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Influence of An Antioxidant Preparation in Diets of Cows on Quality Indicators of Milk - Raw Materials for Butter Production.

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ABSTRACT

Issues of the antioxidant preparation use in diets of cows and its influence on qualitative indexes of milk as raw materials for butter production are considered in the article. It has been found that the antioxidant preparation has a positive influence on technological parameters of milk, cream and butter the amount of which was produced more because of the best extent of fat use from cream and a smaller consumption of milk for 1 kg of butter.

Keywords: milk raw materials, fat, technological properties, antioxidant preparation “Lipovitam Beta”, butter.

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INTRODUCTION

The problem of quality of dairy products has acquired great importance in recent years. Quality of milk – a raw material is characterized by a complex of chemical, physical, biochemical and physiological properties which can be divided into ecological and technological. Ecological quality is understood as a degree of harmlessness of a product for a human body. Technological quality is the suitability of milk – a raw material for processing into various products. Standards of milk-a raw material in modern dairy cattle breeding depend on a set of factors, one of which is feeding, that is regulation of the need of cows for a total quantity of carotene (in its most active β-fraction) [3,4]. However carotinoids in feeds are easily oxidized and decompose under the influence of light, oxygen, cell respiration. The industry produces a carotene preparation with its high resistance, bioavailability and antioxidant properties "Lipovitam Beta" as an alternative to natural sources of carotinoids. A preparation of such structure, unlike the traditional fodder sources of carotene, not only improves the A-vitamin status, but also has antioxidant, immunostimulating and anti-toxic properties against the ecotoxicants coming into an organism. According to scientists, free radicals are the main cause of an oxidative stress. The main method of fight against them is the use of special additives - antioxidants. Antioxidants are the agents capable of giving an electron to an unstable free radical, thereby neutralizing its harmful effects. [6,7,8].

Proceeding from the above-mentioned, the study of use of the antioxidant preparation "Lipovitam Beta" in diets of cows, and clarification of its influence on high-quality parameters of milk as a raw material for butter production is a very topical problem.

OBJECTS AND METHODS OF RESEARCH

The studies were conducted on two groups of cows formed by the principle of a mini-herd and analogous pairs at the dairy farm named after N. K. Krupskaya of the Meleksessky district of the Ulyanovsk region. The feeding of cows was carried out with rations, identical in specific and quantitative forage structure, in compliance with the detailed norms [5]. At the same time the cows of the experimental group were given a complex antioxidant liposomal preparation "Lipovitam Beta" in their diet structure. Cows throughout the winter stall maintenance were fed as a the main ration with the following types of forages, kg: wheat straw - 5,5; corn silage -25; soft wheat- 2,7; barley-1,8; oats - 0,5; wheat bran -1,4; sunflower meal - 1,3; fodder molasses -1,6; salt - 0,070; fodder chalk -0,104. This diet contained 14,94 fodder units, 16,79 Mj of metabolizable energy, 17,68 kg of dry matter, 2309,5 g of crude protein, 1548,80 g of degestible protein, 3961,0 g of crude cellulose, 2623,9 g of starch and 1249,3 g of sugar. In addition to a diet cows of the second group were fed respectively with 4,0 g of the preparation "Lipovitam Beta" 1 time in 5 days.

Research methods

Efficiency of the preparations action was considered and studied in view of the following indicators: milk productivity according to control milking operations each decade; the assessment of milk properties in accordance with state standard P 52054-2003 "Cow milk- natural raw material". The yield and technological indicators of milk processing products from experimental cows were determined during the most physiologically intensive period of their lactation (3-4 months). Butter was produced from cream after maturation by a churning method in which the following parameters were determined: weight fraction of fat – state standard 5867-90; weight fraction of moisture – state standard 3626-73. A buttermilk yield from 10 kg of cream was calculated and its consumption to produce 1 kg of butter; milk consumption for 1 kg of cream and for 1 kg of butter.

RESULTS

In the course of the studies the link of quality indicators in a chain has been established from milk as a raw material to a finished product - butter. Cream production from milk of the experimental cows was carried out at a dairy laboratory. 10 kg of milk for separation was taken from 5 cows – analogs of each group on 3-4 month of their lactation. If to compare a cream yield from 10 kg of milk, then its amount (by 77 g, $P<0,01$) from milk of cows of the experimental group (table 1) was significantly more that is caused by an increased fat content in it. In case of butter production the fatty phase of milk is mainly used, however its structure, properties, quality exert the determining impact on the structure and quality of butter. The formation of the

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physical structure of butter is predetermined by fatty balls of milk, their condition, properties, the extent of use.

Table 1: Technologic properties of milk processed into cream

groups	Indicators							
	Fat content in milk, %	Fat units in 10 kg of milk, g	Cream yield from 10 kg of milk, kg	Fat content in cream, %	Fat units of cream, g	Degree of fat use, %	Milk consumption for 1kg of cream, kg	Skimmed milk yield, kg
I -K	3,78±0,06	378,00	0,972±0,006	37,64±0,14	365,86	96,79	10,288	9,028
II-O	4,05±0,05*	405,00	1,049±0,008**	37,87±0,12	397,26	98,09	9,533	8,951

*P<0,05; **P<0,01

With an increase of the milk fat content the yield of butter increases and fat use improves, that is a rather smaller amount of fat remains in skimmed milk and in buttermilk. It is reasonable to use milk of the increased fat content for the production of butter. In our experiments all these properties were seen in milk separation, creaming and in milk consumption for 1 kg of cream. Cream is the heterogeneous system consisting of the same components as milk, but with other ratio between a fatty phase and plasma thereof physical and chemical properties of milk and cream differ significantly. The size of fatty balls in cream exerts impact on the process of butter formation and the extent of fat use. In case of milk separation the extent of fat extraction from milk of cows of the control group was 96,79% whereas from milk of cows of the experimental group it was maximum and equal to 98,09%. Perhaps, it is associated with the influence of the complex preparation “Lipovitam Beta” not only on the process of fat formation of milk, but also on the diameter of its fatty balls the size of which had an effect on the yield of cream. From the economic point of view it is very important that losses of fat with skimmed milk were as less as possible. The amount of cream produced from 10 kg of milk of cows of the experimental group was more by 7,92% (1,049 kg, P<0,01), than from the same amount of milk in cows of the control group (0,972kg). To produce 1 kg of cream from milk of cows of the experimental group it was used by 0,755kg less, than in case of cream production from milk of cows of the control group.

Butter was made of cream, butter grain was of the identical size, it was evaluated as good and no difference between groups was observed. The composition of butter predetermines its consumer-oriented characteristics. In butter production one of the important indicators is the amount of milk used to produce 1 kg of the product. In our experiment its consumption for 1 kg of butter decreases by 9,88%, at the same time in the control group its consumption was 21,05 kg, and in the experimental it was more efficient by 9,82%–18,97 kg (table 2).

Table 2: Technologic parameters of milk as a raw material for butter production

Indicator	Group	
	I -K	II-O
Butter produced from cream of 10 kg of milk, kg	0,475±0,004	0,527±0,008***
Fat content of butter, %	72,24±0,026	72,40±0,026***
Fat units of butter, g	343,14	381,55
Degree of fat use from cream to produce butter, %	93,79	96,04
Cream consumption to produce 1 kg of butter, kg	2,046	1,991

Degree of using milk fat to produce butter, %	90,78	94,21
Milk consumption for 1 kg of butter, kg	21,05	18,97

*** P<0,001

The consumption of cream to produce 1 kg of butter decreased by 2,69% in comparison with the control group. It is seen that from the same amount of milk (10 kg) 0,475 kg of butter was produced from cows of the control group whereas from cows of the experimental group - 0,527 kg or by 10,95% more (P <0,001). The use of a target antioxidant preparation in diets of cows also improved the extent of fat extraction in cream production which increased from 96,79 up to 98,09%, and in butter production from cream to 96,04% versus 93,79% from cream of milk in cows of the control group.

The moisture content in butter fluctuates in a very considerable range, the importance of a moisture factor in different types of butter especially increases with an increase of its amount in a product and water-soluble components (protein, lactose, etc.), or the former and the latter at the same time. If in butter produced from cream of milk of cows of the control group there was fat of 72,24% and moisture of 26,70% (table 3), then in butter produced from cream of milk of cows of the experimental group respectively 72,40 and 26,45% (P <0,001).

Table 3: Quality characteristics of butter

Group	Indicator		
	Moisture content in butter, %	Fat content in butter, %	Content of MSNF in butter, %
I –К	26,70±0,029	72,24±0,026	1,060±0,013
II-О	26,45±0,024***	72,40±0,026***	1,140±0,010

Non-fat milk solids are composed of the solids of milk proteins, lactose containing in them, mineral salts and other non- fatty ingredients, its role is indisputable in forming a flavoring bouquet and butter texture[1, 2]. The amount of MSNF in butter produced from milk of cows of the experimental group was 0,08% more versus the control group, the indicator of fat use in a product (milk/butter) was also more efficient in the experimental group – 94,21% whereas in the control group this value was 90,78%. When calculating the extent of cream/butter extraction the same tendency is observed: 96,04% and 93,79%.

CONCLUSIONS

Thus after inclusion of an antioxidant additive in the diet of cows, an improvement of the technological properties of milk is observed. Technological properties are expressed in an increase of the general nutritional value of milk on account of an individual components increase in its composition. It is determined by activation of the enzyme and humoral system of metabolic processes in the organism of cows and strengthening of bioavailability of vitamins in the synthesis of milk components as a raw material for butter production.

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