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PLANT BASE FOR THE BEVERAGE

Abstract: *The use of local plant raw materials, which have great value due to specific combinations of biologically and physiologically active components, has a wide perspective in the production of food products with high consumer properties. The structure of human nutrition includes vitamins, macro- and microelements, fibers, pectins, etc. fruits, which are the main source, should prevail. Fruit – berry beverages are characterized by a high amount of various micronutrients. Therefore, the production of fruit – berry beverage has not lost its relevance. In addition, the combination of microflora and bioactive substances of plant origin significantly expands the range of products. Apples, oranges, and ginger were selected for processing the beverage production technology. The composition of raw materials is rich in vitamin C, B_9, B_1, B_6, A, and minerals such as calcium, potassium, iron, magnesium, zinc, phosphorus and copper. The ratio of selected raw materials is 50:35:15 for apple, orange, and ginger, respectively. According to organoleptic indicators, the beverage is transparent, without sediments and foreign additives. When a beverage is poured into a glass, foam is created by the release of carbon dioxide bubbles. Physico-chemical parameters of the obtained beverage are as follows: dry matter content – 15,28%; titratable acidity -3,1 ± 0,5^{0}T; carbohydrate content – 12%; fat content – 0,11%; amount of alcohol – 3,12%; ash content, 2%;calcium – 21,74%; phosphorus – 22,96; iron – 7,33; zinc – 7,7; copper – 4,19; magnesium – 11,78; sodium – 24,3. The shelf life of the beverage was 60 days. Pathogenic flora, including salmonella and yeast and mold microorganisms, were not detected.*

Key words: *beverage,local plant, micronutrients, plant base, fruit-berry*

Introduction

In modern times, the demand for beverages is increasing and there is a trend of growth in the production process. Analyzing the results of the study of the structure of the population's diet and the consumption of soft beverages and juices shows a significant increase in demand for them.And the contribution of beverages to the total energy value of the diet currently exceeds 7%.

The importance of beverages in the process of human nutrition cannot be denied. It depends primarily on its chemical composition, nutritional and biological value. All teenagers and young adults use soft beverages. The beverage consists of carbohydrates, organic acids, minerals and other components necessary for the body. The human body needs to consume 0,5 to 1,5 liters of liquid per day in order to maintain a proper normal rate and water balance.

Nutrient components, including biologically and physiologically active components in drinks, react with each other.The formed compounds have great benefits for the human body and have the ability to prevent diseases. The use of these natural products makes it possible to eliminate the effects of man-made factors along with improving the human diet [1].

In this regard, in order to meet the demands of the consumer, the urgency of creating a beverage technology enriched with biologically active substances with an optimized composition is increasing.

The purpose of the work is to study beverage technology based on local plant raw materials enriched with biologically active substance.

Kazakhstan ranks among many countries in the world in the production and consumption of beverages. The production of non-alcoholic beverages is developing in Kazakhstan, and according to the results of its analysis, it can be seen that the demand from the consumer has increased. The share of soft drinks in the total energy value of the diet of the population of Kazakhstan currently exceeds 7%. In the last ten years, has been developing the production of non-alcoholic beverages in Kazakhstan (in 2018, it amounted to more than 415 million deciliters);an important sector is cheap beverages based on sweeteners.

Some of the unused portion of the country's recycling industry is physically obsolete and does not meet current consumer demand [2, 3].

575 enterprises engaged in the production of beverages in Kazakhstan constitute 2,7% of all processing enterprises [4].

377 production organizations produce mineral water and other soft beverages. They arepresented in figure 1:

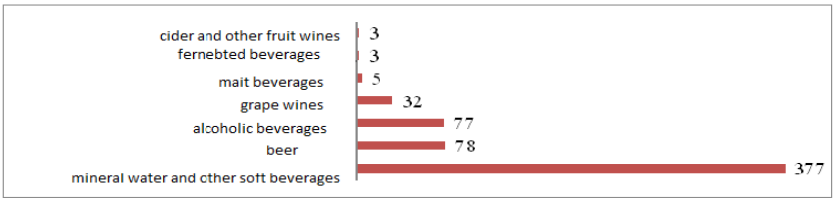


Figure 1 – Indicators of beverage production facilities in Kazakhstan [5]

As can be seen from Figure 1, mineral water and soft beverages account for 65,6% of the market and are 1,9 times larger than alcoholic beverages.

Table of indicators of mineral water and soft beverage production industries in the regions of the Republic of Kazakhstan is shown in figure 2 [5].

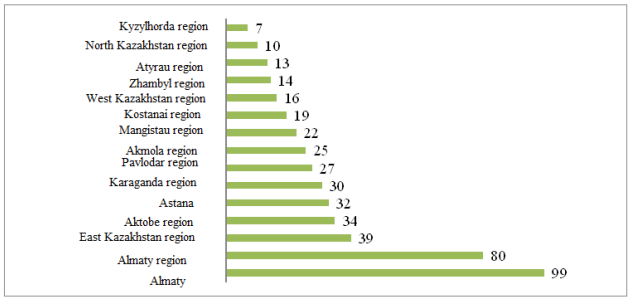


Figure 2 – Number of beverage production industries by region [5]

The first place in Kazakhstan for beverage production is the city of Almaty, where are located 99 enterprises.The next places are occupied by Almaty region and Turkestan region, the number of enterprises there is 80 and 60, respectively.

A lot of work is being done in order to strengthen the direction of beverage production in Kazakhstan. In the process of creating a beverage technology that has an effective effect on the human body, many scientists are working diligently.

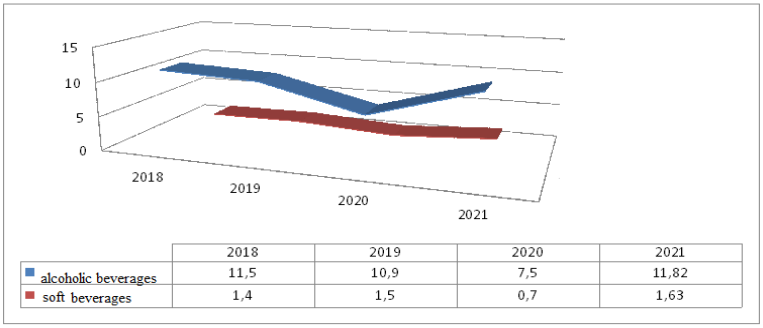
In recent years, the production of non-alcoholic beverages, including probiotic products and new therapeutic-prophylactic products, has increased significantly around the world.The main function of probiotic bacteria is to protect the intestinal walls from bacteria and toxic substances entering the body from the external environment. Beverages based on plant raw materials have probiotic properties from a therapeutic and prophylactic point of view.

Ways of production by enriching the composition of products with raw materials of vegetable origin and biologically active substances are widely considered.

According to the data, the number of fermented alcoholic beverages is higher than that of fermented soft beverages.

Figure 3 presents information on the annual sales of beverages obtained as a result of the fermentation process.

According to figures 3 the range of soft beverages fermented beverages in the market is low both in terms of assortment and price. Although there is a wide range of modern fermented soft beverages, they cannot cover a large amount of production. After all, this route is not in great demand in the market of Kazakhstan and cannot supplement the daily consumption ration. The number of consumers of beverages in this direction is very small. Therefore, the production of a beverage based on local plant raw materials enriched with biologically active substances, provides the opportunity to supplement the energy needed by a person in the daily diet, to obtain products that are useful for health and have high therapeutic and preventive value.



	2018	2019	2020	2021
alcoholic beverages	11,5	10,9	7,5	11,82
soft beverages	1,4	1,5	0,7	1,63

Figure 3 – Information on the annual sales of beverages obtained as a result of the fermentation process [6]

Materials and methods

Research methods. Experimental studies and processing of the results of the local herbal beverage enriched with biologically active substances were carried out in the laboratory of the «Food Engineering» department and the «Structural and Biochemical Materials» laboratory of the M.Auezov South Kazakhstan University.

The microbiological analysis of the product was studied in the Republican State Institution Department of Sanitary and Epidemiological Control of the Shymkent city.

Determining the shelf life of the offered beverage was carried out in accordance with GOST 32061 - 2013. [7]. In accordance with the requirements of the standard, it is recommended to store fermented fruit materials in ventilated, odorless, direct sunlight-free rooms at a temperature from 5°C to 20°C and a relative humidity of no more than 85% [8].

Apples, oranges and ginger were taken as a research object. During the research work were used standard methods of studying the chemical composition, physico-chemical and organoleptic properties of the product.

Results and discussion ofresearch

The proposed method for the production of fermented soft drinks includes the following stages: preparation of raw materials, main and auxiliary materials, grinding, fermentation (temperature 22°C), pasteurization at a temperature of 71-77^{0}C,hold (temperature 12 – 14^{0}C, 7 day),add mineral waterto crushed orange, ginger rootand extraction, deposition, filtering, mixand all necessary technological operations. The following raw materials and ratios are used for the production (table 1):

Table 1 – Raw materials and their ratios

№	№ samples	Composition of raw materials	percentage ratio
1	№ 1	Apple: orange: ginger	50:25:25
2	№ 2	Apple: orange: ginger	50:30:20
3	№ 3	Apple: orange: ginger	50:35:15
4	№ 4	Apple: orange: ginger	50:40:10
5	№ 5	Apple: orange: ginger	50:45: 5

The chemical composition of the selected apples and ginger depends on their variety, the conditions under which they are grown and stored, the degree of maturity and duration of storage, agrotechnical cultivation methods, etc. related. In table 2 [9, 10] and figure 4 are shown data on the physico-chemical parameters of raw materials.

Apple is rich in natural sugars: glucose, sucrose and a large amount of fructose. But the average caloric content of apples is only 42-47 kcal per 100 grams. Apple contains organic acids and various microelements. The content of nutrients such as protein, carbohydrates and fats in ginger is significantly higher than in apples. Ginger contains many useful substances, the main ones are: B vitamins, vitamin K, PP, E and C, fiber (table 2). But the content of vitamin C in an apple is 2 times more than ginger.

From Figure 4 it is evident that the mineral composition of ginger exceeds that of apples and oranges. This proves that ginger can be used in soft beverages production technology. Orange is rich in vitamin C, B9, B1, B6, A, and minerals such as calcium, potassium, iron, magnesium, and copper and this is the advantage of orange in the chemical composition in the soft beverages production technology.

Table 2 – Physico-chemical indicators of apple and ginger [9, 10]

№	Component	Apple	Ginger
		Amount	
1	Protein, g	0,4	7,28
2	Fat, g	0,2 – 0,4	6,75
3	Carbohydrates, g	9,8 – 11,8	63,08
4	Mono and disaccharides, g	9	
5	Starch, g	0,8	
6	Pectin, g	1	
7	Organic acids, g	0,4	
8	Mineral substances, mg	351,84	
9	Dietary fiber, g		2
10	Vitamin B group, mg		0,431
11	Vitamin K (phylloquinone), mkg		0,1
12	Vitamin PP (Niacin equivalent), mg		0,95
13	Vitamin E, mg		0,26
14	Vitamin C, mg	10	5

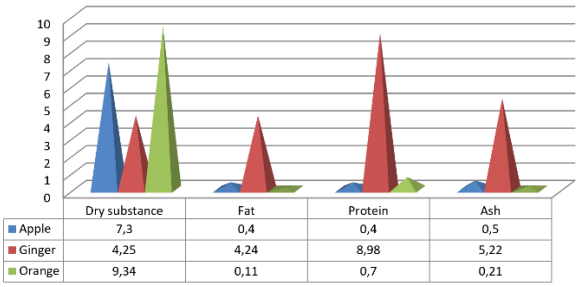


Figure 4 – Diagram of physical and chemical indicators of raw materials

Amino acids are found in apples and play an important role in the development of aroma and taste in the soft beverages production technology.

According to organoleptic indicators, based on the analysis of the perception of the sense organs: sight, smell, touch, taste, and the best combination of three fruit and plant are selected (Table 3, figure 5).

Table 3 – Organoleptic indicators of the beverage

№	№ samples	Color	Consistency	Smell	Appearance	Taste
1	№ 1	Light brown	Liquid	Ginger smell	homogeneous	Bitter
2	№ 2	Brown	Liquid	Nice	homogeneous	Sweet
3	№ 3	Light yellow	Liquid	Nice	homogeneous	Sweet
4	№ 4	Yellow	Liquid	Orange smell	homogeneous	sourish
5	№ 5	Yellow	Liquid	Orange smell	homogeneous	sour

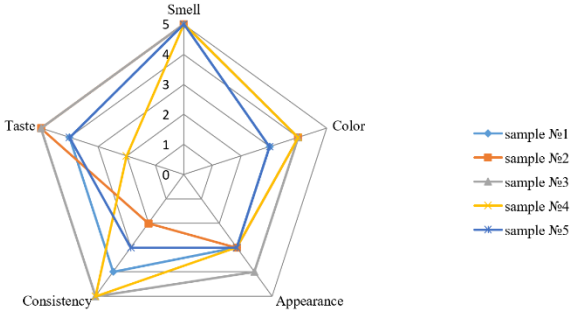


Figure 5 – Profilogram of beveragesamples

As can be seen from the profilogram, the beverage with #2 and #3 samples showed the highest results. These drinks had a transparent color, without sediment or foreign inclusions, the taste and aroma of the drinks combined the tastes and aroma of the original ingredients – they were clearly expressed and balanced. Therefore, this model is considered as a basic product.

Information on the physical and chemical parameters of the beverage is given in table 4.

Table 4 – Physical and chemical,microbiologicalparameters of the beverage

№	Parameters	Amount
1	Dry substance content,%	15,28
2	pH	3,1 ±0,2
3	Titratable acidity, ^{0}T	3,1 ± 0,5
4	Density, kg/m^3	3,10±0,2
5	Carbohydratescontent, %	12
6	Protein content, %	0,7
7	Fat content, %	0,11
8	CO_2content, %	0,58
9	Alcohol content, %	3,12
10	Ash content, %	2
11	Element, per amount of ash	
Ca,%		21,74
Na ,%		24,3
Mg,%		11,78
P,%		22,96
Fe,%		7,33
Zn,%		7,7
Cu,%		4,19
12	Bacteria of the Escherichia coli group	in 100,0 cm^3 (g) not detected
13	Pathogenic flora, including salmonella	in 25,0 cm^3 (g) not detected
14	Yeast and mold microorganisms	Less than 1x10^{1}CFU/g

Note: Colony forming unit-CFU

As we can see from Table 4, the beverage is rich in calcium, sodium and phosphorus. In addition, the product contains enough magnesium, zinc and copper. The mineral composition of apple beverage consist of Ca – 8%, P – 7%, Na – 4%, Mg – 5, Fe – 0,1%. The content of these minerals is higher in the proposed product. For the assimilation of calcium, the optimal ratio of the two elements calcium and phosphorus (Ca:P) in the diet is approximately 1:1. Being a source of carbohydrates and minerals, the beverage is capable of having a general strengthening effect.

According to the standard, the norm of the indicator Bacteria of the Escherichia coli group, Pathogenic flora, including salmonella is respectively shouldn't be in 100,0 cm^3 (g), in 25,0 cm^3 (g) and the norm on Yeast and mold microorganisms no more than 10 CFU/g [11].

The beverage is stored in a cool temperature for the first week at a temperature between 2-4 °C, and in the subsequent periods at a room temperature below 15°C, up to 60 days in total. Information about the storage result is given in figure 6.

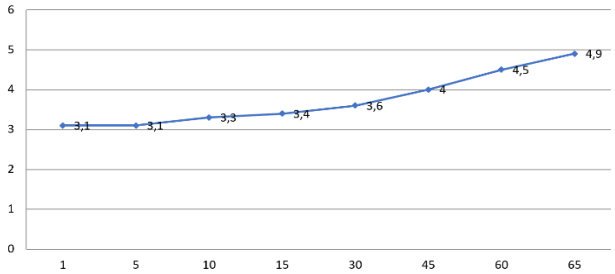


Figure 6 – Study of product acidity over time

As we can see in the diagram, after 60 days, the acidity of the beverage loses its compliance with the international standard, and it can be observed that the amount exceeds the norm.

Conclusion

As the number of people who take care of their health and lead a healthy lifestyle increases, the use of modern beverages with natural substances in their production becomes fashionable, prestigious and a promising trend. And people are looking for ways to maintain health. People are increasingly turning to plants as a safer alternative to chemically synthesized drugs.

The combination of microflora and plant substances significantly expands the range of functional products.

The use of local plant raw materials has broad prospects in the food products production with high consumer properties. Apples, oranges and ginger were selected to develop the soft beverages production technology. The proposed beverage with stable organoleptic and physico-chemical indicators is stored for 60 days.

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СУСЫН ҮШІН ӨСІМДІК ТЕКТІ НЕГІЗ

Биологиялық және физиологиялық белсенді заттардың өзгешеқосылыстары арқылы құндылығы еренотандық өсімдік текті шикізатты қолдану жоғары тұтынушылық қасиеттері бар тамақ өнімдерін өндіруде кең перспективаға ие.

Адамзаттың қоректену затыныңаса құнды құрамына енетін дәрумендер, макро- және микроэлементтер, талшықтар, пектиндер және т.б. бар жемістержәне жидектер, көкөністерүстемболуы шарт. Жеміс-жидек, көкөніссусындарықұрамында алуан түрлі микроэлементтердің мөлшері өте жоғары екендігіменерекшеленеді. Осыған орайжеміс жидек, көкөніс сусындарынын өндіру әлі де өзектілігін жоғалтқан жоқ. Сонымен қатар микрофлора мен өсімдік тектес биоактивті заттардың үйлесуі өнімдердің ауқымын айтарлықтай кеңейтеді.

Сусын өндіру технологиясын өңдеуде алма, апельсин, имбирь таңдап алынды. Шикізат құрамы С витамині, B_9, B_1, B_6, А, ал минеральды заттардан кальций, калий, темір, магний, мырыш,

фосфор және мысқа бай. Таңдалынып алынған шикізаттар қатынасы алма, апельсин, зімбір үшін сәйкесінше 60:35:15.

Органолептикалық көрсеткіштері бойынша сусын мөлдір, шөгінділер мен бөгде қоспаларсыз. Сусынды бокалға құйғанда, көмірқышқыл газының көпіршіктерінің бөлінуімен көбік пайда болады.

Алынған сусынның физика химиялық көрсеткіштері келесідей: құрғақ зат мөлшері – 15,28%; титрленетін қышқылдылық – 3,1 ± 0,5^{0}Т; көмірсу мөлшері – 12%; май мөлшері – 0,11%; спирттің мөлшері – 3,12%; күлділік – 2%; Ca – 21,74%; P – 22,96; Fe – 7,33; Zn – 7,7; Cu – 4,19; Mg – 11,78; Na – 24,3. Сусынның сақталу мерзімі 60 күнді құрады. Патогенді флора, соның ішінде сальмонеллалар және ашытқы және зең микроорганизмдері табылмады.

Түйін сөздер: *сусын, жергілікті өсімдік, микроэлементтер, өсімдік негізі, жеміс-жидек.*

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РАСТИТЕЛЬНАЯ ОСНОВА ДЛЯ НАПИТКА

Использование местного растительного сырья, имеющего большую ценность благодаря особым сочетаниям биологически и физиологически активных компонентов, имеет широкую перспективу в производстве пищевых продуктов с высокими потребительскими свойствами.

В состав питания человека входят витамины, макро- и микроэлементы, клетчатка, пектины и др. Фрукты, являющиеся основным источником, должны преобладать. Морсы характеризуются высоким содержанием различных микроэлементов. Поэтому производство морса не потеряло своей актуальности. Кроме того, сочетание микрофлоры и биологически активных веществ растительного происхождения значительно расширяет ассортимент продукции.

Для обработки технологии производства напитков были выбраны яблоки, апельсины и имбирь. Состав сырья богат витаминами С, В9, В1, В6, А, а также такими минералами, как кальций, калий, железо, магний, цинк, фосфор и медь. Соотношение отборного сырья составляет 60:35:15 для яблока, апельсина и имбиря соответственно.

По органолептическим показателям напиток прозрачный, без осадка и посторонних добавок. Когда напиток наливается в стакан, образуется пена за счет выделения пузырьков углекислого газа.

Физико-химические показатели полученного напитка следующие: содержание сухого вещества – 1,34%; титруемая кислотность – 3,1±0,50Т; содержание углеводов – 12%; жирность – 0,11%; содержание алкоголя – 3,12%; зольность – 2%; Сф – 21,74%; P – 22,96; Fe – 7,33; Zn – 7,7; Cu – 4,19; Mg – 11,78; Na – 24,3. Срок годности напитка составил 60 дней. Патогенная флора, в том числе сальмонеллы и дрожжевые и плесневые микроорганизмы, не выявлены.

Ключевые слова: *напиток, местное растение, микроэлементы, растительная основа, плодо-ягодный.*

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ӨСІМДІК МАЙЫН ПІСІРІЛГЕН ШҰЖЫҚ РЕЦЕПТУРАСЫНА ҚОСУДЫҢ МАҢЫЗЫ

Аңдатпа: *Бұл мақалада шұжық өнімдерінің сапасы мен қоректік құндылығын жақсарту мақсатында зығыр майын қосу арқылы «Любительская» қайнатылған шұжық рецептурасын жетілдіру мәселесі қарастырылады. Зерттеу барысында зығыр майының физика-химиялық қасиеттері, оның шұжықтың құрылымына, дәміне және тағамдық құндылығына әсері талданды. Зығыр майының шұжық өндірісінде қолданылу мүмкіндігі мен негіздемесі ұсынылып, технологиялық процестердің сипаттамалары мен дайын өнімнің сапалық көрсеткіштері көрсетілді. Зығыр майын «Любительская» шұжығына тұрақтандырғыш қосу арқылы жетілдіру тиімді екені дәлелденді. Зығыр майын 15% мөлшерінде қосу өнімнің органолептикалық қасиеттерін сақтауға көмектесетіні анықталды. Сонымен қатар, оның антиоксиданттық қасиеттері сақтау мерзімін ұзартатыны дәлелденді. Жалпы, зерттеу нәтижелері зығыр майын жануар майына балама ретінде пайдалану шұжық өнімдерінің қоректік құндылығын арттырып, тұтынушылық қасиеттерін жақсарта алатынын көрсетті. Зерттеу барысында зығыр майын «Любительская» шұжығына қосқанда, май*