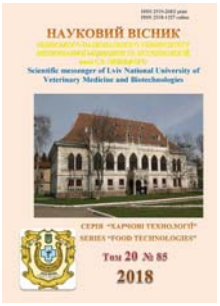

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Influence of thistle grist on organoleptic, physico-chemical and microbiological parameters of kefir

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Modern complex environmental conditions put forward the urgent need to improve the nutritional structure of the population at the expense of improving the quality, biological value and taste of the products. That is why the purpose of the work was to justify the use of thistle grist on kefir technology. In particular, the effect of thistle pellet on the organoleptic, physicochemical and microbiological parameters of kefir has been investigated. It was established that it had a homogeneous consistency with a broken clot and a color from white to cream with interspersed grist. Increasing the dose of thistle grist to 3% and 4% has led to a taste with sharply pronounced flavor of thistle and to a brown color with a pronounced thistle content. The kefir viscosity of 2.5 mg per kg changes over the seven days of storage, although it remains high enough for 8 days, namely 47 seconds. The growth of the viscosity of kefir with thistle grist is due to the hygroscopic properties of grist, resulting binds moisture free product. The analysis of microbiological parameters in the storage of kefir with thistle grist allows us to conclude about the satisfactory sanitary condition of the new product and its harmlessness for the consumer's health.

Key words: *unctional products, kefir, thistle grist, technology.*

Introduction

One of the main directions of the concept of state policy in the field of healthy eating is the development of mass consumption products, products technology of functional purpose, differentiated for the prevention of diseases and strengthening of protective functions of the organism, reducing the risk of harmful substances, in particular for the population of environmentally disadvantaged areas (Sadowska-Rociek et al., 2013; Tsisaryk et al., 2017; Gutyj et al., 2017; Hachak et al., 2018).

Among the large number of functional food groups in millions of people from different countries, sour-milk drinks are deservedly popular, ie cow's milk, milk of sheep, goats, mares and other animals, squashed by various types of lactic acid bacteria (Milani et al., 2011; Mazaraky et al., 2012; Kaminarides et al., 2013; Ferrão et al., 2016). Sour milk products traditionally used in our region are kefir, yoghurt, fermented baked milk, etc. (Didukh and Romanchenko, 2010; Bilyk et al., 2017).

Kefir is one of the most popular sour-milk products, which accounts for more than 2/3 of their production. In Ukraine, this product is very common, because it falls into the category of «essential» products. The beneficial properties of kefir are due to its ability to stop the development of pathogenic bacteria in the intestine. Thus the processes of decay are inhibited and the formation of toxic decay products is stopped (Podobii et al., 2010; Dmytrovska, 2010).

Numerous authors offer a wide range of dairy products with plant components, the use of which ensures the receipt of products with a given structure and qualitative indicators (Musul'manova, 2006; Turchyn et al., 2017). One of these additives in the food industry uses spotty milk thistle, and especially the fruit grist which includes macro- and micronutrients (Ca content – 687 mg/100 grams), amino acids, polyunsaturated fatty acids, a record number of flavolignanes, flavonoids, and fiber. So silymarin in 100.0 grams of grist – 4 grams. All this makes it possible to call this grist a rescue circle of the liver and pancreas! Restored the condition of the liver – the condition of the pancreas improves, the blood sugar level is normalized, lipid metabolism improves, the intestine is normalized. Clinical searches of spotted thistle grist fruits have shown the effectiveness of its use in the complex treatment of viral hepatitis B and C.

Therefore, it is safe to assert that thistle spotty is useful to humans due to vitamins and other biologically active substances.

The purpose of our work was to investigate the effect of thistle grist on kefir technology. To achieve this goal it was necessary to solve a number of tasks:

- to substantiate expediency of use of thistle grist in kefir technology;
- to investigate the organoleptic parameters of kefir with the use of thistle grist;
- to investigate the basic physicochemical parameters of kefir with the use of thistle grist;
- to investigate the microbiological parameters of kefir with the use of thistle grist.

Material and methods

The experimental part of the work was carried out on the basis of OJSC «Ivano-Frankivsk Dairy Plant» and the Department of Milk and Dairy Technologies of the Lviv National University of Veterinary Medicine and Biotechnologies named after S.Z. Gzhytskyj.

For the search it was used kefir, made in accordance with SSU 4417: 2005 and kefir with thistle grist, made according to our recipe.

For researches, the thistle grist was used according to TU U 15.6-24333456-001-2002.

Thistle grist must meet the following requirements:

Appearance – crushed seeds or lumps in the size 0.5–1 mm;

Color – light brown;

The smell is fresh, herbal;

Humidity – no more than 9%:

Calorie content – 164 kcal;

Proteins – 15 g/100 g of product;

Fat – 11 g/100 g of product;

Carbohydrates – 9 g/100 g of product.

The following research methods were used:

1. Organoleptic parameters: taste; scent; consistence.

2. Physico-chemical parameters: titrated acidity, ^{o}T; viscosity, Pa/s.

3. Microbiological indicators: MAFAM; bacteria of the group of E. coli, yeast and mold fungi.

Organoleptic evaluation of kefir includes the definition of such indicators as color, taste, smell, consistency.

The color was determined in a glass cylinder in daylight. The smell was determined when opening the dishes in which the product was located, or when transfusion from one vessel to another.

The taste of kefir was determined by collecting a portion of the product in the mouth, trying to moisten entire mouth cavity to the root of the tongue, exhaling the air through the nose.

The consistency of the product was determined by slowly pouring it from the cylinder into another vessel.

Viscosity measurements can be carried out according to SSU 27709-88. This method determines the measurement of dynamic viscosity using a viscosimeter, using the law of dropping a ball in a viscous medium.

The clot viscosity in the production of kefir was determined by the leakage time at 200 °C from a 100 ml pipette with an outlet 5 mm in diameter.

The leakage time at the end of the fermentation before mixing the clot should be at least 20 seconds.

The titratable acidity was determined according to SSU 3624-92. For this into a conical flask (a glass) volume of 100–250 cm^3 measure 10 cm^3 of kefir or weigh 5 grams of kefir, add 20 cm^3 of distilled water, if the acidity of the cream or 30 cm^3 of water is determined, in the case of determining the acidity of kefir. Then mix and add 3–4 drops of phenolphthalein and the mixture is titrated with a solution of sodium hydroxide until a slight pink color appears, which does not disappear within 1 min.

Acidity (at ^{0}T) corresponds to the number of milliliters of 0.1 normal sodium hydroxide solution, spent on the neutralization of 10 cm^3 cream (or 5 g kefir), multiplied by 10 (or 20). The difference between the parallel definitions should not be higher than 10 ^{0}T (or 20 ^{0}T).

The method of determining the consistency (by diameter of spreading) was developed at the Department of Milk Technology at the Stepan Gzhytskyi National University of Veterinary Medicine and Biotechnologies Lviv.

To determine the consistency of kefir with fillers in the process of its storage for up to 7 days, a method for determining the consistency of the diameter of the spreading was used.

This method was developed at the Department of Technology of Milk and Dairy Products, based on existing methods.

Materials for research:

- object glass
- a millimeter sheet of paper
- microbiological loop
- kefir

The essence of the method is as follows: the plane of the object glass was horizontally fixed on a laboratory table on a millimeter sheet of paper. Microbiological loop kefir was stirring neatly in a chemical glass for 1–2 minutes. Kefir, scooping a loop from a glass, was applied from a height of 5–6 cm to the object glass, a drop of well-mixed kefir, dropped from a microbiological loop on millimeter paper.

According to the presentment of millimeter sheet of paper it was determined the diameter of kefir spreading, mm.

Determination of the amount of lactic acid bacteria was carried out according to SSU 10444.11-89.

The method for determining the bacteria of the intestinal stem group is based on the ability of the bacteria (uncontested, gram-negative, facultative-anaerobic bacteria) to ferment in a nutrient medium lactose at a temperature (37 ± 1) ºC for 24 hours to form acid and gas (BCBG).

Results and discussion

Experimental samples of kefir with thistle grist were manufactured at the Ivano-Frankivsk Dairy Plant. Kefir served as control, made in a reservoir way with traditional technology. Thistle grist were introduced into kefir during its cooling before ripening. The obtained samples were evaluated primarily organoleptically.

Table 1
Organoleptic characteristics of kefir depending on the dose of thistle grist

Dose of wheat bran,%	Taste and smell	Consistency, appearance	Color
-	Sour milk, pure, mild, with a pronounced smell of milk	Homogeneous, with impaired clot	White, homogeneous throughout the mass
1,0	Sour milk, pure with flavor of thistle	Homogeneous, with impaired clot	White, homogeneous with a little splash of grist
2,0	-//-	-//-	Cream with splash of grist
3,0	Sour milk, with pronounced taste of thistle	Homogeneous, dense, with broken clot	Light brown with a splash of grist
4,0	Sour milk, with a pronounced taste of thistle	Homogeneous, very viscous, with a broken clot	Intensely brown with the expression of grist

As can be seen from the above data, kefir, containing 1% and 2% of thistle grist, was characterized by pure sour-milk taste and smell. He had a homogeneous consistency with impaired clot and a color from white to cream with an interspersed grist. Increasing the dose of thistle grist to 3% and 4% has led to a taste with sharply pronounced flavor of thistle and to a brown color with a pronounced thistle content.

Based on the organoleptic parameters of kefir with thistle grist, for further research we chose kefir with 3% of grist.

To assess the change in kefir's consistency with thistle grist in the process of storage, its viscosity and diameter were determined.

Table 2
Change of conditional viscosity of kefir during storage

Duration of leakage, p / Product Name	Initial sample	day 3	Day 5	Day 8
Kefir with fms 2.5% (Traditional)	57	57	53	47
Kefir with fms 2.5% with thistle grist	59	60	64	66

Table 3
Changing the diameter of kefir during storage

Diameter of spreading, mm / Product Name	Initial sample	day 3	Day 5	Day 8
Kefir with fms 2.5% (Traditional)	8.8	9.8	11.6	14.1
Kefir with fms 2.5% with thistle grist	8.0	8.0	7.6	7.2

As can be seen from the tables above, the structure of products, and therefore their consistency, are changing during storage.

The kefir viscosity with fms 2.5% changes over seven days of storage, although it remains high enough for 8 days, namely 47 s. This can be explained by the presence of kefir in the acetic micro flora, which is the cause of high viscosity even after the expiration of its storage. The growth of the viscosity of kefir with thistle grist is due to the hygroscopic properties of grist, as a result of which free moisture product is bound.

Changes in the acidity of dairy products during storage are an important characteristic for assessing their quality.

Table 4
Change of titrated acidity of kefir during storage

Diameter of spreading, mm / Product Name	Initial sample	day 3	day 5	day 8
Kefir with fms 2.5% (Traditional)	90	93	99	103
Kefir with fms 2.5% thistle grist	89	96	102	108

The increase in the titrated acidity of products during storage indicates an intensification of the growth of lactic acid bacteria, although the acidity values are within the limits specified by the standard, even after expiration. Interesting is that which is in kefir with thistle grist the increase in acidity is somewhat more intense compared to traditional kefir and on the 8th day of storage it is at 5°T higher than in kefir.

Based on the table data, we can assume that thistle grist is a nutrient medium for the growth of lactic acid bacteria and their development is illustrated by the value of titrated acidity.

In order to clarify the terms of storage of kefir with thistle grist, microbiological studies were conducted.

The microbiological criteria of kefir safety were selected as follows: the titer of the bacteria of the E. coli group and MAFAM in 1g of the product. When setting the storage date of a new type of kefir, these figures should not exceed the maximum allowable values, which are specified in normative documentation (SSU 4417: 2005 Kefir. Specifications).

Table 5
Microbiological parameters of kefir during storage at a temperature of 4 ± 2°C

Indexes	Traditional kefir						Kefir with thistle grist						Norm
	Duration of storage, days						Duration of storage, days						
	0	2	4	6	8	10	0	2	4	6	8	10	
Bacteria of the group of E. coli (coliforms), absent in the mass of the product, g	0.1 0.01 0.001	0.1 0.01 0.001	0.01 0.001	0.01 0.001	0.001	0.001	0.1 0.01 0.001	0.1 0.01 0.001	0.01 0.001	0.01 0.001	0.001	0.001	0.001
Pathogenic microorganisms, including salmonella	absent						absent						not allowed
Microscopic fungus, CUO/g	3	3	4	5	10	31	2	3	3	4	13	49	-
Yeast, CUO/g	2	2	2	3	4	54	2	2	3	3	6	26	-

We investigated the microbiological parameters of kefir with thistle grist immediately after its manufacture and in the process of storage at a temperature (4 ± 2) C for 2, 4, 6, 8 and 10 days. For comparison, kefir was used as a control sample of 2.5% fms.

The analysis of microbiological parameters in the storage of kefir with thistle grist allows us to conclude about the satisfactory sanitary condition of the new product and its harmlessness for the consumer's health.

So, when determining the titers of bacteria in the E. Coli on the Kessler's medium, three product dilutions (0.1, 0.01 and 0.001 g) were seeded. In all samples of kefir when stored (temperature 4 ± 2 °C) for eight days this figure is more than 0,01g. It should be noted that the value of the titre of bacteria in the group of E. coli kefir with thistle grist did not differ from the control.

Conclusions

The expediency of use of thistle grist in kefir technology is substantiated. Adding thistles to foods, including kefir technology, promotes the enrichment of their food fibers and biologically active substances, which among the functional food ingredients has a significant role.

Kefir with thistle grist with fms 2.5% according to the organoleptic and physico-chemical indicators meets the requirements of the current standard SSU 4417: 2005. Kefir. Specifications.

Kefir with thistle grist is a therapeutic and prophylactic product, because it contains plant-based technologically active substances.

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