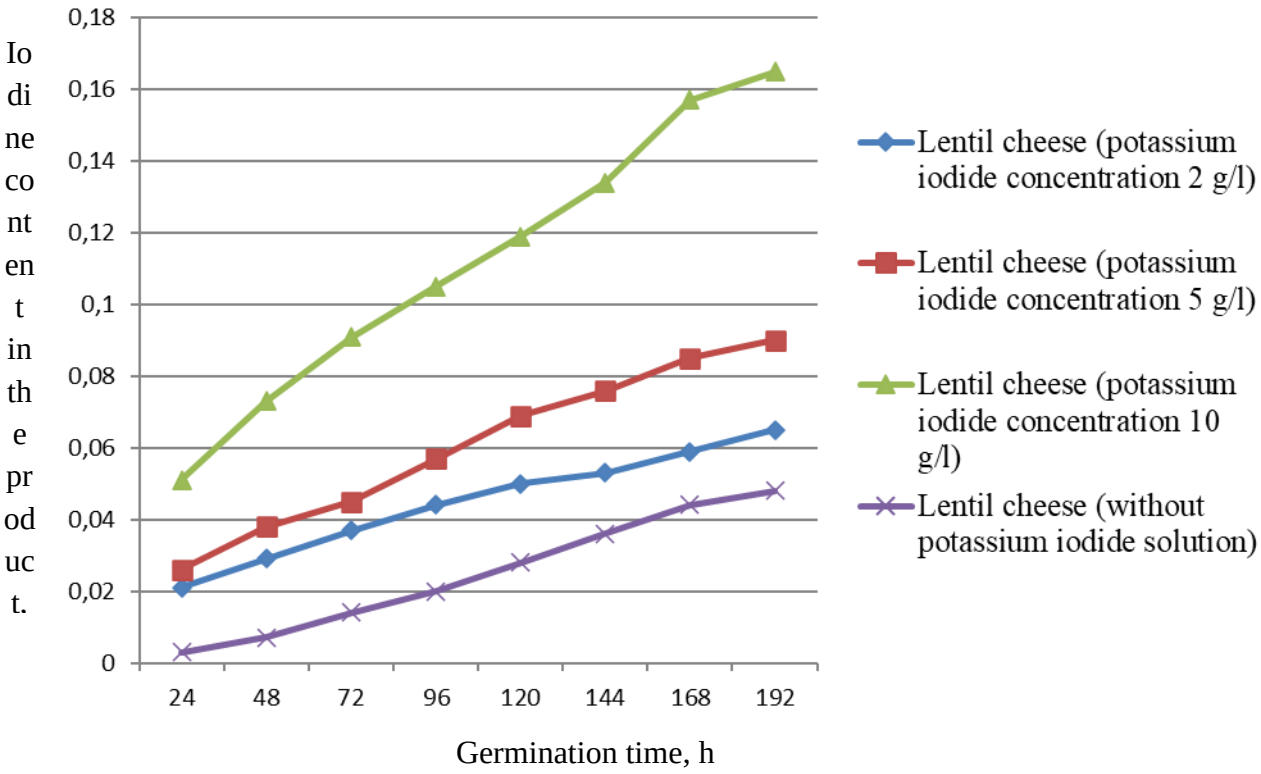

Figure 1. Diagram of iodine content in vegetable cheese from sprouted lentil seeds

It was found that the recommended daily intake of iodine for a healthy adult is 0.150 mg. The optimal dose of fortification of germinated lentil seeds is 10 g/l, since the iodine content in the final product is 0.165 mg.

An important indicator in the production of different types of cheese is the formation of a curd. In the production of vegetable cheese from lentils, three types of thickeners were used as a coagulant: collagen (of fish origin), gelatin and agar-agar. Figures 2, 3, 4 show the diagrams of the dynamic viscosity of lentil cheese when using thickener concentrations of 20 g/l, 50 g/l, 100 g/l of the mixture [5].

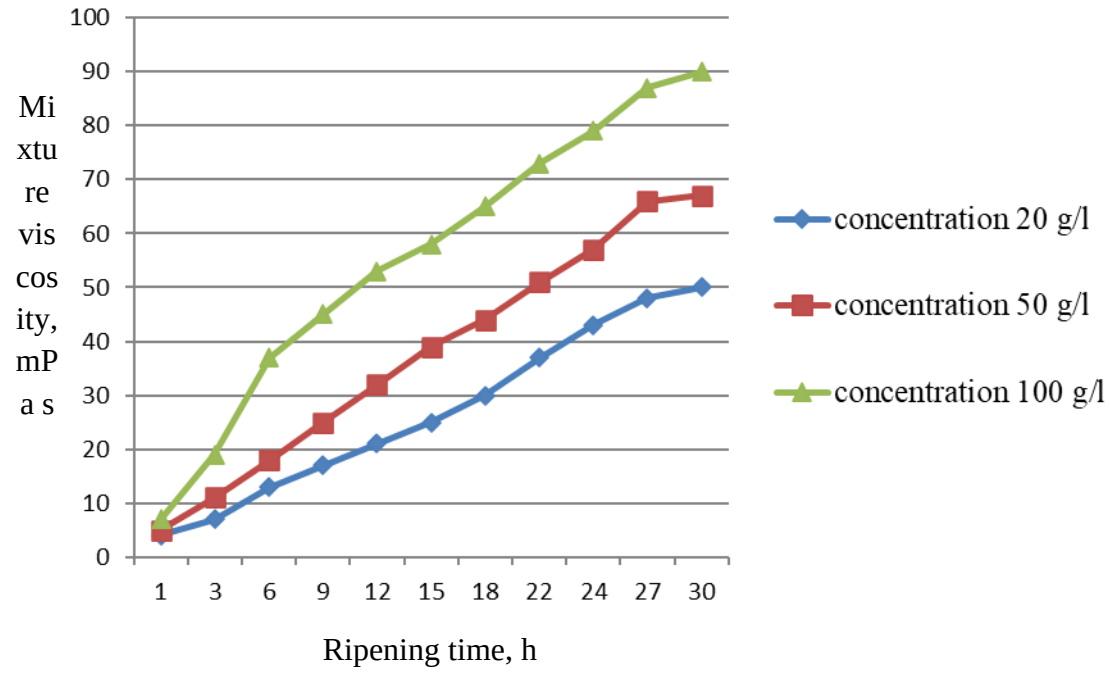

Figure 2. Indicators of dynamic viscosity of lentil cheese using collagen (fish origin)

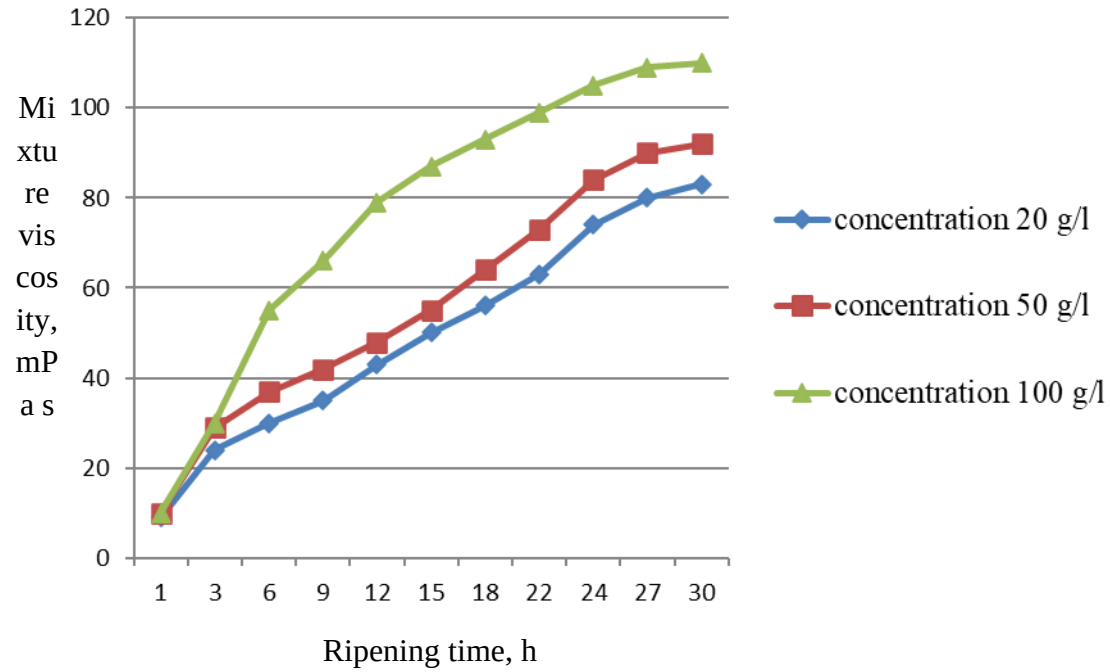

Figure 3. Indicators of dynamic viscosity of lentil cheese when using gelatin

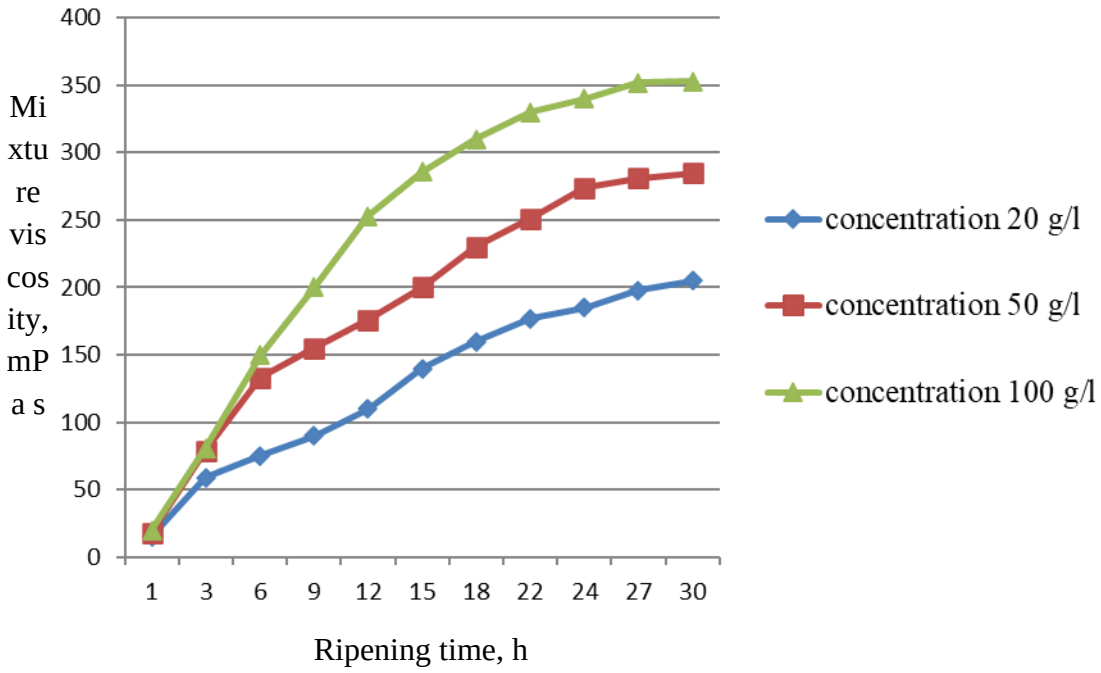

Figure 4. Indicators of dynamic viscosity of lentil cheese when using agar-agar

In the course of experimental studies, it was found that collagen and gelatin exhibit weak coagulating properties in the production of lentil cheese. At a concentration of 100 g/l, the dynamic viscosity of the plant product with collagen was 90 mPa·s, and with gelatin, 110 mPa·s. At these rates, the lentil cheese had a poorly bound structure that was unstable upon further storage. There was a slight fishy odor when collagen was added.

The best texture and flavor characteristics were obtained when using agar-agar in the production of lentil cheese. As can be seen in Figure 4, already at 12-15 hours, a dense structure is formed in vegetable cheese, which retains its shape throughout its shelf life. In terms of taste, there is an insignificant lentil taste and smell, which fully satisfies the needs of the consumer.

The resulting product - lentil cheese is characterized by the corresponding indicators. Organoleptically, the product has a fairly dense clot with an acceptable slightly brittle, but not crumbly consistency. Creamy color, evenly distributed over the entire cut area of the finished product, there is a weak taste and smell of lentils.

Using modern research methods, we analyzed the chemical composition of the product being developed, shown in table 1.

Table 1. Chemical composition of lentil cheese

Indicator name	Component content in the product,%
Mass fraction of fat	9.5

Mass fraction of protein	6.0
Moisture content	72.0
pH	5.6

From the data in table 1, it can be seen that lentil cheese has the necessary set of appropriate nutritional components to meet the needs of the body.

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