

Ministry of Education and Science of Ukraine
**ODESSA NATIONAL ACADEMY OF
FOOD TECHNOLOGIES**

International Competition of
Student Scientific Works

BLACK SEA SCIENCE 2018

PROCEEDINGS



April, 4, 2018
ODESSA, ONAFT 2018

Ministry of Education and Science of Ukraine
Odessa National Academy of Food Technologies

International Competition of Student Scientific Works

BLACK SEA SCIENCE 2018

Proceedings

April 4, 2018

Odessa, ONAFT 2018

Міністерство освіти і науки України
Одеська національна академія харчових технологій

Міжнародний конкурс студентських наукових робіт

BLACK SEA SCIENCE 2018

Матеріали

4 квітня 2018 року

Одеса, ОНАХТ 2018

UDC 001(262.5):378.4.091.27(08)
BBC 421D221
B64

Editorial board:

Prof. B. Yegorov, D.Sc., Rector of the Odessa National Academy of Food Technologies, Editor-in-chief

Prof. M. Mardar, D.Sc., Vice-Rector for Scientific and Pedagogical Work and International Relations, Editor-in-chief

Dr. I. Solonytska, Ph.D., Assoc. Professor, Director of the M. V. Lomonosov Technological Institute of Food Industry, Head of the jury of «Food Science and Technology»

Dr. O. Kalaman, Ph.D., Assoc. Professor, Director of the G. E. Weinstein Institute of Applied Economics and Management, Head of the jury of «Economics and Administration»

Prof. V. Volkov, D.Sc., Head of the Department of Applied Mathematics and Programming, Head of the jury of «Automation»

Prof. S. Artemenko, D.Sc., Head of the Department of Computer Engineering, Head of the jury of «IT Technologies and Cybersecurity»

Prof. B. Kosoy, D.Sc., Director of the V. S. Martynovsky Institute of Refrigeration, Cryotechnology and Ecoenergetics, Head of the jury of «Renewable Energy Sources and Environmental Protection»

Prof. L. Morozyuk, D.Sc., Professor of the Department of Cryogenic Engineering, Head of the jury of «Refrigerating Machines and Equipment»

Dr. V. Kozhevnikova, Ph.D., Assistant Professor of the Department of Hotel and Catering Business, ONAFT, Technical Editor

Black Sea Science 2018: Proceedings of the International Competition of Student Scientific Works, April 4, 2018, Odessa / Odessa National Academy of Food Technologies; B. Yegorov, M. Mardar (editors-in-chief.) [*et al.*]. – Odessa: ONAFT, 2018. – 827 p.

Proceedings of International Competition of Student Scientific Works «Black Sea Science 2018» contain the works of winners of the competition.

The author of the work is responsible for the accuracy of the information.

ISBN 978-966-289-181-2

Odessa National Academy of Food Technologies

УДК 001(262.5):378.4.091.27(08)
ББК 421D221
В64

Редакційна колегія:

Єгоров Б.В. – д.т.н., професор, ректор Одеської національної академії харчових технологій, відповідальний редактор

Мардар М.Р. – д.т.н., професор, проректор з науково-педагогічної роботи та міжнародних зв'язків, відповідальний редактор

Солоницька І.В. – к.т.н., доцент, директор технологічного інституту харчової промисловості ім. М.В. Ломоносова, голова журі напрямку «Харчова наука і технологія»

Каламан О.Б. – к.е.н., доцент, директор інституту прикладної економіки та менеджменту ім. Г.Е. Вейнштейна, голова журі напрямку «Економіка і управління»

Волков В.Е. – д.т.н., професор, зав. кафедри прикладної математики і програмування, голова журі напрямку «Автоматизація»

Артеменко С.В. – д.т.н., професор, зав. кафедри комп'ютерної інженерії, голова журі напрямку «ІТ технології та кібербезпека»

Косой Б.В. – д.т.н., професор, директор інституту холоду, кріотехнологій та екоенергетики ім. В.С. Мартиновського, голова журі напрямку «Відновлювані джерела енергії та охорона навколишнього середовища»

Морозюк Л.І. – д.т.н., професор кафедри кріогенної техніки, голова журі напрямку «Холодильні машини і установки»

Кожевнікова В.О. – к.т.н., асистент кафедри готельно-ресторанного бізнесу, технічний редактор

Black Sea Science 2018: Матеріали Міжнародного конкурсу студентських наукових робіт, 4 квітня 2018 р., Одеса / Одеська національна академія харчових технологій; Б. В. Єгоров, М. Р. Мардар (відп. ред.) [та ін.]. – Одеса: ОНАХТ, 2018. – 827 с.

Збірник включає матеріали робіт переможців Міжнародного конкурсу студентських наукових робіт «Black Sea Science 2018».

За достовірність інформації відповідає автор публікації.

Organizing committee:

Prof. Bogdan Yegorov, D.Sc., Rector of Odessa National Academy of Food Technologies, Head of the Committee

Prof. Maryna Mardar, D.Sc., Vice-Rector for Scientific and Pedagogical Work and International Relations of Odessa National Academy of Food Technologies, Deputy Head of the Committee

Prof. Stefan Dragoev, D.Sc., Vice-Rector on Research and Business Partnerships of University of Food Technologies (Bulgaria)

Prof. Baurzhan Nurakhmetov, D.Sc., First Vice-Rector of Almaty Technological University (Kazakhstan)

Prof. Andrzej Kowalski, Dr. habil., Director of Institute of Agricultural and Food Economics (Poland)

Dr. Olivera Djuragic, Ph.D., Director of Scientific Institute of Food Technology of University of Novi Sad (Serbia)

Prof. Mircea Bernic, Dr. habil., Vice-Rector on Research and Doctorate of Technical University of Moldova (Moldova)

Prof. Jacek Wrobel, Dr. habil., Rector of West Pomeranian University of Technology (Poland)

Prof. Michael Zinigrad, D.Sc., Rector of Ariel University (Israel)

Dr. Mei Lehe, PhD, Vice-President of Ningbo Institute of Technology, Zhejiang University (China)

Prof. Plamen Kangalov, Ph.D., Vice-Rector on Education of “Angel Kanchev” University of Ruse (Bulgaria)

Dr. Alexander Sychev, Ph.D., Assoc. Professor of Sukhoi State Technical University of Gomel (Belarus)

Dr. Hanna Lilishentseva, Ph.D., Assoc. Professor, Head of the Department of Merchandise of Foodstuff of Belarus State Economic University (Belarus)

Prof. Heinz Leuenberger, Ph.D., University of Applied Sciences and Arts Northwestern Switzerland (Switzerland)

Організаційний комітет:

Сторов Богдан Вікторович – д.т.н., професор, ректор – Одеська національна академія харчових технологій – голова оргкомітету

Мардар Марина Ромиківна – д.т.н., професор, проректор з науково-педагогічної роботи та міжнародних зв'язків – Одеська національна академія харчових технологій – заступник голови оргкомітету

Драгоєв Стефан Георгієв – д.т.н., професор, проректор з наукової роботи і бізнес партнерства – Університет харчових технологій (Болгарія)

Нурахметов Бауржан Кумаргалієвич – д.т.н., професор, перший проректор – Алматинський технологічний університет (Казахстан)

Ковальські Анджей – доктор-хабілітат, професор, директор інституту економіки сільськогосподарської та харчової промисловості – Інститут сільськогосподарської та продовольчої економіки (Польща)

Дюрагіц Олівера – доктор, директор інституту харчових технологій – Університет в м. Нові Сад (Сербія)

Бернік Мірча – доктор-хабілітат, професор, проректор з наукової роботи та докторантури – Технічний університет Молдови (Молдова)

Вробель Яцек – доктор-хабілітат, професор, ректор – Західнопоморський технологічний університет (Польща)

Зініград Михайл – доктор наук, професор, ректор – Аріельський університет (Ізраїль)

Лехе Мей – доктор, віце-президент – Технологічний інститут Нінбо Чжэцзянського університету (Китай)

Кангалов Пламен – професор, доктор, проректор з навчальної роботи – Русенський університет «Ангел Канчев» (Болгарія)

Сичев Олександр Васильович – к.т.н, доцент, проректор з навчальної роботи – Гомельський державний технічний університет ім. П. Й. Сухого (Білорусь)

Лілішенцева Анна Миколаївна – к.т.н, доцент, зав. кафедрою товарознавства продовольчих товарів – Білоруський державний економічний університет (Білорусь)

Леунбергер Хайнц – доктор, професор – Університет прикладних наук і мистецтв Північно-західної Швейцарії (Швейцарія)

1. FOOD SCIENCE AND TECHNOLOGY

2. ХАРЧОВА НАУКА І ТЕХНОЛОГІЯ

BEVERAGES-BIOPROTECTORS WITH HIGH ANTIOXIDANT PROPERTIES

Author – Bezzodina A., Oliinyk M.

Supervisor – Dziuba N.

Odessa National Academy of Food Technologies

In the work, the description of the collagen hydrolyzate, which contains oxylysine and oxyproline, is presented. Methods of swelling test of glutin and psyllium, recipes of beverages with bioprotectors with high antioxidant properties and beverages for pregnant women are presented.

The chemical composition of the developed drinks was studied, the main quality indicators such as organoleptic, microbiological indicators were determined and the biological activity of the beverage ingredients and the beverages themselves was determined. The technological schemes of beverage preparation are given.

ASLT analysis was conducted to predict the terms and conditions for the storage of beverages. The manufacture and storage of beverages were carried out in identical conditions, changing the storage parameters in accordance with the established ALST test plan, in conditions similar to those for modern catering establishments. It has been established that the overall organoleptic quality of developed beverages during storage for 24 hours at different temperatures has not changed. During the next 12 hours, all but the color dropped. Quality scores remained high enough for 72 hours. The research results of the developed drinks have shown that the drinks can be stored for 5 days at a temperature $(5 \pm 1) ^\circ\text{C}$ in a sealed container.

It is established that the developed drinks will be competitive on the consumer market of Ukraine.

As a result of this work, the results were made on three conferences, three abstracts-reports were published, two articles are in leading international journal and three applications were filed for the obtaining of patents of Ukraine for the utility model.

Introduction

Healthy eating is a way of eating, in which the outcome of this process is to strengthen and improve the health, physical and spiritual forces of human, prevention and treatment of various diseases, slowing down of aging processes.

Nutrition of pregnant women is a special category of special dietary food, at this time mom need to enrich her daily diet with vitamins and useful substances in the diet plays an important role drinking mode.

The best thing is using water, and that was exposed to abstertion. It can be filtered or mineral, but soda water should be avoided. It is especially important to drink enough water after the first half of pregnancy.

During pregnancy, women have to give up many of the usual things, including from some of the beverages. Expectant mothers often are interested in questions during pregnancy what beverages are healthy.

The recommended beverages during pregnancy include natural juices. Canned juices for this purpose are not suitable because they may contain preservatives. It is best to use freshly squeezed juices. Fruit beverages that can be made from compote, jam, from dried fruit, frozen fruits or vegetables will also fit. These drinks contain useful vitamins and trace elements.

Recommend to include milk in beverages for pregnant women as well. But it needs to be cautious with this product. There are people who are having allergic reactions to lactose contained in it. It will be useful for the fetal development.

The beverages may have to be used by pregnant women, of course, which include sour-milk products: butter milk, fermented burger, liquid yoghurts. They are even more useful than milk and do not cause allergic reactions in the majority of people. Sour-milk products contain many useful vitamins and micro-elements, such as vitamins B1 and B12, calcium, potassium, magnesium, proteins. In addition, they have useful bacteria that improve digestion, normalize the work of the stomach and intestines, improve the microflora in them. Due to a healthy microflora the immunity of the mother and baby will become stronger. With a knowledge of the usefulness of various categories of beverages for pregnant women, this work is dedicated on developing a cocktails of enriched vitamins and

minerals that complement the energy value of the daily diet of pregnant women.

If the future mother will be mostly stick to the correct choice of beverages, drink clean water, juices, herbal decoctions, cocktails, then sometimes it can afford to drink and what you really want, for example: coffee or tea. Then it will be easier to transfer temporary restrictions.

Thus, the development of beverages that would be enriched with useful substances, including folic acid, plays an important role in the formation of healthy fetuses, is an actual topic of study. In addition, in today's sedentary way of life in the future mother's diet, the mass of products should be small in volume, but provide all the useful substances and have a high degree of digestibility. In particular milk-based cocktails with the addition of plant products satisfy the requirements.

1. Analytical review

During pregnancy, the woman's body undergoes changes associated with growth and full-fledged operation of the fetus. It is important during this period that the future mother reviews her diet and it needs to eat only natural foods. Importantly at the very beginning of the pregnancy to get used to the beverages that really fill the deficiency of vitamins in the body.

Smoothie is a thick, useful cocktail that meets all the requirements of healthy eating for children and pregnant women.

When taking it, it is necessary to remember that this cocktail is a full meal for a dense breakfast or noon, a dessert for a light lunch or dinner. The caloric content of the strip, of course, depends directly on the nutritional value of its components.

A balanced diet of pregnant women involves the presence of a full-fledged useful breakfast, which will help store energy so that a woman has enough strength and vigor during the day.

Ideal nutrition of pregnant women for breakfast is cereals, which provides the necessary energy to mom; fruits or dried fruits are riched in vitamins; milk or dairy products are important sources of calcium.

An indispensable product for breakfast is oatmeal. It is valuable as a great source of fiber and complex carbohydrates. It is very important and that the regular use of oatmeal stimulates bowel activity.

Fruits for breakfast can be composed of oatmeal (cereal with dried fruits) may be fresh or baked. For the variety of food pregnant women smoothies can be made with fruits, mixed with fruit, natural yoghurt and nuts.

A proper breakfast during pregnancy counts for a great deal in each trimester, but account must be taken of some of the nuances. So, in the first trimester is recommended at least four meals a day: breakfast, second breakfast, lunch and dinner.

The [21] work presents the results of the activities in the sphere of securing the posts of functional recognition on the basis of topinambur and pumpkin. As a biologically active additive it is suggested to add walnut milk-wax ripeness. Experimentally determined their rational content in the technology of smoothie: walnut – 4 ... 8% , alcohol extract – 5...8%, sugar – 13... 30%. The technology of an artichoke/pumpkin- walnut smoothie.

In article [15] the functional and technological properties were investigated and technology of production of new types of oxygen-containing whey-based beverages (smoothie), natural fruit and berry juices and purees and dietary fibers "Citri-Fi", including non-cerebral polysaccharides (guarana and xanthan gum), which promote a particular texture of the drink and as stabilizers of oxygen foam.

The formulation of the dishes is presented "Smoothie of sandthorn and pumpkin" [23] for people suffering from lack of vitamins, it is recommended to use for children, pregnant women, and in the autumn-winter period. A recipe for this dish has been developed. The benefits of products were described, which are used in the recipe.

The problem of school nutrition [1] is considered, the development of a formula of milk and blueberry smoothie with using of vitamin premix "GS-2039" by the company "Electronic Medicine". Much attention is paid to the chemical composition of the ingredients of the developed product.

Based on the data, which are given in the work, we can conclude that the use of pupils of any age for breakfast 250g of the blue-protein smoothie, which is enriched with vitamin premix "GS-2039" will satisfy the need for vitamins B1, B6, B12, C, PP on 100%. The use of junior schoolchildren of this product will satisfy the need for Mg and K by 100%, and Ca and P by 50 and 70%, respectively.

In scientific literature [16] functional properties of natural bee honey. Work objective is the consideration of the feasibility of entering into the composition of natural honey kernels of nuts as a source of micro-and macronutrients, which are contributed to the provision of functional properties of honey.

Vegetable milk is received as a prescription ingredient of beverage – smoothie [10].

The main factors in the development of technology and formulation during the experiment on the preparation of the cocktail "Smoothie on the the plant milk-based" were: the factor of selectivity: the absence of proteins of animal origin; economic factor: minimum costs for the cost of the finished product; classification factor: the creation of a homogeneous, dense, knocked-down consistency, characteristic lane; the factor of taste preferences: creation of high taste characteristics and nutritional value; factor of individual benefits: providing the lowest caloric content.

Investigation of the dispersed composition of vegetable and fruit semi-finished products – bases for a beverage smoothie.

Work objective was to study the disperse composition of vegetable and fruit semi-finished products, as the main component of the beverage smoothie.

In work a method for the production of semi-finished products was proposed, which are frozen plasma and fruits and vegetables millcake, for the production of a smoothie that has a dense consistency, a homogeneous structure, a bright color with pronounced taste and flavour.

It is proved that fatty acid composition of ice cream with vegetable fats meets the established norms of physiological needs.

The quality of food affects human health by almost 15% [1], and it is this that causes intensive scientific research on new food products, as well as the development of technologies for the processing of plant and animal raw materials. Improving the nutritional structure of the Ukrainian population implies an increase in the production of food products due to the improvement of existing and the creation of new technologies for functional food products.

Proteins are consumed in elevated quantities during diets – they accelerate the metabolism, protect the body from destruction, provide nutrition to the body, saturate the person for a long time.

In the food industry, collagen and products of its hydrolysis are used in the production of gelatine, for the clarification of wine, for the production of clingfilms, coatings, edible membranes, as a formulation agent – in fillings for canned food and comminuted fish, molded fish products, in the production of artificial caviar, broths, jellies , sauces, various health beverages and cocktails, as well as additives in bakery and confectionery production [5]. Actual is the use of collagen hydrolysis products in the feed industry in the production of starter fodder for the elderly of valuable breeds of fish and hydrobionts (sturgeon, trout, salmon,

sea urchin, etc.), which contributes to an increase in the percentage of their survival.

Collagen is a fibrillar protein of glycoprotein nature, consisting of macromolecules having a unique three-spinal structure, accounting for about 1/3 of all mammalian albumen proteins and 70% of the mass of skin proteins.

The body must constantly go through the process of protein synthesis. Collagen, the structural units of which are amino acids, is formed as a result of the splitting of proteins from food. Formation of proteins stops if there is at least one indispensable amino acid. When forming your diet it is important to consume foods that enhance the production of collagen.

Collagen Hydrolyzate is a natural amino acid cocktail that stimulates the regeneration of collagen fibers in the skin, slows the processes of its aging, gives the skin elasticity and youth. As a protein, collagen is not complete – it does not contain cystine, tryptophan and rapidly degrades glutamine. The benefit of collagen is the presence of two amino acids that are rarely found in other proteins – oxyproline and oxysilin, as well as a source of glycine (up to 30%).

Hydrolysis of proteins, carried out using proteolytic enzymes, deprived of all of these disadvantages of acid and alkaline hydrolysis. In its course there are no pathological changes in the products of hydrolysis, and although this type of hydrolysis does not exceed 70-80%, the results of the splitting of the components of the physiological, are easily penetrated into the cell and are included in the processes of cellular metabolism [9].

Collagen is a family of a number of iso-carotenoids, which include more than 20 types of proteins, differing not only in structure but also in a variety of functional properties. Currently, 12 types of collagen are well studied. They differ in amino acid sequence, structure, distribution in tissues, molecular weight and functions. By their structure, they can be conventionally divided into three groups: collagen with fibrillar structure of types I, II, III, V and XI; non-fibrous, mesh collagen or collagen of basal membranes of type IV, VI and minor collagen, to which the collagen types VII, VIII, X and XII are belonged to. The collagen of fish mainly refers to types I and III, similar to that of human skeletal muscle collagen. The fish and animal collagen consists of subunits (tropologenes), which are twisted into a spiral with a relative molecular mass of 300 kDa [2, 7, 11].

Due to the absence of tryptophan, collagen is a protein of low biological value. Based on the physiological effect, collagen can be attributed to food fibers.

In this regard, it is urgent to develop scientifically grounded technology of products containing collagen hydrolyzates.

Protein beverages are needed for fast muscle growth. For people who are engaged in sports or any physical activity, they are simply irreplaceable. The preparation of the protein drink does not take much time and can be consumed at any time. Not only athletes can use protein drinks, but practically every person.

Thus, it is promising to develop a formulation of new beverages, which are enriched with collagen hydrolyzate. Such a beverage can be positioned as a prophylactic for elderly nutrition and for a growing body in infant nutrition.

2. Object, subject and methods of research

Object of research is the development of beverages with a balanced protein-antioxidant composition.

Subjects of research:

- develop a recipe for drinks with bio-protective properties and milk-based cocktails and enrich it with folic acid;
- to select natural sources of folic acid and their concentration of application;
- make a cocktail formula that would provide energy value for a separate meal;
- to introduce into the structure, the designed purpose, psyllium, which regulates work in the gastrointestinal tract and accelerates the elimination of toxins;
- to develop the technology of preparing a cocktail with a new recipe;
- organoleptic analysis;
- to conduct physical and chemical research and development of cocktails;
- to conduct microbiological researches in order to find out the SAPin indicators;
- to study the influence of technological parameters on the formation of foam and the hydration properties of collagen hydrolyzate (CH);
- calculate the competitiveness of the developed drinks.

Research methods. Research methods – standard and special biophysical, chemical, physico-chemical, microbiological, technological, organoleptic, merchandising.

3. Methods and methodology

The collagen preparation was obtained from collagen-containing fish raw material (fish scales), by alkaline treatment according to the method described in the patent of Ukraine on the utility model No. 79357 [16].

The fish scales were degreased by a 3-5% solution of NaOH at a GM = 1: (2-5) and at a temperature of 2 ... 6°C for 24 hours. Then the fish scales after scalding were washed with running water and hydrolysed by two-fold processing.

3.1. Swelling test of psyllium

For swelling test of the solution with psyllium, 100 ml of a well-stirred solution is added (at different temperatures and level of acidity) into the cylinder and place it on a horizontal surface. After that is left for swelling for 10 minutes. The index is taken on the generated gel layer on a linear scale of the cylinder.

3.2. Determination of rheological properties

Bostwick's consistometer is designed to control the flow of viscous products. The device is used to determine the consistency of puree, dense and viscous products, by measuring the rate of fluidity of the material under the influence of its own weight over a certain period of time. In the beginning, the device is set horizontally, using the level using the leveling screws. After filling the reservoir with the test product, the shutter rises, and the product begins to float on a measuring rim under its own weight during 3 minutes. The path that passed the research product over a specified time period is monitored.

3.3. Recipe optimization

Implementation of mathematic simulation of composite structure of beverages was solved by using linear programming using the editor MS Excel 2007 [24].

3.4. Comprehensive assessment of beverages

For more comprehensive assessment of the quality of the developed fresh remixes the multiplicative type additive model of comprehensive assessment was used [25].

3.5. Procedure of sensory analysis

The organoleptic method is based on the use of information obtained as a result of the analysis of sensations perceived by sensory organs – vision, hearing, smell, touch and taste. While human organs perform the role of receivers and converters, certain information.

The investigated product is calculated according to the following criteria: the appearance, color, smell, taste, consistency.

Immunostimulating beverages were developed for qualimetric quality control. A comprehensive quality indicator K_0 , which is generally indicated as a function of single product quality indicators:

$$K_0 = f(M_i \cdot K_i) \quad [1]$$

Taking into account the importance of individual indicators of the mathematical model of the comprehensive quality indicator has the following form:

$$K_0 = f(M_i \cdot K_i) \quad [2]$$

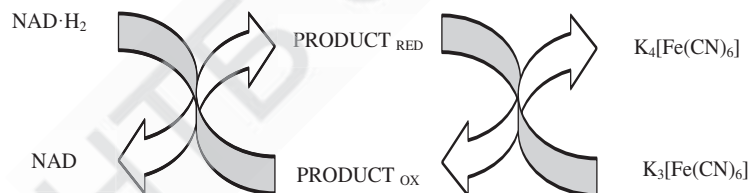
where M_i – significance of indicators; K_i – assessment of these indicators.

3.6. Microbiology study

Microbiological indicators of drinks were determined according to the document State Standards of Ukraine 4069:2016 and are presented in table 2 in appendix A.

3.7. Procedure of bioactivity

Biological activity (BA) fresh-mixes were determined using [26], electron-ransport model-NAD · H₂-K₃ [Fe (CN) 6] presented in Fig. 2.



This criterion is widely used for the previous integral quality assessment as a finished product and ingredients are included in the recipe developed drinks [27].

Any deviations from physiological control, such as starvation or disease, are accompanied by a decrease in NAD / NAD · H₂. At the same time, an increase in the concentration of NAD creates conditions for the activation of energy homeostasis [28]. In a cell, processes whose mechanism involves the oxidation of NAD · H₂ to NAD, is dominated by the mechanism, and this mechanism for the transfer of electrons from the

oxidized substrate to oxygen is the main source of energy for growth and development of the cell [28].

Thus, transitions, NAD to NAD · H₂ substantial for the redox properties of the cells and regulate intracellular metabolic processes [29].

The ability of various biologically active components of plant material to cause non-enzyme oxidation of NAD · H₂ to NAD and simultaneously restore Fe + 3 to Fe + 2 shows that these substances can increase the overall non-specific resistance of the organism [21].

4. Research results

4.1. Swelling test of gluten

Investigation of the hydration of gluten was carried out at physiological values of pH (2.3, 7.0, 10.1) and at different temperatures (Appendix B, Figure 1-3).

At pH = 7,0, the highest degree of swelling is observed after 3-3,5 hours, at pH = 2,3 – after 2,5-3 hours of incubation (Appendix B, Fig. 1, 2).

This can be explained by the fact that at the isoelectric point (when the charge of the protein molecule is close to zero), the protein's ability to adsorb water is the least. As can be seen from the data obtained, the smallest degree of swelling is observed at pH = 10,1 (Annex B, Figure 3).

The microphotographs of dry and swollen gluten are shown in Appendix B Fig. 1.

Consequently, it can be argued that CH as a complex protein has an isoelectric point in an alkaline medium.

Decrease of pH results leads to the dissociation of the main (NH-) and acidic groups (COOH-) of the protein, increasing of molecule charge of the protein gluten molecule and increasing its hydration. The hydrated (water) shell provides stability of protein solutions, prevents individual particles from sticking together and to precipitate out – around which powerful hydrated shells are formed that protect the protein molecules from bonding and precipitating.

Determination of the effect of temperature on the degree of swelling at different pH values also showed that the temperature significantly determines the tendency of hydration. At all selected values of pH at 60 °C, a slight swelling of gluten is observed, at pH = 2.3, it is 198%, at pH = 7.0 – 151%, at pH = 10,1 – 110% in 1,5 hours. With a temperature depression, the value of swelling increases significantly, so at 20 °C gluten gradually hydrates and reaches the highest degree of swelling (305%),

which acquires at pH = 2,3 after 3 hours. At pH = 10,1 at a temperature of 60 °C, the destruction of gluten and the formation of gelatin occurs.

The basis for aerating beverages can be dairy sweet whey or juices. Therefore, it is necessary to determine the behavior of gluten in its proper meaning of pH. The next step in the study of protein hydration was the determination of the influence of temperature in the medium-acid medium on the swelling of gluten.

Research have shown that with temperature rise, the degree of hydration of gluten increases, and then decreases (Appendix B, Figure 4). So at a temperature of 60 ° the maximum value of the degree of swelling is reached at 2 hours of incubation at 40 °C and 50 °C for 3 hours of incubation (195% and 204% respectively), and at 20 °C the degree of swelling reaches a maximum of 220% in 3 incubation hours. Further incubation of gluten leads to a decrease of swelling value

To confirm the time of the beginning of the dissolution of glutei, a study was conducted on the accumulation of dry matter in the liquid phase. Initial value of dry substances is taken for 100%. With an increase in incubation time, the content of dry matter is increased by an initial concentration of 4.23% at a temperature of 20 °C, by 5.2% -40 °C, by 6.34% -50 °C and by 7.24% at 60 °C.

4.2. Swelling test of psyllium

The study of swollen psyllium was performed at physiological values of pH (2; 6.5; 9) and at different temperatures (20 °C, 40 °C, 60 °C) (Appendix B Fig. 5).

At pH = 6.5 at all temperatures there is the lowest degree of swelling that is associated with the extraction of fraction B (gel-forming) and mucifying.

At pH =2, swelling attains after 10 minutes of incubation at 714, 967, 1,167% at 20 °C, 40 °C and 60 °C respectively. For all analyzed temperatures there is the highest degree of swelling at pH = 9, and the most extracted fraction is A, due to it binding of water molecules occurs and the volume of psyllium increases.

Determination of the effect of temperature on the degree of swelling at different pH values showed that the temperature significantly determines the tendency of hydration.

At 20 °C, the degree of swelling of the psyllium after 5 minutes of incubation is 343%, 114%, 429% at pH 2, 6.5 and 9, respectively. At 40 °C, the degree of swelling of the psyllium after 5 minutes of incubation is 467%, 167%, 600% at pH 2, 6.5 and 9, respectively.

At a temperature of 60 °C, the degree of swelling of the psyllium after 5 minutes of incubation is 567%, 200%, 700% at pH 2, 6,5 and 9, respectively. After 10 minutes of incubation at different temperatures, the degree of swelling increases by almost 1,9-2,1 times.

Microphotographs of dry and swelling psyllium are shown in Appendix Fig. 7

It was established that the average size of dry particles of psyllium is 1.79 mm, and swollen (5 minutes, 20 °C) – 2.28 mm. That is, the lobes are increased at an average 1,3 times. As is seen from Fig. 7 dry particles have clear contours, and when swelling (Fig. 7 b) contours are softened by swelling of the structure of psyllium.

4.3. Recipe optimization

We developed drinks with high levels of protein with antioxidants. Two drinks were also developed – spinach and banana for pregnant women, the optimal criterion for which was the maximum content of folic acid. So, we can recommend these drinks for pregnant and young mothers.

Essential criteria for choosing raw materials for beverages were high nutritional value and the possibility of combining components to produce a product with high levels of nutrition value and antioxidative activity with high organoleptic characteristics. The ingredients of beverages are shown in Appendix C Tables 1, 2.

4.4. Sensory analysis

Summative assessment of "Immuno plus" and "Zdorov'yachko" beverages is 34.2 points, while the "Kovotok health" beverage is 34 points.

overall organoleptic assessment of "Shpinatnyy" drink was 32.5 points, while "Bananovyy" drink was 34 points.

Sensory analysis data show a rather pleasant figure of the drinks, taste and color, that is, high organoleptic properties (Appendix C Fig. 1, 2).

According to modern nutrition principles, products must contain a wide range of ingredients that are necessary for the human body, they have to be balanced by nutritional and biological value.

4.5. Bioactivity

There are data of biological activity of drink ingredients "Immuno Plus", "Kovtok zdorov'ya", "Zdorov'yachko", "Shpinatnyy", "Bananovyy" (Appendix C Fig. 3-7).

The beverage "Shpinatnyy" has the highest biological activity of 7500 c.u., and "Kovtok zdorov'ya" has the smallest – 150 c.u. this is evidenced that when the psyllium (2750 c.u.) is introduced into the recipe of beverage, as well as such ingredients as walnuts (3,500 c.u .) and

spinach (1000 c.u.), which have relatively high biological activity indicators among beverage components, the index of biological activity is increased by 50 times.

4.6. Analysis of beverages

Analysis of beverages is carried out with a view to 100 gr of all components, according to the book I.M. Skurikhin "Chemical composition of Russian food products", and record the result according to its ratio (Appendix C Fig. 8-11).

Inasmuch as beverages contain high protein content, the study of the amino acid composition is shown in Appendix C Fig. 12, 13.

Research of the vitamin content showed high levels of vitamins-antioxidants, Fig. 8,9. Due to the use of plant raw material products, ready-made beverages contain food fibers such as 0.9; 0.5; 0.98; 1.06; 1.09 gr / 100 ml respectively for "Immuno Plus", "Kovtok zdorov'ya", "Zdorov'yachko", "Bananovyy", "Shpinatny". The content of fats and carbohydrates in the drinks "Immuno Plus", "Kovtok zdorov'ya", "Zdorov'yachko", "Bananovyy", "Shpinatny" there are 0,2 and 21,8 g / 100 ml, 0,16 and 15,4 g / 100 ml, 7.03 and 17.4 g / 100 ml, 4.5 and 9.9 g / 100 ml, 4.7 and 7.3 g / 100 ml, respectively. The content antioxidant of vitamin C in the Drink "Kovtok zdorov'ya", "Zdorov'yachko", "Shpinatny" covers an average of 10% of the daily intake of 100 ml. And in the drink "Immuno Plus", the largest amount of vitamin C is 48.5 mg / day, and "Bananovyy" has the smallest – 2.6 mg / day.

The energy value of beverages for "Immuno Plus", "Kovtok zdorov'ya", "Zdorov'yachko", "Bananovyy", "Shpinatny" was 117.05; 104.6; 149.8; 104.01; 102.3 kcal.

4.7. Microbiology testing: QMAFAnM, BCG, presence on mold and yeast

One of the main indicators of the quality of beverages, which determines their harmlessness to the body, is the level of microbiota content. The study of microbiological indicators of beverages is given in Appendix C Tables 3-7.

Microbiological studies were conducted during storage to determine the shelf life and safety of the developed beverages. Microbiological studies were carried out in accordance with normative regulatory documents.

The results of microbiological studies show that the indicators do not exceed the permissible sanitary and hygienic conditions and correspond to the requirements of the current DSP 4.4.5.078-2001, which indicates the

high quality of the developed drinks and the possibility of their implementation in the dining outlets.

In the process of storing beverages, there is a variety of physico-chemical changes that may affect the quality of finished products

To substantiate the terms and conditions of storage, the drinks were stored in accordance with the requirements for sour-milk beverages at a temperature (4 ± 2) °C, humidity not more than 75%. The samples were stored in hermetic glass jars.

4.8. ALST analysis – shelf-life

Microbiological studies were conducted during storage to determine the shelf life and safety of the developed beverages. According to microbiological indicators, the developed beverages comply with the requirements of the current sanitary legislation of Ukraine and the microbiota of beverages practically does not change within 4 days. Bacteria of the *E. coli* (coliform), pathogenic microorganisms, such as bacteria from the *Salmonella* genus, *S. Aureus*, were not found in any sample during storage. The change of mesophilic aerobic and optional anaerobic microorganisms (MAFAMs) during storage is presented in Appendix C Table. 8.

To forecast the actual period of storage of beverages, the dependence of the process of changing commodity indicators and indicators of safety of dessert on the time was used and temperature of storage was used. The main indicators of quality were: organoleptic and microbiological indicators.

The beverages were divided into 50 ml volumes, which during storage were subjected to changes in temperature from 5 °C to 15 °C, in increments of 5 °C, and a shelf life of 12 to 72 hours. Step in 12 hours. The manufacture and storage of dessert was carried out in identical conditions, changing the storage parameters in accordance with the established plan, in conditions similar to modern dining outlets. According to the results of the obtained data it was established that the optimum storage life of the developed sour milk dessert in the hermetically sealed glass container is:

- at a temperature of storage at 5 °C for 60...72 hours;
- at a temperature of storage at 10 °C for 36 ... 48 hours;
- at a temperature of storage at 15 °C to 24 hours.

4.9. Technological schemes of beverage production

For organoleptic analysis, we prepared "Immuno Plus", "Kovtok zdorov'ya", "Zdorov'yachko", "Bananovyy", "Shpinatnyy". Technological

schemes for the preparation of beverages are presented in Appendix D Fig. 1-5.

Conclusions

Beverages of functional purpose with optimum caloric content, high biological and antioxidant action were developed. The problem of healthy eating, and especially nutrition for expectant mothers, is relevant for our country.

On the basis of theoretical calorimetry methods a comprehensive assessment of the quality of new types of beverages was carried out. It is shown that improving the consistency, homogeneity and stability of beverages is due to the presence of gluten, which acts as a hydrocolloid, and it is in these indices that consumers determine the quality of beverages. Data were presented on the vitamin and mineral content of beverages-bioprotective, as well as essential amino acids presented in them. It has been established that the developed bioremediation beverages will be competitive on the consumer market of Ukraine, due to improvement of organoleptic parameters, increase in the composition of food fibers, vitamins and minerals, and also the presence of preventive properties. The chemical composition of gluten and psyllium, the determination of optimal technological parameters, hydrolysis, foaming and swelling are studied.

The recipes of beverages "Immuno Plus", "Kovtok zdorov'ya", "Zdorov'yachko", "Bananovy", "Shpinatny" are developed.

References

1. Алексієв Г.В. Дослідження та інтенсифікація процесу динамічного подрібнення плодів для виробництва напоїв з м'якоттю. – Санкт-Петербург: РСХА. 2006. – 25 с.
2. Бажина Т.П. Особливості білкового комплексу насіння кунжуту. – Кубань: КГТУ. 2008. – 29 с.
3. Гмошинська М.В. Харчування вагітних і годуючих жінок з використання спеціалізованих продуктів. – Москва: відділ дитячого харчування НИИ РАМН. 2011. – 23 с.
4. Дайронос Ж.В. Морфолого-анатомічне вивчення плодів горіха грецького та горіха чорного. – Росія: Всеросійський науково-дослідний інститут овочеводства. 2015. – 28 с.
5. Дьяков А.Г., Торяник А.И. Дослідження вмісту вологи шротів і клітковини вівса і проектування на їх основі технології смузі геродіетического. – Харків: Інститут харчових технологій. 2009. – 181 с.

6. Іванова М.І., Кашлева А.І., Разін А.Ф. Проростки – функціональна органічна продукція. – Росія: Всеросійський науково-дослідний інститут овочеводства. 2012. – 25 с.
7. Калугіна І.М., Ненова А.В. Розробка технології йодовмісних смузі на основі фейхоа. – Одеса: ОНАХТ. 2014. – 128-133 с.
8. Квасенков Є.І., Мякіннікова О.І. Розробка рецептур морозива і смузі з тропічними плодами. – Кубань: КГТУ. 2014. – 32 с.
9. Ковтун Н.К. Роль зелених культур профілактика захворювання. – Санкт-Петербург: РСХА. 2006. – 25 с.
10. Кожевникова А.Ю., Петрова Ю.В. Отримання рослинного молока рецептурного інгредієнта напою. – Кемеровск: КТІПП. 2015. – 25-46 с.
11. Кореницина К.Д., Комкова О.Г. Розробка безалкогольних напоїв з натуральних компонентів. – Донск: ДГАУ. 2014. – С. 244-247.
12. Ловкис З.К. / Інноваційні підходи в переробці плодів та ягід. – Белорусь: НПЦ НАН. 2011. – 25 с.
13. Минаєв Л.В., Минаєв Т.В., Кравцова Е.В., Алексеїв В.І. / Експериментальне визначення оптимальною форми лезового інструменту для подрібнення фруктів та овочів. Санкт-Петербург: Університет ИТМО. 2008. – 88 с.
14. Міхеєва Г.А., Шатнюк Л.Н., Спірічев В.Б., Спірічева Т.В., Ладодо О.Б. /Нові види продуктів для вагітних і годуючих жінок – Пермь: «Здоровье семьи». 2010. – 10 с.
15. Неповинних Н.В. / Розробка технологічних рішень при виробництві напоїв профілактичних дій. – Саратов: Саратовский ГАУ. 2014. – 29 с.
16. Одинцова К.А., Дубровська Н.О. /Підтвердження функціональних властивостей натурального меду з горіхами – Санкт-Петербург: СППУ Петра Великого. 2017. – 456-464с.
17. Погожих М.І. / Дослідження дисперсного складу овочевого та фруктового напівфабрикату як основної складової частини для напоїв смузі – Харків: Харківський державний університет харчування і торгівлі. 2010. – 5-15 с.
18. Скрипін П.В., Крючкова В.В., Лодяного В.В. / Якісні показники сирної маси, збагаченої волоським горіхом, ягодами шовковиці і шротом розторопші. – Донск: ДГАУ. 2009. – 29 с.
19. Солондіков С.Ю., Люшіна Г.А., Колесова О.В, Маслова В.В., Андреева Ю.В., Кузнецов А.А. / Оцінка біологічних властивостей

сока з паростків пшениці. Розробка технології його отримання. – Пермь: ПНПГУ. 2015. – 29 с.

20. Спірічев В.Б., Пересічний М.І. Розробка технології смузі на основі топінамбура з використанням добавок з волоського горіха

21. Тюрікова І.С., Пересічний М.І. / Розроблення технології плодоовочевих смузі з використанням біологічно цінного волоського горіха. – Полтава: Науковий вісник Полтавського університету економіки і торгівлі. 2015. – 73с.

22. Федосова А.Н., Каледіна М.В. / Розробка функціонального продукту з медом на основі концентрату натурального казеїну. – Ставрополь: Сучасні проблеми науки та освіти. 2014. – 145 с.

23. Фіщенко А.В./Розробка рецептури блюда смузі з облепихою та гарбузом. – Донск: ДГАУ. 2017 – 74-55 с.

24. Telezhenko, L.M., Dzyuba, N.A., Kashkano, M.A., Valevskaya L.O. (2016) *Osnovy naukovykh doslidzhen: navch. posib.: [dlia vyshch. Navch. zal.]*. Kherson: Hrin D.S., 192.

25. Telezhenko, L.N., Kashkano, M.A. (2014) *Kompleksnaya otsenka kachestva polykomponentnykh krupianikh zapakanok. Yzvestiya visshykh uchebnykh zavedenyi. Pyshchevaia tekhnolohiya*. – Krasnodar, 1 (337), 101-104.

26. Khomych, H.P., Vikul, S.I., Kapreliants, L.V., Osypova, L.A., Lozovska, T.S. (2015) Patent na vynakhid 107506 S2 MPK G 01N 33/00 (2015.01). *Sposib vyznachennia biolohichnoi aktyvnosti ob'ektiv pryrodnoho pokhodzhennia*. – Vlasnyk Odeska natsionalna akademiia kharchovykh tekhnolohii, U 201302626, zaiavl. 04.03.2013; opubl. 12.01.2015, Biul. 1.

27. Vykul, S.I. (2012) *Byolohycheskaya aktyvnost rastytelnogo sirianyuhredyenta pyshchevikh produktov. Kharchova nauka i tekhnolohiia*, 4(21), 40-44.

28. Panyu, L.E. (1983) *Byokhymycheskye mekhanyzmy stressa*. Novosybtorsk: Nauka, 216.

29. Khalmuratov, A.H., Totskyi, V.N., Chahovets, R.V. (1982) *Membrannii transport kofermentnykh vytmynov*. Kyev: nauk. Dumka, 280.

30. Dzyuba N.A. ASLT-Test –Methods for determining shelf-life of high-protein desserts / N.A. Dzyuba, M.I. Oliiynik, A.R. Bezzodina // *Science and society / Proceedings of the 1st International conference / Accent Graphics Communications and Publishing / Hamilton, Canada*. – 2017. – P. 15-20.

31. Інтернет-джерела:

<https://kosya.wordpress.com/2009/03/04/полезные-напитки-при-беременности/>
<http://www.mirwomne.ru/beremennost/articles/pitye-wo-wremya-beremennosti/>
<http://www.mirwomne.ru/beremennost/articles/pitanie-beremennoi/gagda/>
<http://www.pinetka.com/beremennost/shkola-buduschih-mam/samyie-poleznyie-napitki-pri-beremennosti-reyting.html>
http://ilive.com.ua/family/gazirovannaya-voda-pri-beremennosti_113445i15855.html
<http://odnatakaya.ru/beremennost/koka-kola-pri-beremennosti.html>
<http://proevents.com.ua/mozhno-li-kvas-beremennym-polza-ili-vred/>
<http://mama66.ru/pregn/778>
<http://detochgur.ru/beremennost-i-rody/19-moloko-pri-beremennosti.htm>
http://poxudeem.ru/produkti/molochnie_produkty/3594-tan-kislomolochnyy-napitok.html
<http://mamochkaiya.ru/pitanie/polza-kefira-dlya-beremennoj-zhenshiny.html>
<http://www.ivan-teas.ru/svoystva-protivopokazaniya/beremennost/>
<http://wmn.pp.ua/11-1-0-9207.html>
http://www.zid.com.ua/ukr_creativework/chaj-rojbush-i-vidvar-vivsa-napoji-dlya-vahitnyh
<https://nebolet.com.ua/pravilnoe-pitanie/chaj-s-limonom-dlja-beremennyh-mozhno-dazhe-nuzhno.html>
<http://vidpoviday.com/kakao-pri-vagitnosti-chi-mozhna-piti-neskvik-i-napij-z-molokom>
<http://ya-matusya.com.ua/tsikoriy-naykrashhiy-napij-dlya-bagatoh-vagitnih/>
<http://detochgur.ru/beremennost-i-rody/3908-berezovyj-sok-pri-beremennosti.html>
http://ilive.com.ua/family/soki-pri-beremennosti_11187i16441.html
<http://www.mamamoldova.com/sokoterapiya-vo-vremya-beremennosti/>
<http://vseznai.in.ua/svizhovizhati-soki-korist-chi-shkoda/>
<http://moiaberem.ru/kislorodnye-kojtejli-dlya-beremennyh>
<http://detochgur.ru/beremennost-i-rody/4287-kisel-pri-beremennosti-skolko-i-kakoj.html>

<http://www.beregite-zdorovje.ru/page/napitki-dlja-beremennyh-i-kormjashhih-mam>

<http://organic.ua/uk/2010/07/2200-likuvalni-travy-i-vagitnist>

<http://tvoymalysh.com.ua/uk/pregnancy/health/7172-toksikoz-pid-chas-vagitnosti-7-naykrashtih-napoiv-shto-polegshuyut-nepriyemniy-stan.html>

<http://lady.tochka.net/ua/10499-krasnoe-vino-vo-vremya-beremennosti-za-i-protiv>

НТБ ОНАХТ

APPENDIX A

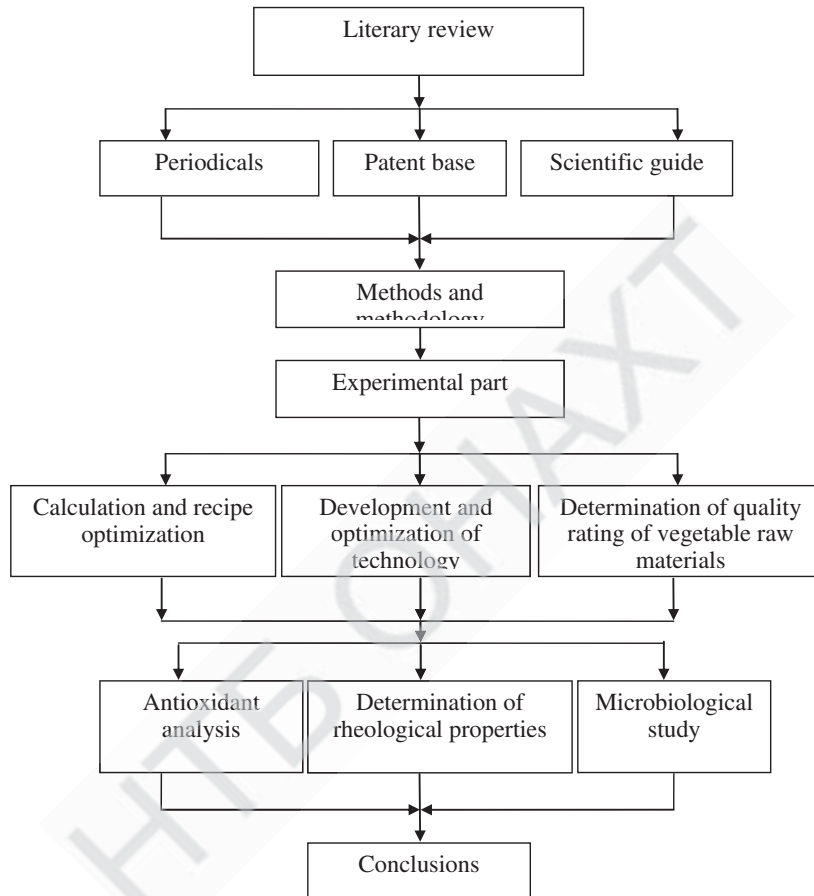


Fig 1. Exploration program

Table 1 – Scale for assessing sensory performance of developed beverages

Indicators name	K _{weight}	Level of quality, points			Description of quality level		
		4	3	2	Well (4)	Satisfactory (3)	Satisfactory (2)
1	2	3	4	5	6	7	8
Organoleptic							
Outward	4	16	12	8	Homogeneous, uniform, free of foreign matter	Homogeneous free of foreign matter	Presence of foreign matter, supplements are out of sight
1	2	3	4	5	6	7	8
Color	3	12	9	6	Uniform throughout the surface	Uniform	Not expressed
Taste	4	16	12	8	Intensely expressed	Weakly expressed	Not expressed
Flavour	3	12	9	6	Intensely expressed	Weakly expressed	Not expressed
Consistency	3	12	9	6	Homogeneous surface, filled regularly with bubbles	Homogeneous surface, filled regularly with bubbles	Nonhomogeneous
Uniformity	3	12	9	6	Homogeneous	Weakly homogeneous	Nonhomogeneous
Firmness	3	12	9	6	Persistent	Weakly persistent	Nonpersistent
Physical and chemical features							
Mass content of carbohydrates, %	10	40	30	20	at least 2.5	1.2	less than 1
Mass content of solids, gr/100 gr of product	5	20	15	10	not less than 5	2...5	less than 2
Active acidity	10	40	30	20	not less than 4.5	3... 4.5	less than 3

Indicators of nutrition value							
Mass content of dietary fibers, g	9	36	27	18	not less than 0.46	0.35 ... 0.45	less than 0.3
Caloric content, kcal	10	40	30	20	not more than 80	60... 75	less than 70
Preventive internals	8	32	24	16	Multidirectional	3-4 directional	1-2 directional
Indicators of innovation activity							
The novelty of recipe	10	40	30	20	Patented	Patent-free	Absent
Indicators of marketing research							
Adverti-sing	7	28	21	14	Television, newspaper, magazines, outdoor advertising	Newspapers, magazines, outdoor advertising	Absent
1	2	3	4	5	6	7	8
Market and demand analysis	8	32	24	16	Lack of competition, high demand	Low competition, high demand	Strong competition, slack demand
Composite indicator of marketability	100	400	300	200			

Table 2 – Microbial attributes of beverages on juice-based

Indices	Norm (DSTU 4069:2016)	Method of detection
Bacteria of coliform group, cm ³ , in which they are not allowed	333	DSTU GOST 30712
Number of mesophilic anaerobic and facultative-anaerobic microorganisms, CFU/cm ³ , not more	0	GOST 1044.15
Pathogens, including <i>Salmonella</i> genus, cm ³ , in which they are not allowed	25	DSTU IDF 93A
Number of mold fungi and yeast, CFU / cm ³	100	GOST 10444.12
Number of lactic acid bacteria, CFU / cm ³	0	GOST 10444.11

APPENDIX B

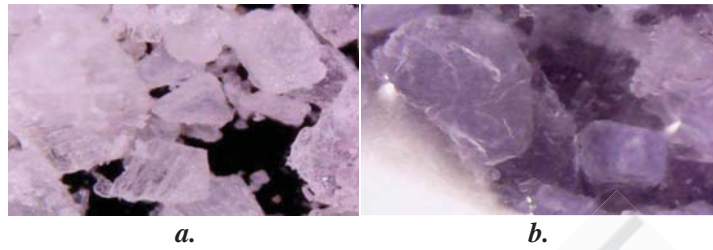


Fig. 1. Microphotography of dry and swollen gluten (a – dry gluten, b – swollen gluten)

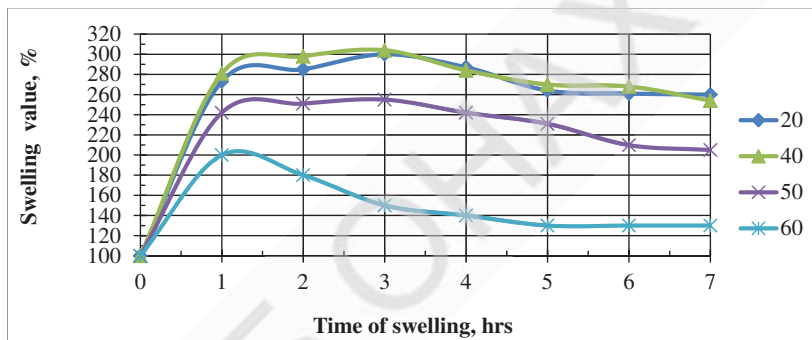


Fig. 2. Dynamics of hydration of HC at pH = 2,3

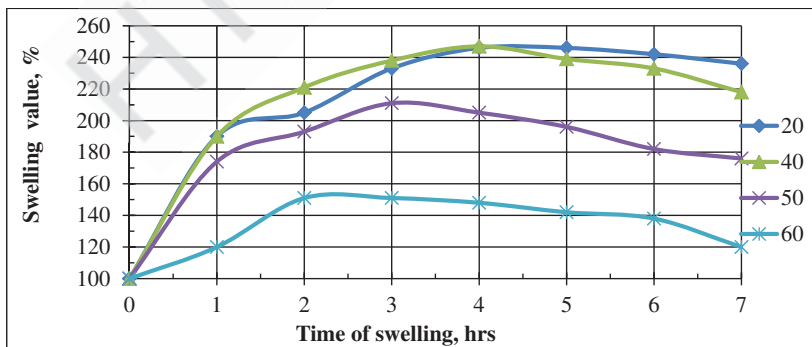


Fig. 3. Dynamics of hydration of HC at pH = 7,0

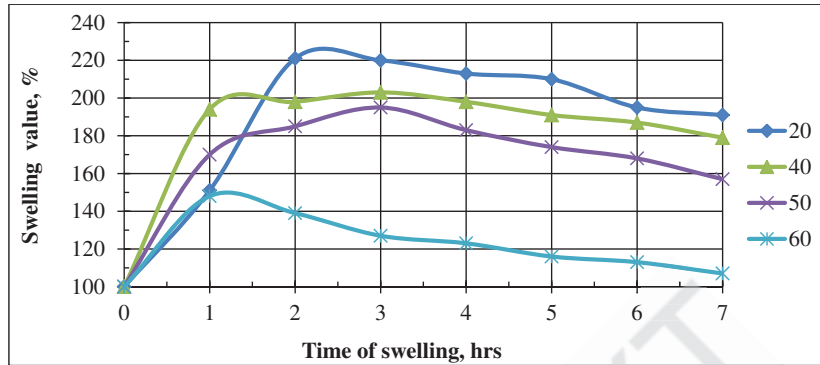


Fig. 4. Dynamics of hydration of CH at pH

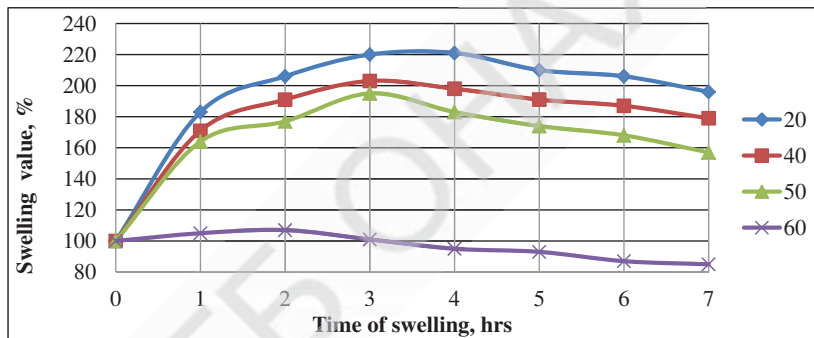
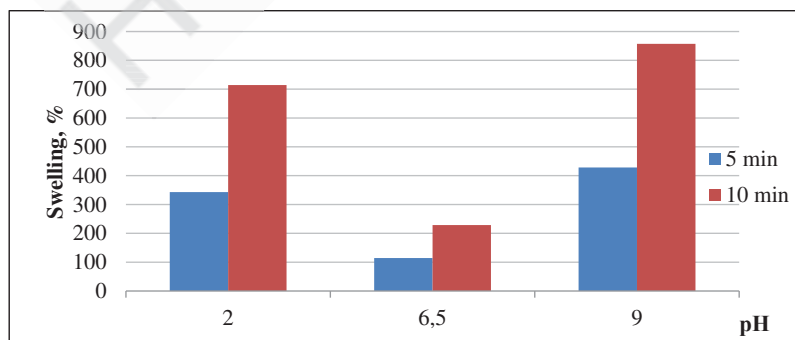
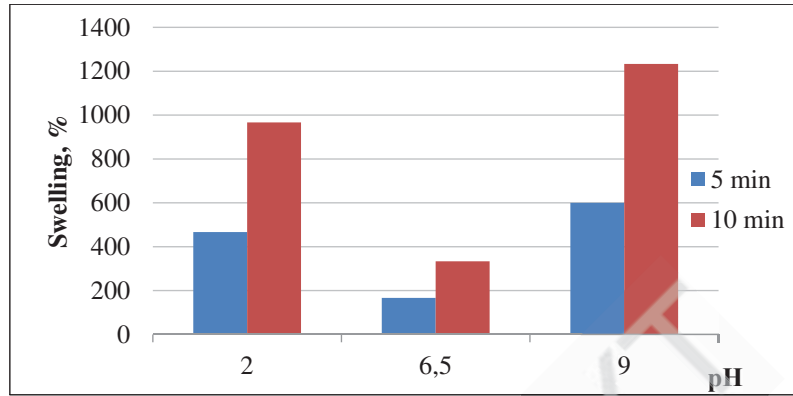


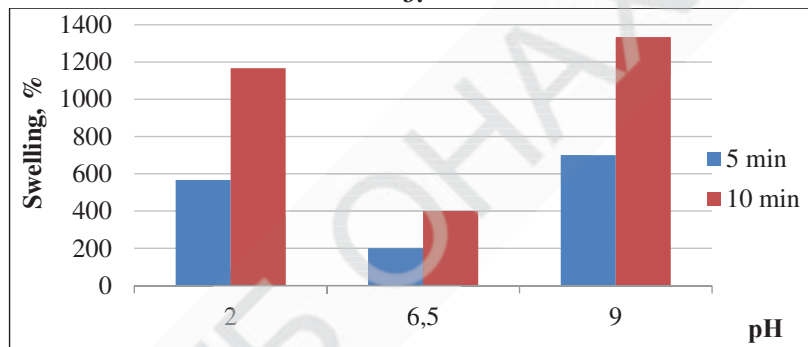
Fig. 5. Dynamics of hydration of glutin in serum (pH = 5.2)



a.

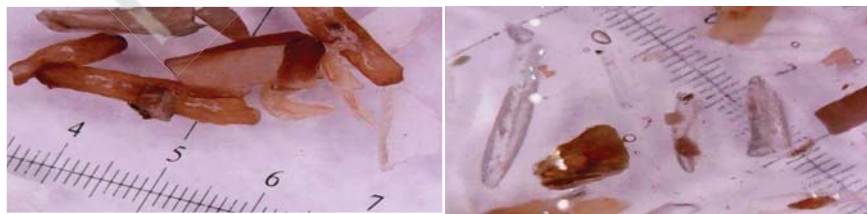


b.



c.

Fig. 6. The dynamic pattern of swelling of the psyllium, depending on the temperature and pH (*a.* $t = 20\text{ }^{\circ}\text{C}$, *b.* $T = 40\text{ }^{\circ}\text{C}$, *c.* $t = 60\text{ }^{\circ}\text{C}$)



a.

b.

Fig. 7. Microphotographs of psyllium (*a.* dry psyllium, *b.* swelling psyllium)

APPENDIX C

Table 1 – Recipe for drinks

Initial product	Proportion of ingredients, g		
	"Kovtok zdorov'ya"	"Immuno Plus"	"Zdoro- v'yachko"
Cabbage juice			20
Carrot juice			18
Beet juice			40
White honey	5	18	10
Collagen Hydrolyzate		10	5
Glutin	15		
Sunflower oil			7
Apple juice		15	
Orange juice	60		
Flesh of briar		7	
Banana	20	10	
Output of the finished drink	100	100	100
Milk serum		40	

Table 2 – Recipe of beverages for pregnant

Initial product	Proportion of ingredients, g	
	"Shpinatnyy"	"Bananovyy"
Acid curd cheese	20	20
Gingelli	4	3
White honey	7	7
Cow's semi-skimmed milk	121	125
Walnuts	12	10
Spinach	30	
Banana		29
Psyllium	1	1
Collagen Hydrolyzate	5	5
Output of the finished drink	200	200

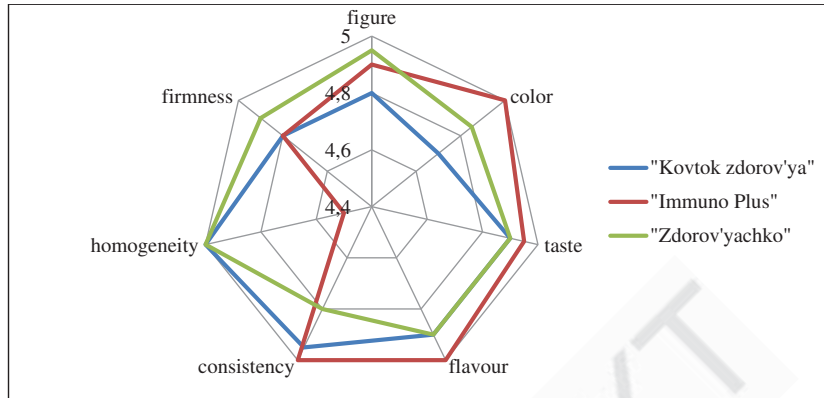


Fig. 1. Organoleptic profiles of high-protein beverages

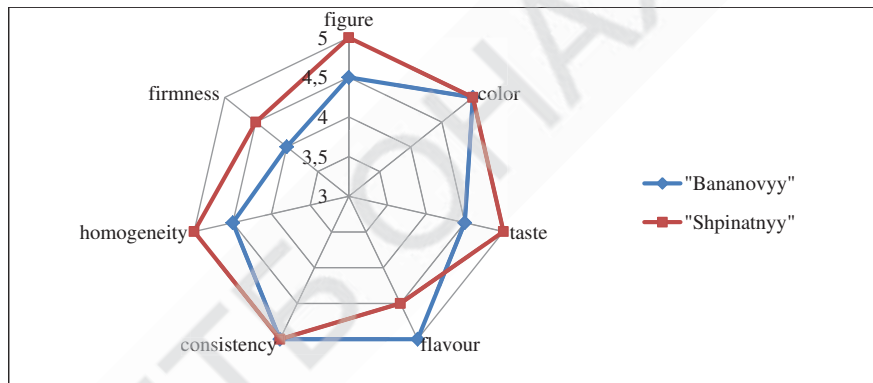


Fig. 2. Organoleptic profiles of beverages for pregnant women

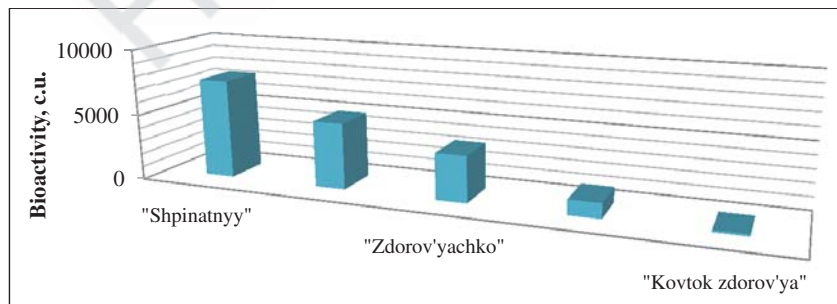


Fig. 3. Bioactivity of beverages

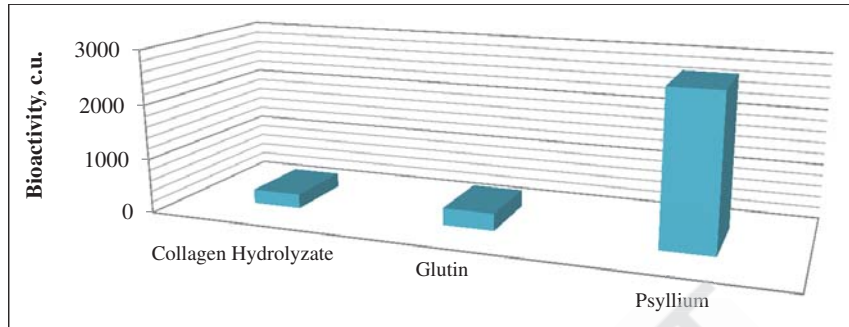


Fig. 4. Bioactivity of ingredients of non-traditional initial product

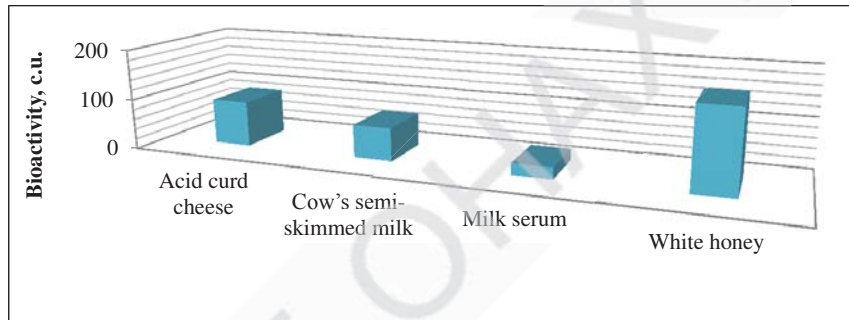


Fig. 5. Bioactivity of ingredients

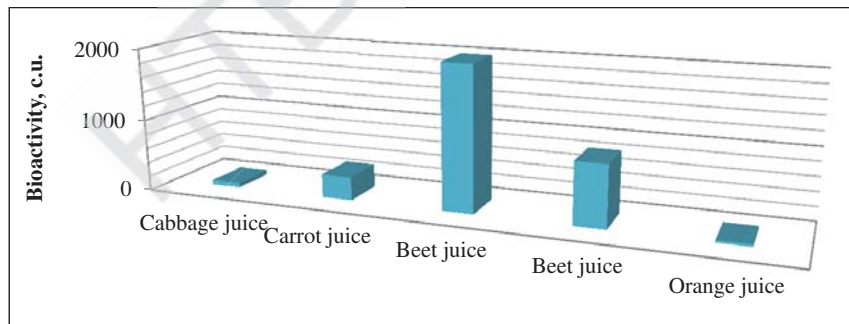


Fig. 6. Bioactivity of juices

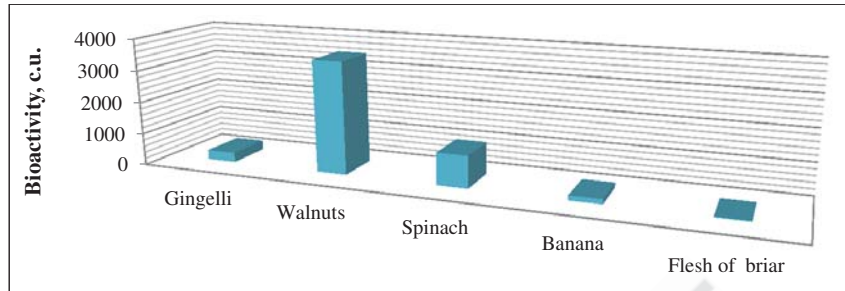


Fig. 7. Bioactivity of plant ingredients

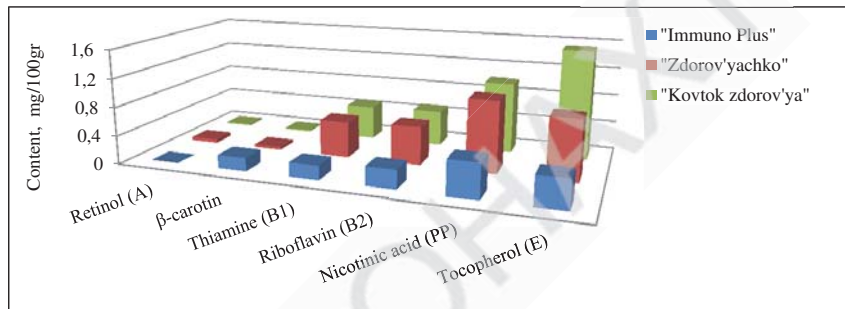


Fig. 8. Profile of the vitamin composition of the developed beverages (mg / 100g)

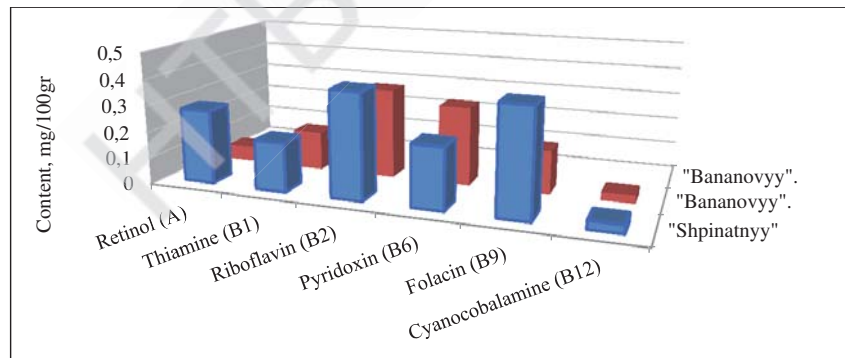


Fig. 9. Profile of the vitamin composition of developed drinks for pregnant women (mg / 100g)

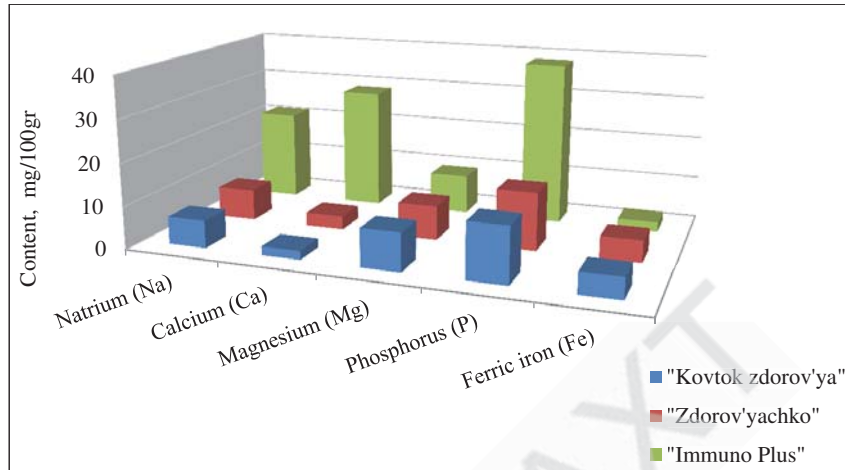


Fig. 10. Profile of the mineral composition of the developed beverages (mg / 100g)

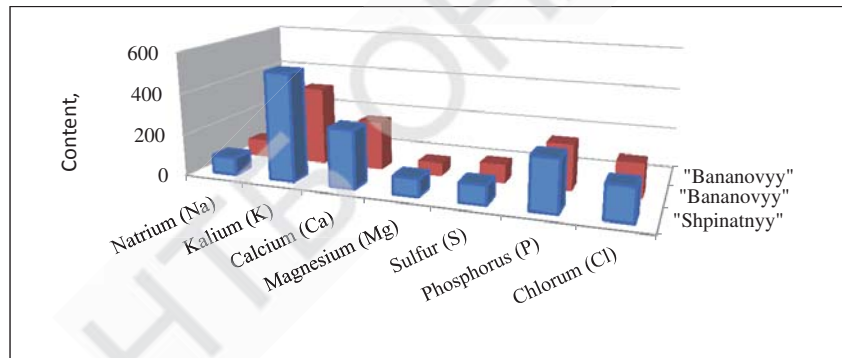


Fig. 11. Profile of the mineral composition of developed beverages for pregnant women (mg / 100g)

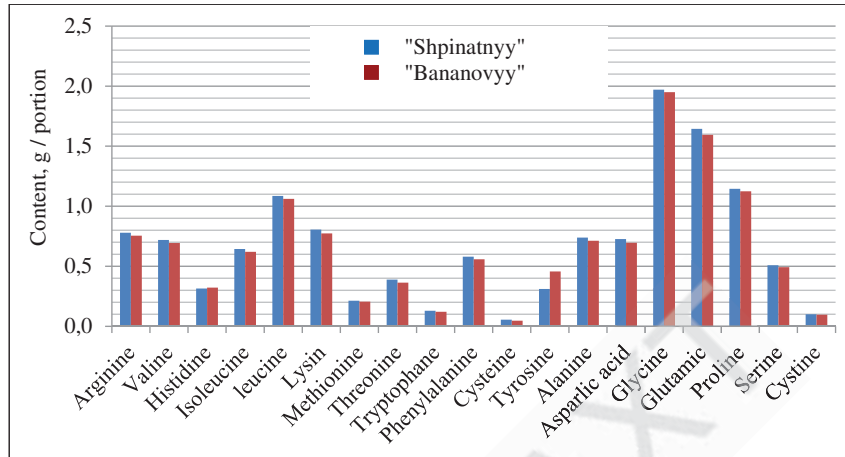


Fig. 12. Amino acid composition of protein drinks for pregnant women

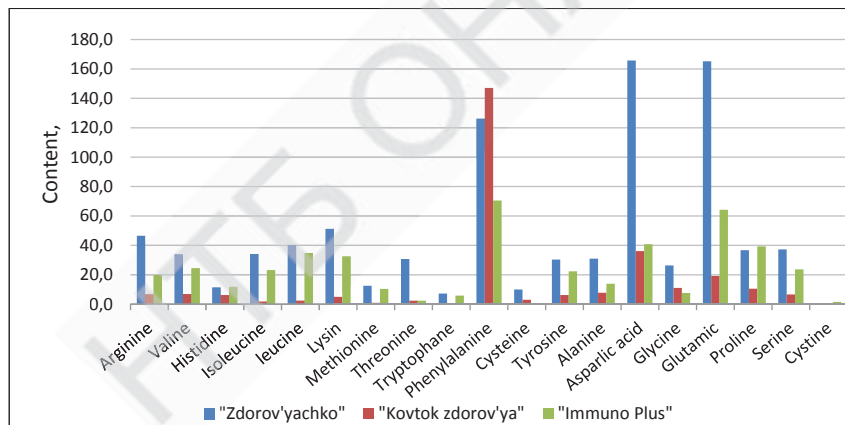


Fig. 13. Amino acid composition of proteins of beverage

Table 3 – Characteristics of the microbiological parameters of the drink "Shpinatnyy"

Indicator names	Value according to normative documentation	Actual value of the indicator
Bacteria of coliform group in 1 gr	Not allowed	Not detected
Pathogens, including <i>Salmonella</i> genus, in 100 g	Not allowed	Not detected
Number of mesophilic anaerobic and facultative-anaerobic microorganisms, CFU/cm ³ , not exceeding	3,0·10 ³	1,1·10 ³
Number of mold fungi and yeast in 1 g, CFU/cm ³ , not exceeding	50	4

Table 4 – Characteristics of microbiological indicators of the drink "Bananovyy"

Indicator names	Value according to normative documentation	Actual value of the indicator
Bacteria of coliform group in 1 g	Not allowed	Not detected
Pathogens, including <i>Salmonella</i> genus, in 100 g	Not allowed	Not detected
Number of mesophilic anaerobic and facultative-anaerobic microorganisms, CFU/cm ³ , not exceeding	3,0·10 ³	1,3·10 ³
Number of mold fungi and yeast in 1 gr, CFU/cm ³ , not exceeding	50	Not detected

Table 5 – Characteristics of the microbiological indicators of the drink "Immuno Plus"

Indicator names	Value according to normative documentation	Actual value of the indicator
Bacteria of coliform group in 1 gr	Not allowed	Not detected
Pathogens, including <i>Salmonella</i> genus, in 100 gr	Not allowed	Not detected
Number of mesophilic anaerobic and facultative-anaerobic microorganisms, CFU/cm ³ , not exceeding	Not allowed	Not detected
Number of mold fungi and yeast in 1 gr, CFU/cm ³ , not exceeding	3,0·10 ³	0,8·10 ³

Table 6 – Characteristics of the microbiological indicators of the drink "Kovtok zdorov'ya"

Indicator names	Value according to normative documentation	Actual value of the indicator
Bacteria of coliform group in 1 gr	Not allowed	Not detected
Pathogens, including <i>Salmonella</i> genus, in 100 gr	Not allowed	Not detected
Number of mesophilic anaerobic and facultative-anaerobic microorganisms, CFU/cm ³ , not exceeding	Not allowed	Not detected
Number of mold fungi and yeast in 1 gr, CFU/cm ³ , not exceeding	3,0·10 ³	1,2·10 ³

Table 7 – Characteristics of the microbiological indicators of the drink "Zdorov'yachko"

Indicator names	Value according to normative documentation	Actual value of the indicator
Bacteria of coliform group in 1 gr	Not allowed	Not detected
Pathogens, including <i>Salmonella</i> genus, in 100 gr	Not allowed	Not detected
Number of mesophilic anaerobic and facultative-anaerobic microorganisms, CFU/cm ³ , not exceeding	Not allowed	Not detected
Number of mold fungi and yeast in 1 gr, CFU/cm ³ , not exceeding	3,0·10 ³	1,3·10 ³

Table 8 – Content of QMAFAnM, CFU in 1gr

Beverages	Days				
	0	1	2	3	4
"Immuno Plus"	Not detected	3x10 ¹	10x10 ²	13x10 ²	23x10 ³
"Kovtok z-dorov'ya"	Not detected	2x10 ¹	9x10 ²	11x10 ²	22x10 ³
"Zdorov'yachko"	Not detected	1,5x10 ¹	6x10 ²	9x10 ²	19,3x10 ³
"Shpinatnyy"	Not detected	3x10 ¹	10x10 ²	13x10 ²	23x10 ³
"Bananovyy"	Not detected	3x10 ¹	10x10 ²	13x10 ²	23x10 ³

APPENDIX D

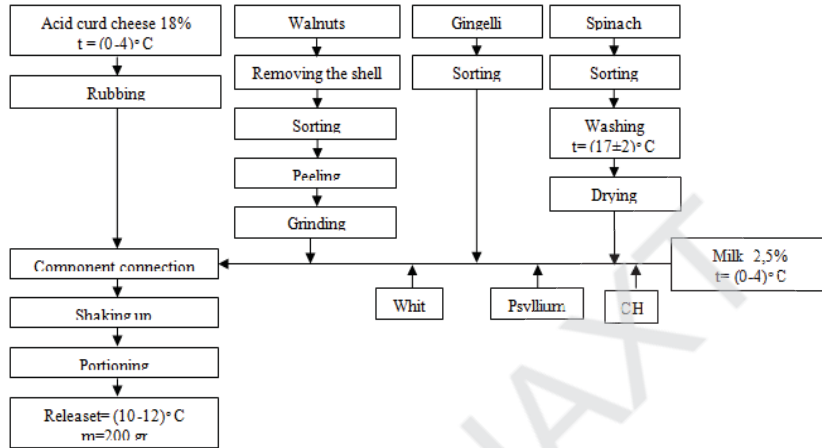


Fig. 1. Technological scheme of beverage preparation "Shpinatnyy"

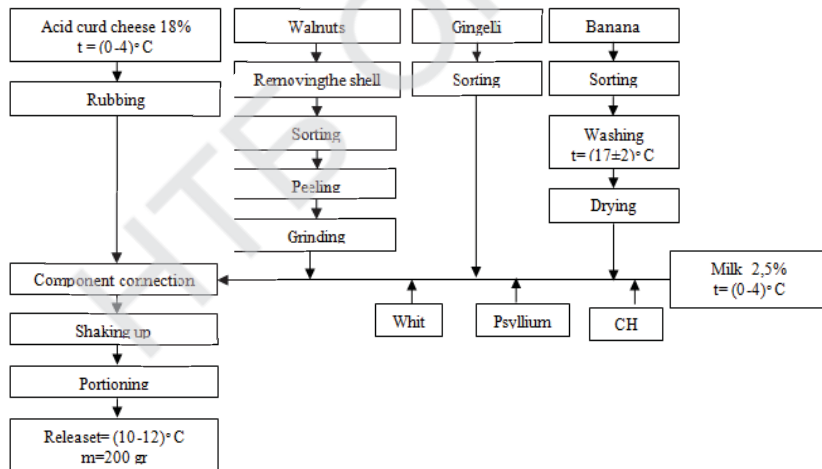


Fig. 2. Technological scheme of beverage preparation "Bananovyy"

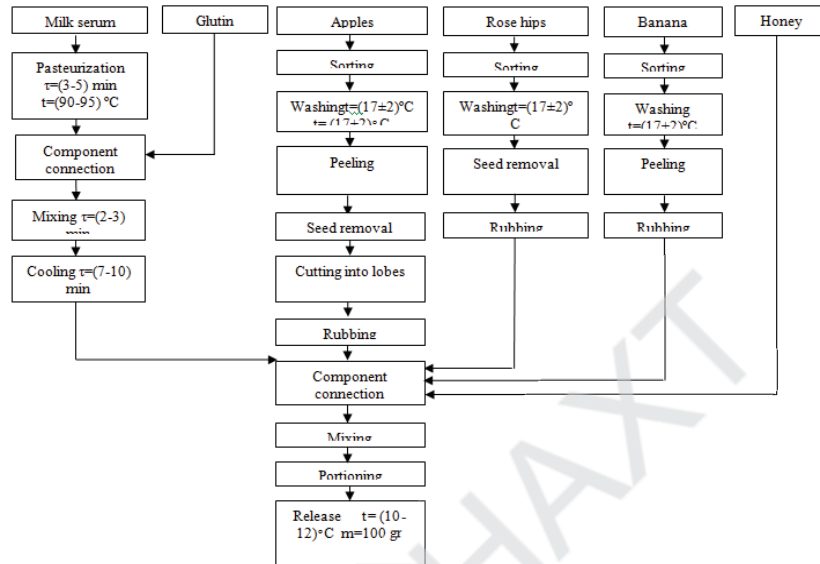


Fig. 3. Technological scheme of beverage preparation "Immuno Plus"

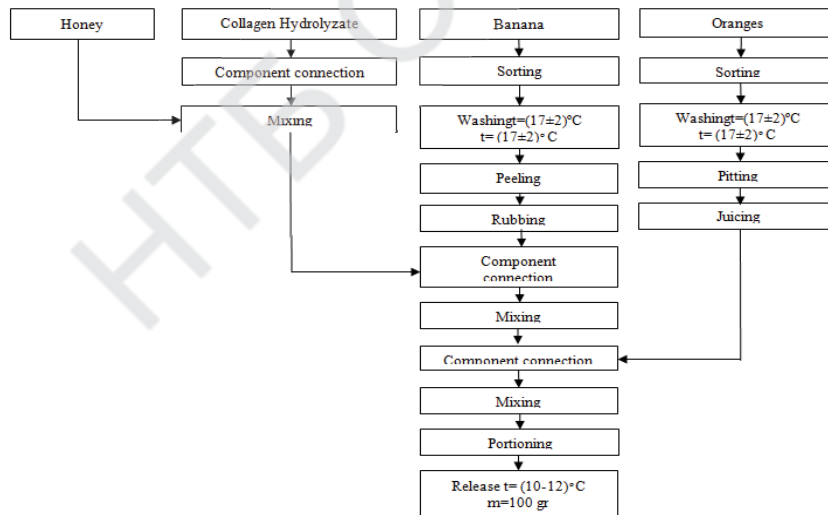


Fig. 4. Technological scheme of beverage preparation "Kovtok zdorov'ya"

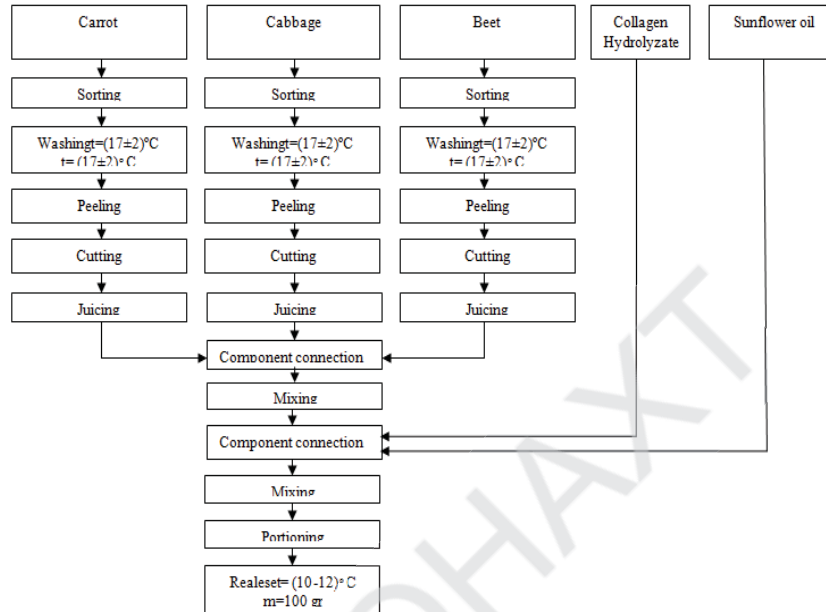


Fig. 5. Technological scheme of beverage preparation "Zdorov'yachko"

TABLE OF CONTENTS

1. FOOD SCIENCE AND TECHNOLOGY.....	7
BEVERAGES-BIOPROTECTORS WITH HIGH ANTIOXIDANT PROPERTIES Author – Bezzodina A., Oliinyk M., Supervisor – Dziuba N.	7
APPLICATION OF A QUALIMETRIC MODEL FOR PREDICTING QUALITY INDICATORS AT THE DEVELOPMENT OF CANNED FOOD "SECOND DINNED DISHES" WITH ADDED PROPELLED WHEAT GRAIN Author – Babich N., Supervisor – Zenkova M.	44
THE TECHNOLOGY OF DRINKING BREAKFAST USING FOOD COMPOSITIONS FROM PLANT RAW MATERIALS Author – Serenko A., Supervisor – Vitryak O.	62
A PROMISING TECHNOLOGY FOR MAKING BITTER TINCTURES FROM AMARANTH Author – Zhunusova M., Supervisor – Ibraimova S.	80
TECHNOLOGICAL PROPERTIES AND QUALITY INDICATORS OF HULLED WHEAT Author – Zhyhunova H., Supervisor – Stankevych H.	98
INCREASING THE SHELF LIFE OF CUTLETS OF TYPE «HAMBURGER» Author – Lisnik D., Chistiukhin D., Supervisor – Irina H.	111
USING OF NEW PROGRESSIVE TECHNIQUES FOR STUDY OF THE COW'S MILK QUALITY AND SAFETY Author – Polunina T., Supervisor – Radchenko A.	126
RESEARCH OF THE EFFECTIVENESS OF DEVELOPED FUNCTIONAL PRODUCTS FOR PROFILACTIC TREATMENT Author – Zymlianskyi M., Supervisor – Kaliuzhna O.	149
PRODUCT SCREENING OF FOODS FOR PRESCHOOL AND SCHOOL AGE AND THEIR WEB-REPRESENTATION IN THE REPUBLIC OF BELARUS Author – Bolsun A., Kovalova Y., Makarenko A., Medjakova E., Supervisor – Masanskyi S.	167
ENRICHMENT OF GEORGIAN CHEESE WITH BIOLOGICALLY ACTIVE COMPONENTS OF SAPERAVI Author – Maisuradze G., Supervisor – Elanidze L.	197

Наукове видання

Міжнародний конкурс студентських наукових робіт

BLACK SEA SCIENCE 2018

Матеріали

Верстка – Н.М. Ковальчук

Формат 60x84/16. Гарнітура Times New Roman.
Умовно-друк. арк. 48,07. Тираж 300. Замовлення № 0518-105.

Видавництво і друкарня – Видавничий дім «Гельветика»
73034, м. Херсон, вул. Паровозна, 46-а, офіс 105
Телефон +38 (0552) 39 95 80
E-mail: mailbox@helvetica.com.ua
Свідоцтво суб'єкта видавничої справи
ДК № 4392 від 20.08.2012 р.