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РЕСПУБЛИКИ КАЗАХСТАН

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STUDY OF WHEY AND WHEY-BASED DRINKS

Abstract. The aim of the study is enhancement of efficiency of the applying of secondary dairy product whey by developing whey-based drinks. About 50% of milk solids, as well as vitamins A, C, E, nicotine acid, choline, biotin, a complete set of vitamins of group B remains in the whey. The yield of whey from 1 ton of milk spent for the production of high-protein products is from 65% to 82%. Such a large volume of secondary dairy products poses the problem of studying the properties of whey and finding the best ways of its processing. An effective technology for producing fruit and whey drinks has been developed by the study of perspective methods of processing of whey. Experimental samples of apple-whey and pear-whey drinks were obtained. On the basis of sensory analysis, the optimal formulations of apple-whey and pear-whey drinks were determined. The optimal ratio of whey and fruit juice for apple and whey juice is 60:40, for pear and whey is 55: 45. In the laboratory, physical and chemical parameters and mineral composition of whey, apple-whey and pear-whey drinks were determined. It was found that the whey is dominated by mineral elements such as sodium (~20%), phosphorus (11.6%), potassium (44.7%), sulfur (2.09%), and magnesium (1.78%). In contrast to the serum, in the pear and whey drink the content of potassium (75.2%), magnesium (2.99%) is increased significantly and the amount of phosphorus (11.53%) and calcium (10.15%) is decreased. In apple and whey drink the content of potassium (76.94%), magnesium (2.80%) is also significantly raised, and the amount of phosphorus (8.83%) and calcium (11.22%) is lowered. Overall, there are also elements such as manganese, iron, cobalt, copper, zinc, strontium, molybdenum, etc. in developed drinks. Low fat in the fruit-whey beverages can attribute them to the category of dietary ones.

Keywords: whey, drink, technology, composition, fruit, secondary product, dairy.

Introduction. The production of milk and dairy products is one of the most important sectors of the food industry in Kazakhstan. The consumption of milk and dairy products directly affects the state of health of the nation: it is well known that milk is one of the basic food products, an important component of a healthy diet of people of all ages. The urgency of an issue of the processing of secondary products grows up annually with increased volume of dairy production in Kazakhstan [1].

Milk whey is a by-product in the production of protein-fat products such as cheese, cottage cheese, casein. About 50% of milk solids, as well as vitamins A, C, E, nicotine acid, choline, biotin, a complete set of vitamins of group B remains in the whey. Whey proteins are the most full-fledged among all studied food proteins, they have the highest rate of degradation in the digestive tract and digestibility is 98 %. The most valuable are the so-called "native" ones, i.e. undenatured, whey proteins with immunomodulatory properties [2].

It is known that the yield of whey from 1 ton of milk sent to the production of high-protein products, ranging from 65% to 82%: natural cheese – 80%; skimmed cheese – 65%; low–fat cheese – 65%; cheese – 65%; cottage cheese – 80%; technical casein – 75%; food casein -82% [2].

Such a large volume of secondary dairy products poses the problem of studying the properties of whey and finding the best ways of its processing.

Various methods of whey processing, such as separation, concentration, preservation, membrane technologies, biological methods have been developed and successfully applied in the world practice [3].

In the food industry, whey is used in the production of bakery, confectionery and dairy products [4,5]. The most interesting is the development of functional beverages based on whey, assigned to compensate micronutrients and sports nutrition [6-8].

To preserve the whey before the main processing, it must be subjected to heat or preservation. Heat treatment of whey is carried out at a threshold temperature of denaturation of whey proteins, followed by cooling. After such treatment, the whey can be stored for 2 days. In addition, various preservatives are used: solutions of hydrogen peroxide, formaldehyde, sodium chloride.

Membrane technologies allow concentrating and fractionating the main components of whey, and, consequently, increase the volume of processed raw materials and the range of its applying. Depending on the pore size, the following types of membrane processes are distinguished: microfiltration, ultrafiltration, nanofiltration and reverse osmosis [9]. By treating curd whey with nanofiltration, it is possible to achieve the level of demineralization of 25-27% and the level of deoxidation – 15-18 % [10, 11]. The undeniable advantage of membrane processes is that they are carried out at low temperatures (8-10°C), which allows you to save the useful substances of whey.

To reduce the sour taste of curd whey obtained by nanofiltration, the minimum values of its neutralization level were studied and justified [12].

Voronova N. S. and Ovcharov V. D. developed a technology of functional drink based on whey with vegetable fillers, which are taken as puree Jerusalem artichoke, beets and carrots [6]. The whey was deoxidized to pH=6,2-6,6 by adding 5% sodium bicarbonate solution. Vegetable puree was added into the neutralized whey, the mixture was pasteurized, cooled and a concentrate of bifidobacteria was introduced for souring of the resulting mixture. The addition of vegetable mixture to the drink enhances its probiotic effect and symbiotic properties.

Zhaylaubaev Zh.D. et al. developed a composition of low-calorie diet fermented milk cocktail based on a milk mixture of milk and whey, mass.% [13]:

Milk mixture of skimmed milk and whey	71.5
Inoculum consisting of bacterial cultures (Streptococcus thermophilus and Lactobacillus delbrueckii subsp. bulgaricus)	5.0
A colloidal solution of gelatin	2.0
Chicory root extract	6.5
Fruit syrup	15.0

Shepochkina Y. A. proposed a method of producing a beverage from whey, providing heating the whey up to 95-96°C, holding at this temperature for 0.8 to 1.2 min, cooling with rate of at least 7.5°C/min up to 5-10°C, filtering, applying the filtrate flavorings, sugar syrup [14]. In the filtered whey as a flavoring additive, a watermelon peel is brought, pretreated with steam at a temperature of 90-120°C and rubbed in a puree, or pretreated watermelon peel and watermelon juice in an amount of 1-25% and 5-10%, respectively, from the mass of the filtered whey with subsequent mixing. The finished drink has no taste and smell of whey.

Employment of whey in the production of functional products, in particular, beverages with additives is some of great interest. As additives, it is advisable to use fruit crops. For this purpose, drinks from whey with fruit base were developed. The fruit base harmonizes the taste of the drink, giving it a pleasant fruit flavor with a sour shade. Initially, different types of raw materials were tested as a vegetable basis: cherry, raspberry, watermelon, melon, etc. The best sensory characteristics of the drink were achieved by adding apple and pear juices. Therefore, it was decided to develop a composition of drinks from whey with apple and pear juices.

The purpose of the study is to increase the efficiency of the use of secondary milk raw material and fruit crops by developing technology and formulations of fruit drinks based on whey.

Methods. The pilot study included:

- development of technology and composition of whey-based drinks.
- study of physical, chemical and mineral composition of whey and finished drinks.

The following devices were used to determine the physical, chemical and mineral composition:

- milk analyzer "Clever-2" - for determination of temperature, density, solids content;
- mass spectrometer with inductively coupled plasma with quadrupole mass analyzer MS-820 Varian.

Determination of temperature, density, solids content using the device "Clever-2. Milk analyser». The analyzer "Clever-2" is made in the form of two blocks, in the cases of which are placed:

- the power supply with voltage 12.6 V;
- in the measuring unit is an ultrasonic measuring cell, as well as the electronic circuit of the device. The measuring cell includes a sample receiver with a heating and thermo stabilization system, a source of ultrasonic vibrations, a detector and an amplifier. The control microprocessor unit provides registration of the ultrasonic signal, its processing according to the algorithm and the output of the data on the display.

The analyzer "Clever-2" is a device with direct indication in a compact splash-proof housing made of impact-resistant plastic (figure 1).

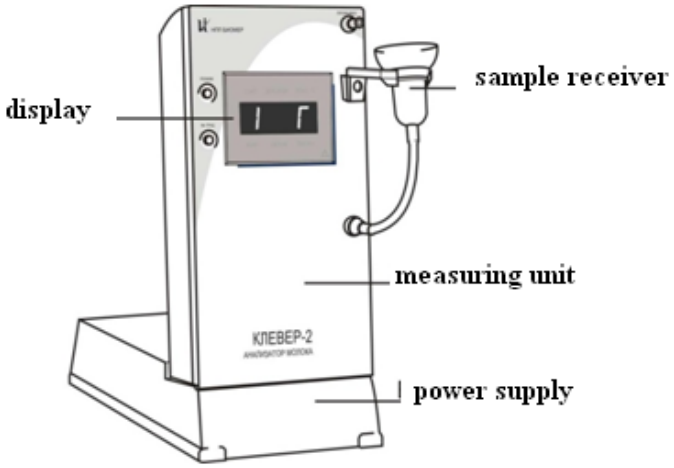

Figure 1 – General view of the analyzer "Clever-2"

The principle of operation of the analyzer is based on the measurement of the characteristics of ultrasound passing through the sample, depending on the concentration of substances and the temperature of the sample. The samples are poured directly into the probe of the device. The analyzer operation is controlled by a microprocessor. Measurement and results are automatically generated.

Samples saturated with gases are pre-degassed. To remove the air, it is necessary to degass the sample: heat it to a temperature (45 – 50)°C, hold at this temperature for 5 minutes, mix and cool to a temperature (25±2)°C .

The sample should be uniform. In the presence of a settled layer of fat (cream), the milk sample is heated in a water bath to (40-45)°C, mixed, cooled to a temperature of (25±2)°C and mixed again. In order to obtain the most accurate result, the temperature of the sample at the time of pouring it into the analyzer is maintained at the level (20±2)°C.

The physical and chemical parameters of whey and whey-based fruit drinks (apple and pear) were studied on the analyzer "Clever - 2".

Determination of macro- and microelements by the inductively coupled plasma spectrometer with mass spectroscopy by ST RK ISO 17294-2-2006. The content of macro-and microelements in the studied raw materials was determined by mass spectroscopy (ISP-MS) by means of dry mineralization of the product. For this purpose, a mass spectrometer with inductively coupled plasma with quadrupole mass analyzer MS-820 Varian (figure 2) was used. In a result of analysis, 35 elements were found, among which phosphorus, potassium, sodium, magnesium and calcium were found in a larger number.

Generally, the studied solution is fed by a peristaltic pump to a spray gun, in which by the argon stream it is converted into an aerosol. The aerosol through the central channel of the plasma burner enters the plasma, where under the influence of high temperature (7000-8000 K) the substances contained in the sample dissociate into atoms, which are then ionized. The resulting positively charged ions pass through the ion optics system to the analyzer, where the ion filtration by mass and detection of the ion flux intensity takes place. The received signal is transformed into the dependence of intensity on the value of m/z.

Figure 2 – Mass spectrometer with inductively coupled plasma quadrupole mass analyzer with MS-820 Varian

Results. The technological scheme for obtaining a fruit and whey beverage includes technological operations of preparation of whey and fruit juice, which are then mixed in the right proportions, then the mixture is pasteurized, bottled, sealed, the product is cooled and stored in a cooled state. Preparation of the whey includes its filtration, heating and cooling. Filtration of whey is required for the separation of proteins that make serum taste, create muddiness, and reduce the resistance during storage. The filtered whey was heated to 60 ^{0}C for 25-30 minutes to preserve its properties. Then the whey is cooled to a temperature of 4-6 ^{0}C. After cooling, such serum can be stored for up to 2 days. In the first variant, filtered apple juice was added to the curd whey. In the second variant, filtered pear juice was added to the curd whey.

Because pears and apples are seeded fruits, pear-whey and apple-whey beverages production technology are identical.

Apples and pears must be sorted out; fruits affected by diseases and pests or with mechanical damage are removed. Then the fruits are sorted by size, washed with running water.

The grinding process is a necessary operation in the preparation of apples and pears for pressing. From the degree of grinding, i.e. the number of destroyed cells depends on the output of the juice during pressing. The crushed mass is pressed to separate the juice. The squeezing, i.e. remains of pressing should be dry. The resulting juice was filtered.

The juice was heated at a temperature of 40-50ºC with holding for 60 seconds for clarification. The resulting juice is cooled for clarification. When the juice is cooled, the structure of protein molecules changes, protein coagulation and sedimentation occurs. The solids content in apple juice is10,0%.

The pasteurization temperature of the beverage is in the range of 87±3 °C, process duration is 30-45 sec. Technological scheme of production of whey beverage is shown in figure 2.

These regimes are necessary and sufficient to achieve the objectives.

The finished product was poured in hot view into prepared glass jars and sealed. Banks were cooled to 4-6 ^{0}C and stored at a temperature of air 6 °C and a relative humidity of air no more than 75%. The resulting drinks had good sensory characteristics (table 2).

With the help of sensory analysis, the optimal formulations of fruit and whey drinks were established (table 1).

Table 1 – Formulations of fruit and whey drinks

The name of the drink, its composition	Ratio of components, %
Apple and whey drink: - curd whey - apple juice	 60 40
Pear and whey drink: - curd whey - pear juice	 55 45

Table 2 – Sensory characteristics of fruit-whey drinks

Product	Sensory indicators			
	colour	smell	taste	consistency
Apple and whey drink	Yellowish with greenish tint	Peculiar to apple	Sweetish and sour	Homogeneous liquid mass
Pear and whey drink	Light yellow	Peculiar to pear	Sweetish and sour	Homogeneous liquid mass

Physico-chemical parameters of the beverages are shown in table 3.

Table 3 – Physical and chemical parameters of whey and fruit and whey drinks

Defined component	Experimental data		
	whey	apple and whey drink	pear and whey drink
DSMR*, %	7.29 %	–	–
Solids, %	–	10.74	10.86
Fats, %	0.19%	0.11%	0.13%
Proteins, %	2.69%	3.96	4.01
Density, kg/m^3	1027.00	1041.31	1041.00
* DSMR - dry skim milk residue.			

The results of studies of curd whey and fruit and whey drinks on the content of macro-and micro-elements by mass spectrometry with inductively coupled plasma are shown in table 4.

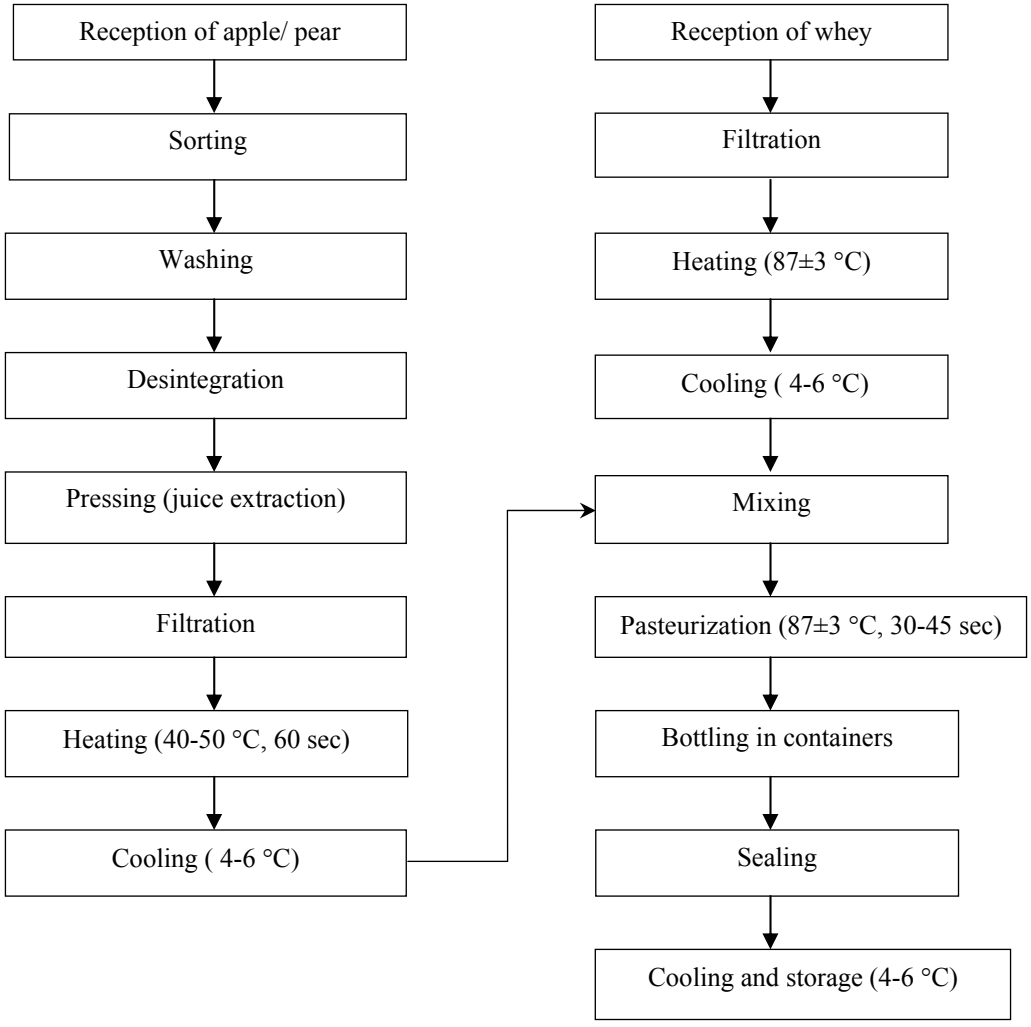

Figure 2 – Technological scheme of fruit and whey drink

Table 4 – Content of micro- and macronutrients in curd whey,
determined by inductively coupled plasma mass spectrometer with quadrupole mass analyzer MS-820 Varian

Name of micro-and macronutrients	Concentration of elements in μg / dm^3		
	whey	apple and whey drink	pear and whey drink
Be9	0.0000	0	0
Na23	117831.2000		
Mg24	10582.3333	2.802941114	2.532099814
Al 27	20.8031	0.006061966	0.019261433
Si29	0.0000		
P31	68822.3333	8.837428828	9.410853545
S34	12353.1633		
K39	264376.1333	76.94413687	73.04560334
Ca44	115828.1667	11.22404332	14.09385706
Ti47	175.4627	0.020135315	0.025408716
V51	0.4406	0	0
Cr53	15.0477	0	0.003521109
Mn55	0.9744	0.007318822	0.003804626
Fe57	1054.6133	0.013221087	0.062276864
Co59	0.2383	0.000149051	0.000104736
Ni60	28.8537	0	0.000391624
Cu63	27.3765	0.023565797	0.001244589
Zn66	29.4742	0.033216951	0.0082742276
As75	1.2498	0	0
Se78	5.9151	0	0
Rb85	202.1753	0.037185066	0.055609824
Sr88	50.0379	0.027559103	0.018577346
Mo95	10.7986	0.002152212	0.01796118
Ag107	0.1737	0	0.0001068
Sn118	0.2538	0	0
Sb121	0.0497	0	0
Cs133	1.2163	0	0.000112787
Ba137 ppb	5.8537	0.020645657	0.689618655
W182 ppb	0.1285		
Pb208 ppb	13.3806	0	0
U238 ppb	0.0106	0	0

Discussion. The ready drinks were characterized by a pleasant sourish-sweet taste and moderate aroma. The taste of the fruit base is quite clearly expressed.

Apple-whey drink had a yellowish color with a green tint, liquid consistency, sweetish and sour taste. Ready pear-whey drink had a light yellow color, liquid consistency, sweetish and sour taste. Compare to the whey, the color of the drink has changed from weak green to light yellow, the taste became sweetish-sour, there was a distinct pear smell.

As can be seen from table 3, drinks are characterized by a sufficiently high protein content (from 3.94 to 4.01%) and low fat content, which characterizes them as products that can be used in dietary nutrition.

As can be seen from table 4, the whey is dominated by mineral elements such as sodium (~20%), phosphorus (11.6%), potassium (44.7%), sulfur (2.09%), magnesium (1.78%).

Ash content of pear-whey beverage was 0.80 %. In contrast to the whey, in the pear-whey drink the content of potassium (75.2%), magnesium (2.99%) is significantly increased and the amount of phosphorus (11.53%) and calcium (10.15%) is decreased.

Ash content of apple-whey beverage was 0.26 %. As in the pear-whey drink, content of potassium (76.94%), magnesium (2.80%) into apple-whey drink was significantly raised, and amount of phosphorus (8.83%) and calcium (11.22%) was lowered. Generally, there are also elements such as manganese, iron, cobalt, copper, zinc, strontium, molybdenum, etc in the developed drinks.

The fruit base harmonizes the taste of the drink, giving it a pleasant fruit flavor with a sour shade.

Overall, producing drinks from whey fruit base seems promising way to recycle the last one.

REFERENCES

[1] Abdizhapparova B.T., Hanzharov N.S., Agaev S., Qulbosyn D. (**2016**) Covremennoe sostojanie proizvodstva moloka i molochnyh produktov v Juzhno-Kazahstanskoj oblasti: perspektivy pererabotki vtorichnyh molochnyh produktov // Tr. mezhdunar. nauchno-praktich. konj. «Aujezovskie chtenija – 14: Innovacionnyj potencial nauki i obrazovanija Kazahstana v novoj global'noj real'nosti», Shymkent, Kazakhstan. P. 3-7 (in Russ.).

[2] Nurtaeva A.B., Mashanova N.S., Sataeva Zh.I., Mural G. (**2015)** Sovremennoe sostojanie pererabotki molochnoj syvorotki i poluchenie na ee osnove molochnogo sahara v Kazahstane // Materialy Respublikanskoj nauchno-teoreticheskoj konferencii «Sejfullinskie chtenija – 11: Molodezh' i nauka». Vol. 1, part 1. P. 159-163 (in Russ.).

[3] Chervecov V.V. (**2007**) Processy i metody pererabotki molochnoj syvorotki Milk processing [Pererabotka moloka] 12: 30-32 (in Russ.).

[4] Savenkova T.V., Krylova E.N.; Hodak A.P., Svjatoslavova I.M., Gorjacheva G.N. (**2012**) Molochnaja syvorotka v proizvodstve konditerskih izdelij, Dairy industry [Molochnaja promyshlennost'] 12: 61-63 (in Russ.).

[5] Evdokimov I.A. (**2008**) Sovremennoe sostojanie pererabotki molochnoj syvorotki, Dairy industry [Molochnaja promyshlennost'] 8:37-38 (in Russ.).

[6] Voronova N.S., Ovcharov D.V. (**2014**) Razrabotka tehnologii funkcional'nogo napitka na osnove molochnoj syvorotki s ovoshhnymi napolniteljami, Scientific journal KubGAU [Nauchnyj zhurnal KubGAU], 104(10) (in Russ.).

[7] Novokshanova A.L., Ozhiganova E.V. (2013) Ispol'zovanie tvorozhnoj syvorotki v industrii sportivnogo pitanija, Dairy-economical herald [Molochnohozjajstvennyj vestnik] 4(12): 80-84 (in Russ.).

[8] Grunskaja V.A., Gabrieljan D.S. (**2012**) Obogashhennye kislomolochnye napitki, Dairy industry [Molochnaja promyshlennost'] 9:56 (in Russ.).

[9] Zolotoreva M.S., Topalov V.K. (**2014**) Membrannye processy v tehnologii pererabotki syvorotki, Milk processing [Pererabotka moloka] 5 (in Russ.).

[10] Cuartas–Uribe B., Alcaina–Miranda M.I., Soriano–Costa E., Bes–Pia A. (**2006**)Comparison of two nanofltration membranes NF200 and Ds-5 DL to demineralize whey. Desalination, 199: 43-45.

[11] Nabi G., Nasrabadi B., Nasrabadi T. (**2006**) Use of nanofltration for concentration and demineralization in the dairy industry // Pakistan Journal of Biological Sciences, 9, Issue 5: 991-994.

[12] Shohalova V.N., Kuzin A.A., Dykalo N.Ja., Shohalov V.A., Kostjukov D.M. (**2013**) Issledovanie bufernoj emkosti koncentratov tvorozhnoj syvorotki, poluchennyh metodom nanofil'tracii, Dairy-economical herald [Molochnohozjajstvennyj vestnik] 4:86-92 (in Russ.).

[13] Zhajlaubaev Zh.D., Abimul'dina S.T., Smagulova Z.T., Iskakova B.B.,Sergazina M.A. (**2010**) Composition for preparation sour-dairy cocktail [Kompozicija dlja prigotovlenija kislomolochnogo koktejlja]. Innovation patent of the Republic of Kazakhstan [Innovacionnyj patent RK] 22560. (varianty) (in Russ.).

[14] Shhepochkina Ju.A. (**2010**) A method of production of drink from dairy whey [Sposob proizvodstva napitka iz molochnoj syvorotki] Patent of Russian Federation [Patent RF] 2403795. (in Russ.).

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СҮТ САРЫСУЫН ЖӘНЕ ОНЫҢ НЕГІЗІНДЕГІ СУСЫНДАРДЫ ЗЕРТТЕУ

Аннотация. Жұмыстың мақсаты бұл сарысу негізінде сусындарды жасай отырып қайталама сүт өнімнің пайдалану тиімділігін жоғарылату болып табылады.

Сүтті сарысудың құрамында шамамен 50% құрғақ заттар, сондай-ақ А, С, Е дәрумендері, никотин қышқылы, холин, биотин және В тобы дәрумендерінің толық жинағы қалады. Ақуыз мөлшері жоғары өнімдердің өндірісіне жіберілетін 1 тонна сүттен сарысудың шығу мөлшері 65-82% құрайды. Қайталама сүт өнімдерінің мұндай үлкен көлемі сүтті сарысудың қасиеттерін зерттеу және оны тиімді өңдеу жолдарын іздеу мақсатын қояды. Сүтті сарысудың тиімді өңдеу тәсілдерін зерттеу негізінде жеміс пен сарысу қосылған сусындардың

тиімді технологиясы құрастырылды. Алма мен сарысу, алмұрт пен сарысу сусындарының тәжірибе жүзінде үлгілері алынды. Органолептикалық сараптама негізінде алма мен сарысу, алмұрт пен сарысу сусындарының тиімді рецептуралары анықталды. Сарысу мен жеміс шырының тиімді қатынастары: алма мен сарысу сусынына – 60:40, алмұрт пен сарысу сусынына – 55:45. Зертханалық жағдайларда сарысу, алма мен сарысу, алмұрт пен сарысу сусындарының физика-химиялық көрсеткіштері мен минералды құрамы анықталды. Сарысу құрамында натрий (~20%), фосфор (11,6%), калий (44,7%), күкірт (2,09%), магний (1,78%) сияқты минералды элементтер басым екендігі анықталды. Сарысуға қарағанда, алмұрт пен сарысу сусынында калий (75,2%), магний (2,99%) мөлшерлері өсті, ал фосфор (11,53%) және кальций (10,15%) мөлшерлері төмендеді. Алма пен сарысу сусынында да калий (76,94%) мен магнийдің (2,80%) мөлшерлері өсті, ал фосфор (8,83%) мен кальцийдің (11,22%) мөлшерлері төмендеді. Жалпы, жасалынған сусындарда марганец, темір, кобальт, мыс, мырыш, стронций, молибден және т.б. элементтер кездеседі. Дайындалған жеміс пен сарысу сусындардағы майдың төмен мөлшері оларды диеталық өнімдердің қатарына жатқызуға мүмкіндік береді.

Түйін сөздер: сарысу, сусын, технология, құрамы, жемістер, екінші өнім, сүт өнімдері.

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ИССЛЕДОВАНИЕ МОЛОЧНОЙ СЫВОРОТКИ И НАПИТКОВ НА ЕЕ ОСНОВЕ

Аннотация. Целью исследования является повышение эффективности использования вторичного молочного продукта – сыворотки путем разработки напитков на ее основе. В молочной сыворотке остается около 50% сухих веществ молока, а также витамины А, С, Е, никотиновая кислота, холин, биотин, полный набор витаминов группы В. Выход молочной сыворотки из 1 т молока, направляемого на производство высокобелковых продуктов, составляет от 65% до 82%. Такой значительный объем вторичных молочных продуктов ставит задачу исследования свойств молочной сыворотки и поиска оптимальных путей ее переработки. На основе изучения перспективных способов переработки молочной сыворотки разработана эффективная технология получения фруктово-сывороточных напитков. Получены опытные образцы яблочно-сывороточного и грушево-сывороточного напитков. На основе органолептического анализа определены оптимальные рецептуры яблочно-сывороточного и грушево-сывороточного напитков. Оптимальное соотношение сыворотки и фруктового сока для яблочно-сывороточного сока составляет 60:40, для грушево-сывороточного – 55:45. В лабораторных условиях определены физико-химические показатели и минеральный состав сыворотки, яблочно-сывороточного и грушево-сывороточного напитков. Обнаружено, что в сыворотке преобладают такие минеральные элементы, как натрий (~20%), фосфор (11,6%), калий (44,7%), сера (2,09%), магний (1,78%). В отличие от сыворотки, в грушево-сывороточном напитке значительно повысилось содержание калия (75,2%), магния (2,99%), а количество фосфора (11,53%) и кальция (10,15%) понизилось. В яблочно-сывороточном напитке также значительно повысилось содержание калия (76,94%), магния (2,80%), и понизилось количество фосфора (8,83%) и кальция (11,22%). В целом, в разработанных напитках встречаются также такие элементы, как марганец, железо, кобальт, медь, цинк, стронций, молибден и др. Низкий уровень жира в полученных фруктово-сывороточных напитках позволяет отнести их к категории диетических.

Ключевые слова: сыворотка, напиток, технология, состав, фрукты, вторичный продукт, молочные продукты.

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