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THE USE OF TARRAGON IN FUNCTIONAL DRINKS BASED ON MILK WHEY

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Abstract:

The implementation of the food transition and processing industry to resource-saving technologies that ensure waste-free production and production with minimal impact on the environment, is possible through the use of natural plant raw materials and functional food ingredients derived from it. Experimental studies of the development of a drink, based on milk whey with the addition of tarragon syrup were conducted at the faculty of technological management of the Gorsky SAU in the laboratory of "The Technology of Production, Storage and Processing of Animal products» Department. The choice of raw materials and components for the production of beverage was justified at the first stage of research. At the second stage, organoleptic and physico-chemical parameters of raw materials – cheese whey were studied. At the third stage, we held the selection of components for the preparation of syrup from the leaves and stems of tarragon. At the fourth stage we studied the doses of vegetable syrup in the raw material, and its effect on the organoleptic and physico-chemical properties of the finished product. The objects of research were: whey, cheese; leaves and stems of tarragon (lat. Artemísia dracúnculus). While carrying out the work we used conventional and standard methods of research of raw materials and finished products' organoleptic and physico-chemical parameters; fat, protein, solids, titratable acidity in accordance with GOST 3626-73; GOST 26809.1, GOST 3622, GOST 3624, GOST 23327, GOST 5867, GOST R 52738, GOST R 53438. It was found that the short-term pasteurization of cheese whey destroyed pathogenic microflora, reduced acidity, its rate of increase, which extends the shelf life of the finished product. In the process of filtering whey protein flakes are removed and the raw material becomes transparent, that improves its presentation. While combining cheese whey with tarragon syrup, the best organoleptic and commercial qualities had a drink in which the amount of the whey was 70% of the total volume, and the amount of the syrup was 30%. The drink acquired a transparent emerald color, refreshing taste of tarragon, without interrupting the taste of the whey.

Key Words: *cheese whey, tarragon, functional product, drink.*

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INTRODUCTION:

The whey is formed in the production of cheese, cottage cheese, casein such a byproduct. It is the most valuable raw material from which it is possible to make unusually wide range of foodstuff, fodder and technical means [1,2]. The main component of whey solids is lactose. No less important component are whey proteins, as they have an optimal set and balance of essential amino acids [3,4]. Almost all the vitamins of milk are preserved in the whey composition, primarily water-soluble, and some, for example, choline even accumulate. Analysis of protein, carbohydrate and lipid complexes testifies to the high value of whey as a food raw material, industrial processing of which is extremely promising and economically feasible [1].

Despite the fact that whey is a valuable liquid, many manufacturers do not sell this useful product due to the low concentration of solids in it (6.3%), the high energy intensity of its deep processing, as well as due to the lack of the opportunity to purchase expensive equipment [5]. The process of disposal is also very problematic, as the oxidation of one ton of whey, merged into a natural reservoir, requires the same amount of dissolved oxygen in water, as for the oxidation of 110 m3 of household waste [6]. This proves the necessity and expediency of the organization of rational use of whey, both from environmental and economic points of view [7].

Academician N. N. Lipatov noted that "Issues related to whey, its composition, nutritional and biological value, processing and use, occupy a dominant place in the dairy industry of all developed countries of the world and attention to this problem increases every year " [8,9]. Basing on the analysis of protein, carbohydrate and lipid complexes, we can conclude that cheese whey is of a high value as a food raw material. Large-scale industrial processing of this whey is undoubtedly promising and environmentally justified. A new look at the biotechnological potential of whey allows its usage to create functional products.

The transition of the food and processing industry to resource-saving technologies that ensures waste-free production and production with minimal impact on the environment is possible through the use of natural plant raw materials and derived from it, functional food ingredients [10]. The studies of medicinal plants in terms of searching for species with organs containing vital biologically active substances for the treatment of diseases such as cardiovascular, cancer, diabetes and others have been intensified recent years. The state of the population's health reflects the need for the development of domestic science at a more modern level, including the use of all possible reserves in the development of natural components from medicinal plant species for the production of biologically active substances and their targeted use in the treatment and prevention of serious diseases [11]. Natural extracts from raw materials of plant origin are always in demand of food, cosmetic and pharmaceutical industries.

The use of infusions and extracts from domestic plant materials containing a wide range of substances of different pharmacological orientation is a promising direction in the creation of functional beverages. Herbal extracts in the composition of beverages increase the body tone, adaptive capacity of the nervous system, the body's resistance to adverse environmental factors and have antioxidant properties [12, 13]. The drinks, enriched with natural physiologically active components and creating a certain level of their content in the human body, are able to have a healing or preventive effect on the human body [14]. The use of whey as a basis for the creation of functional beverages of therapeutic and preventive orientation with the use of biologically active substances isolated from medicinal plants, will maximize the use of raw materials of the dairy industry, expand the range of products and reduce the amount of waste and energy losses to a minimum [15, 16].

The leaves and stalks of tarragon were chosen as additional raw materials for the developed product. Tarragon is a well-known medicinal and food plant. Since ancient times it has been used in medical practice as a means of digestion improving.

In modern medicine, the liquid extract is used to improve appetite, treat stomatitis, as an anti-inflammatory, analgesic and antioxidant [17,18,19,20].

The Purpose of Development: the development of a combined functional drink, based on milk whey with the addition of tarragon.

The Research Tasks:

- the analysis of physical and chemical parameters of crude cheese whey;
- the study of the pasteurization and filtration effect on the chemical composition and shelf life of cheese whey;
- the preparation of tarragon syrup;
- the combination of different proportions of components and the final formulation.

The Materials and Methods of the Research: The Experimental studies of the development of a drink based on the whey with the addition of tarragon syrup were conducted at the faculty of Technological Management of the Gorsky SAU in the laboratory of the Department "The Technology of Production, Storage and Processing of Animal Products".

- At the first stage of research we justified the choice of raw materials and components for the production of beverage.
- At the second stage we studied the organoleptic and physico-chemical parameters of cheese whey.
- At the third stage we selected the components for the preparation of syrup from the leaves and stems of tarragon.
- At the fourth stage we held the study of vegetable syrup's doses in the raw material, and its effect on the organoleptic and physico-chemical properties of the finished product. We calculated the biological value and profitability of the developed drink production.

The objects of research were:

- whey, milk, cheese;
- leaves and stems of tarragon (lat. Artemísia dracúnculus).

In carrying out the work we used conventional, standard methods of research of organoleptic and physico-chemical parameters of raw materials and finished products; fat, protein, solids, titratable acidity in accordance according to GOST 3626-73; GOST 26809.1, GOST 3622, GOST 3624, GOST 23327, GOST 5867, GOST R 52738, GOST R 53438.

The color of the raw material is determined in a glass cylinder in daylight. The color of the test whey – light green, with white protein flakes, cloudy.

The smell of milk raw is determined by pouring it into the milk meter. Careless receiving and storing it acquires odors, but for whey it is possible to have a specific sour smell.

The taste of the whey is determined at room temperature.

The consistency of normal whey should be homogeneous, but white flakes and settling of raw materials are allowed.

The consistency of the transfusion of raw materials from one vessel to another is also determined.

The density of whey was determined according to GOST 3625-84 "Milk and dairy products. Methods of determination of density".

The acidity of the whey was determined according to GOST 3624-92.

Other whey parameters, such as fat content, protein, lactose, SOMO, SMO, freezing point, etc. were determined on the "Clover-2M" biomer.

Milk analyzer "Clover-2M" is designed to measure the mass fraction of fat, protein, lactose, mineral salts (ash) and density in milk and dairy products in accordance with the measurement procedure, certified in accordance with the established procedure.

Additionally, the analyzer measures or calculates on the basis of the measured data the mass fraction of dry milk residue, skim milk residue, homogenization degree and freezing point of milk, indicates the temperature of the sample and the calculated amount of added water as well. Indication of measurement results is made in digital form with a readout of 0.01 %.

The Research Results and Their Discussion. Whey is a secondary product that remains after the production of cottage cheese, casein and various types of cheese.

Whey is separated after denaturation of proteins, then in the process of self-pressing and pressing in the preparation of cheeses. Then by straining filtered from protein flakes.

Whey is a cloudy liquid of light yellow or green-yellow color. The whey has a specific sour smell, despite the fact that the acidity of the whey may be within the 21 from.

A group of products based on whey is developed nowadays: dairy products, infant formula, sports nutrition. The main components of whey products are lactose, proteins and minerals. Due to the special composition of whey and its unique properties, whey products are ideal components in various diets. They significantly increase the biological value of the finished product, and due to lipotropic and antioxidant components compensates for the lack of vitamins. Considering the nutritional value, healing and scale of the utilized whey it is advisable to fully process it, thereby it is possible to expand the range and volume of products manufactured at the enterprise, that will improve the economic efficiency of the enterprise.

The leaves and stalks of tarragon (tarragon) were chosen as additional raw materials for the developing product. Tarragon is a well-known medicinal and food plant. Since ancient times it has been used in medical practice as a means of improving digestion. Alcohol tincture is recommended as a sedative and anticonvulsant, and aqueous extract of tarragon has immunomodulatory properties.

According to the organoleptic characteristics of the used whey had a characteristic whey taste and aroma, pale green color, with a small amount of protein precipitate, which meets the requirements of GOST R 53438, set out in table 1.

Table 1 - The Organoleptic Characteristics of the Cheese Whey

The Indicator Name	The Whey Characteristics		
	Cheese Whey on GOST P 53438		Cheese Whey on Research
	Unsalted	Salted	Unsalted
The Appearance and Consistency	Homogeneous liquid. The presence of protein precipitate is allowed		Homogeneous, the precipitate is present
Color	Pale green		Pale green
Taste and Smell	Characteristic of whey, sweet	Characteristic of whey, salted	Characteristic of whey, sour

Table 2 - The Indicators of the Quality of Whey

Prouct	Fat	Protein	Density, A	SOMO	SMO	SG	Lactose	Salts	Temperature,°C	T 3°C
Whey	0,21	2,76	28,15	7,47	7,50	-	4,07	0,64	18,4	-0,46

The results of physico-chemical parameters of cheese whey obtained by us meet the requirements of GOST R 53438. The results are presented in the table, from which it follows that the raw material had a sufficient amount of solids – 6,67-7,67%. The mass fraction of lactose was 4,01-4,07%. Acidity was 19 ºT. The temperature corresponded to 6ºC.

Table 3 – The Comparison of Physical and Chemical Parameters of the Used Whey with the Requirements of GOST

Indicator Name	Normal Values for the Whey	
	Cheese Whey	Used Whey
Mass Fraction of Solids, %, Not Less	5,6-7,0	6,67-7,67
Lactose Mass fraction, %, Not Less	4,0	4,01-4,07
Acidity, °T, Not More	20	19
Temperature, °C, Not Higher	6	6

The next stage of processing is pasteurization.

Pasteurization of whey in practice is carried out according to one of the modes: low-temperature (slow), that is, at a temperature of 63-65 ° C with an exposure of 30 minutes, or fast at a temperature of 72 ° C with an exposure of 15-20 ° C.

During heating of raw materials there are changes in some of its physical and chemical parameters.

With an increase in temperature from 55 °C, enzymes begin to break down, at a temperature of 70 °C and more, albumin coagulates, but casein changes only at the border with air.

Raw materials' heating leads to the decomposition of citric acid, and the transition of acidic calcium salts into medium. Casein and truly soluble components of milk vary slightly.

The destruction degree of raw materials' vitamins is determined by the temperature and amount of oxygen in the air.

Vitamins are practically not destroyed if the pasteurization is carried out in plate heat exchangers. The most severe destruction of vitamins C and B 2 occurs during boiling.

The deeper changes with the components of the raw material occurred, the higher is the temperature and the duration of heat exposure.

The fat globules of milk also change. When the temperature rises to 61 ° C, the degree of adhesion increases, but at a higher temperature they are again separate due to the fact that when the temperature rises, CO2 is removed, it is possible to reduce the titratable acidity by 0,5-1°T.

At a temperature of 65 °C, proteins are denatured, and they can be completely isolated from milk by heating to 85 °C for 5 minutes.

During pasteurization, soluble lime salts pass into insoluble ones, as a result of which the salt balance in milk is disturbed.

In the process of a long-term pasteurization, the enzyme amylase is destroyed, a certain amount of phosphorus-calcium salts precipitates, the time of rennet coagulation of milk increases and the time of cream settling on the contrary decreases.

In the process of short-term pasteurization, cream settling time increases, acidity decreases, cream proteins are denatured, coagulability deteriorates, part of the phosphorus-calcium salts passes into insoluble salts.

The next stage of production is filtering. Thanks to cleansing whey protein cereal, it gets a nice transparent color (table. 4). The filtration process does not affect the physical and chemical properties of the product (table. 5).

Table 4 – The Organoleptic Characteristics of the Used Whey

Indicator Name	Not Filtered Cheese Whey	Filtered Cheese Whey
Appearance and Consistency	Unclear liquid with a protein precipitate.	Transparent, homogeneous liquid
Colour	Pale-green	Transparent yellow
Taste and smell	Characteristic of whey, acidic	Characteristic of whey, acidic

During the heating of raw materials there are changes in some of their physical and chemical parameters.

Table 5 - Physical and Chemical Parameters of Whey

№	Indicators %	Cheese Whey	Pasteurized Whey	Filtered Whey
1.	Fat	0,21	0,21	0,20
2.	Protein	2,76	2,76	2,72
3.	Density, A	28,15	28,23	28,18
4.	Water	0,00	0,00	0,00
5.	SOMO	7,47	7,47	6,73
6.	SMO	7,67	7,67	6,93
7.	SG	-	-	-
8.	Lactose	4,07	4,07	4,01
9.	Salts	0,64	0,64	0,63
11.	Energy value, kcal	29,21	29,21	28,72
12.	TZ, °C	-0,4572	-0,4647	-0,4568

Table 6 – The Acidity of Whey During Its Storage at a Temperature of 4-6°C

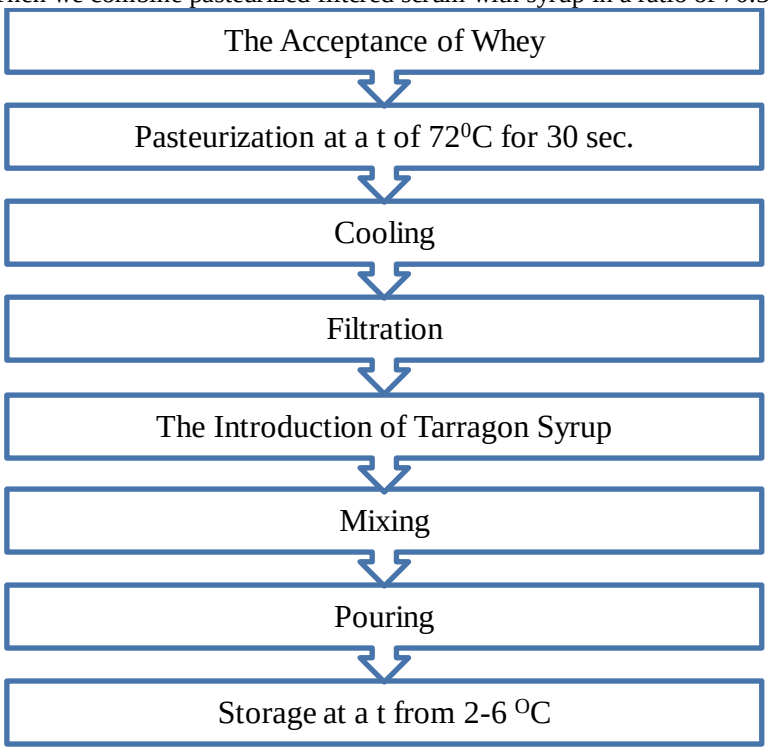
Whey	1-st day	2-nd day	3-rd day	4-th day	5-th day
Raw	19	24	29	35	40
Pasteurized	14	14	16	16	19
Pasteurized and Filtered	10	10	13	14	14

The most acceptable pasteurization mode is at a temperature of 72°C and with an exposure of 30 seconds. This is enough to prevent the vital activity of pathogenic microflora, removal of CO2 and the reduce of acidity. Immediately after pasteurization, it is cooled to a temperature of 4-6°C.

Then we proceed to the production of syrup from the leaves and stems of tarragon. To do this, we separate the stems from the roots, clean and finely cut them.

In boiling water, we pour the chopped leaves and sugar, cook for 3-4 minutes, filter and cool to a temperature of 6-8°C.

Then we combine pasteurized filtered serum with syrup in a ratio of 70:30.



Picture 1. The Technological Scheme of the Combined Drink Production

As a result of various combinations of components, the color of the product varied from pale green transparent to dark green not transparent, and the taste and aroma from sour to sugary sweet (table.7).

Table 7 – The Organoleptic Characteristics of the Drink at Different Doses of Tarragon Syrup

Indicators	Whey/ Syrup			
	80/20	70/30	60/40	50/50
Color and Consistency	Pale green, transparent, without sediment	Emerald, transparent, without sediment	Dark green, not transparent, without any sediment	Dark green, not transparent, without any sediment
Taste and Aroma	Sour taste like whey	Pleasant, refreshing taste of tarragon. The taste of the serum is not interrupted	Sweet taste, interrupting the taste and aroma of the whey	Sugary taste, interrupting the taste of whey

Based on the organoleptic characteristics more pleasant was the variant of drink in which the amount of whey was 70%, and the amount of syrup was 30%. The final formulation is presented in table 8.

Table 8. The Final Formulation of the Combined Drink

Raw Material	Mass, kg
Cheese Whey	70
Syrup:	
The Purified Tarragon	1,8
Sugar	1,8
Water	26,4
In all	100

SUMMARY:

1. It was found that the short-term pasteurization of cheese whey destroyed pathogenic microflora, reduced acidity, its rate of increase, which extends the shelf life of the finished product.
2. In the process of filtering whey protein flakes are removed and the raw material becomes transparent, which improves its presentation sight.
3. While combining the cheese whey with tarragon syrup, a drink in which the serum was 70% had the best organoleptic and commercial qualities, and the amount of syrup was 30%. The drink acquired a transparent emerald color, refreshing taste of tarragon, without interrupting the taste of the whey.

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