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International Conference «Land Economy and Rural Studies Essentials»**VITAMIN AND MINERAL PREMIXES IN FOOD PRODUCTION
OF THE FOODNET MARKET**

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Abstract

The article deals with the experimental justification for the use of vitamin and mineral premixes in combination with berry fillers, to ensure the specialized food production technology with vitamins. The article also presents the results of a comparative study of vitamin and mineral composition of protein mass and a curd product with various berry fillers. The use of vitamins and minerals in combination with berry fillers both increases the biological value of a product and serves as a platform for a balanced diet. The research object is represented with a pure protein mass, previously filtrated of lactose by means of hydrolysis. The chosen method allows reducing the lactose content in dairy products to almost 98%. The maximum hydrolysis makes possible the production of a range of specialized products. The physico-chemical and organoleptic indicators of quality of the studied product samples with blueberry filler added in different ratios have been studied under the temperature conditions of $(4\pm 2)^{\circ}\text{C}$. It has been determined that the use of vitamin and mineral premixes in combination with berry fillers provides the body with 30% of the daily-norm nutrients. This is an important factor of specialized nutrition. The given studies have been conducted using the technical base of the center for collective use of scientific equipment Agricultural and Technological Research of the Omsk State Agrarian University named after P.A. Stolypin.

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1. Introduction

The production of vitaminized curd products, as well as other specialized dairy products, is regulated by a number of state legal acts of the Russian Federation, technical regulations of the Customs Union, decrees and orders of the Russian government (Dvoretzkiy et al., 2012; Makeeva, 2016; Tikhomirova, 2017). It is also necessary to take into account the consumers' demands for these types of products, such as high organoleptic and functional properties, compliance with the criteria of healthy nutrition, aesthetics, proper packaging, legibility of labeling, as well as a long shelf life under cold storage conditions. High requirements are imposed on specialized vitamin products for school nutrition, since it is an important aspect of maintaining a child's health, physical activity and good mood. Therefore, a balanced and regular diet that combines all the necessary micronutrients (vitamins and minerals) plays a major role in healthy lifestyle.

Micronutrients are one of the essential nutrients, necessary for the normal development of a child's organism, protection from diseases and technogenic environmental factors, including genome reproduction

2. Problem Statement

Biologically complete products with a balanced vitamin and mineral composition is one of the most important categories of specialized nutrition for the population, including preschool children. The range of specialized food products with hydrolyzed lactose and enriched with vitamin and mineral premixes is widely represented on the market, but the segment of Russian production is low, not exceeding 15%. Numerous scientific works by Lisin, Gavrilova (Chernopolskaya & Gavrilova, 2019; Gavrilova & Chernopolskaya, 2020; Lipatov, 2007) and scientists of the Omsk State Agrarian University (Ivkova et al., 2020; Muratova et al., 2011; Skryabina et al., 2020) prove that the use of the ratio of vitamin-mineral premixes and berry fillers as recipe ingredients in the specialized food production can ensure the food composition of the product with the specified chemical properties (Lisin et al., 2013). Moreover, the specialized food production technologies are described in detail in scientific literature, which makes it possible to implement targeted combination of ingredients used and obtain recipes with controlled technological properties (Lisin, 2007).

3. Research Questions

The research subject is represented with a berry filler "blueberries" having the following chemical composition: vitamins, mg/100 g (A 1.5, B1 0.01, B2 0.02, C 10.0, PP 0.3); minerals, mg/100 g (Fe 0.7, Ca 51.0, Mg 16.0, Na 6.0, F 13.0); and vitamin and mineral premix H 33253-1.

4. Purpose of the Study

The research purpose is to select and study the optimal ratio and dose of vitamin and mineral complex in combination with berry filler for introduction to the specialized food production technology.

5. Research Methods

The purpose is achieved by evaluating the quality of organoleptic indicators.

6. Findings

To determine the required amount of berry filler, its effect on the organoleptic and physico-chemical parameters of the finished product has been evaluated. The amount of berry filler varied (Kosenchuk & Shumakova, 2019) from 2.5 to 10.0% of the protein mass volume. The physico-chemical and organoleptic parameters of the vitaminized curd product have been evaluated.

Table 01 presents the results of studying the influence of the berry filler's dose on the chemical composition of the protein base (Table 01)

Table 1. Chemical composition of the curd product

Variant	Composition of the vitaminized curd product, %		Chemical composition, mass content, %				Active acidity, units pH
	amount of protein mass	amount of blueberry filler	dry substances	carbohydrates	proteins	fats	
Control sample	100	0	21.4	0.69	14.70	1.50	4.50
1	97.5	2.5	21.96	1.55	14.71	1.45	4.49
2	95.0	5.0	22.51	2.40	14.75	1.42	4.46
3	92.5	7.5	23.07	3.26	14.67	1.40	4.45
4	90.0	10.0	23.62	4.11	14.64	1.39	4.44

The acceptable deviation rate is ± 0.5

Table 01 shows that an increase in the amount of berry filler in the recipe of the curd product leads to an increase in the mass content of dry substances, mainly due to carbohydrates.

- It is also important to note that with an increase in the amount of added berry filler, the active acidity of the curd product practically does not change.

The changes in the dynamic viscosity of the curd product during storage have also been investigated. The study of dynamic viscosity has been carried out to determine the resistance of the curd product to syneresis during storage (Borisova & Bessonova, 2013; Chernopolskaya, 2019; Kolesnikova et al., 2005). The dynamic viscosity increases with increasing the shelf life of the curd product, which has a favorable effect on the consistency of the finished product.

Evaluation of organoleptic indicators of the curd product's quality lets find out that the dose of berry filler over 7.5 % is impractical, since the taste becomes excessively sweet, and the color is lilac (saturated). It should also be noted that prior to the filler introduction the curd product has the following characteristics:

0 (control sample) – tender, homogenous, spreadable, slightly gritty consistency, pure sour-milk taste and smell, milky color, homogenous mass;

2,5 – tender, homogenous, spreadable, slightly gritty consistency, sour-milk taste and smell with slight flavour of the berry filler, light-lilac color, homogenous mass;

5,0 – tender, homogenous, spreadable, slightly gritty consistency, sour-milk taste and smell with slight flavour of the berry filler, light-lilac color, homogenous mass;

7,5 – tender, homogenous, spreadable, slightly gritty consistency with visible berry kernels, sour-milk taste and smell with savoury flavour of the berry filler, sparingly lilac color, homogenous mass;

10,0 – tender, homogenous, spreadable, slightly gritty consistency with visible berry kernels, sour-milk taste and smell with dominant flavour of the berry filler, sweet taste due to the hydrolyzed lactose, lilac color, homogenous mass.

When adding the berry filler "blueberries" in the amount of 2.5-5.0%, the curd product has a light lilac color, characteristic of dairy products for children. Introduction of the filler in the amount of 7.5-10.0% makes the curd product lilac in color, which is not typical of food products for children.

The two methods of introducing premixes in addition to the berry filler have also been studied: into low-fat hydrolyzed milk and into a protein base. The following premixes have been used for the research purpose: vitamin premix H 33253-1, introduced in the amount of 0.25 kg of dry powder per 1000 kg of milk, and mineral premix for baby food dairy products, introduced in the amount of 2.9 kg per 1000 kg of hydrolyzed milk.

The amount of water-soluble vitamins and minerals has been determined using the capillary electrophoresis system Kapel-105. The protein mass without berry fillers, vitamin and mineral premixes has been used as a control sample. The amount of micronutrients does not increase in the protein mass, since most of the vitamins and minerals are transferred to the whey. Then, the vitamin premix and the mineral premix have been added to the curd product with berry filler "blueberries" in the amount of 0.25 kg and 2.9 kg, respectively, per 1000 kg. The content of vitamins and minerals in the curd product is presented in Table 02.

Table 2. Content of vitamins and minerals in the curd product

Vitamins, mg/100 g	Control sample	Curd product with berry filler, vitamin and mineral premixes
B ₂	1.18	1.20
B ₆	0.54	0.55
C	9.97	37.98
B ₃	5.20	6.54
B _c	0.14	0.15
B ₅	Absent	0.27
B ₁	Absent	0.31
Macronutrients, mg/g, not less than:		
potassium	0.10	0.14
sodium	0.11	0.13
magnesium	0.02	0.06
calcium	0.24	0.32

The amount of micronutrients in the curd product can be increased by adding them directly to the protein mass. It has been determined that the introduction of vitamin and mineral premixes directly into the protein mass allows providing a child's organism with 30% of the daily-norm nutrients (at consumption of 125 g per day).

7. Conclusion

The use of vitamin and mineral premixes in combination with berry fillers provide the body with 30% of the daily-norm nutrients.

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